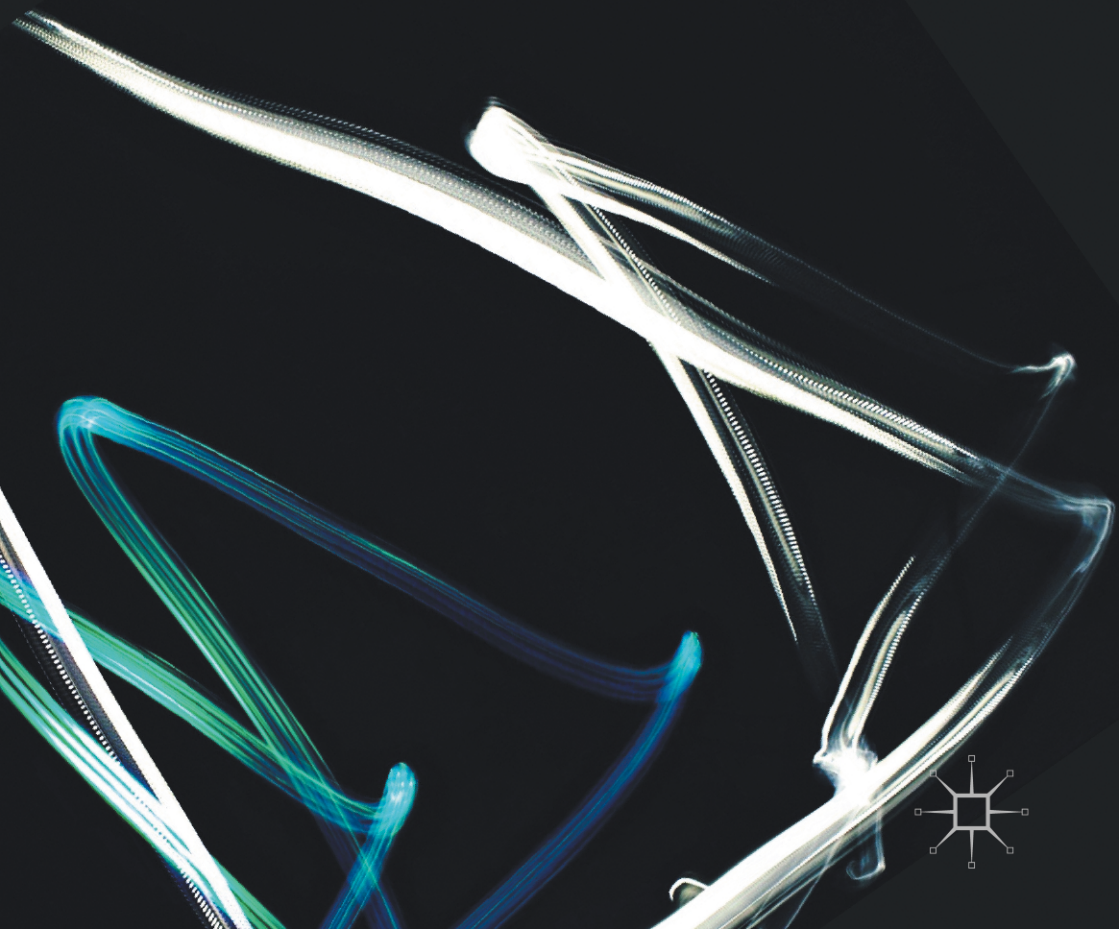
HETERODOX INVESTMENT THEORY

STOCHASTIC PREDICTABILITY AND UNCERTAINTY

Thomas Pistorius



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Stochastic Predictability and Uncertainty

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To Mieke

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Introduction

1.1 The Critical Thinking of the Humanities

In practice, investment theory has done damage, witness the financial crisis of 2008 in which statistical models again proved to be too optimistic. The investment theory of Markowitz and its subsequent practice of institutional investors claim that investment decisions can be handled with mathematical statistics. Statistics assumes that randomness has a fixed structure, but does it apply to investing? A common approach would be to test the value of statistics with . . . statistics. That is, however, begging the question, meaning that you will find what you ask, because the answer is hidden in the question. The truth is that statistics, in the sense of probability theory, is a theory, a theoretical layer over facts. Statistics has pervaded social sciences like finance.

So how to investigate a science which has been immersed in statistics? Therefore we need critical thinking outside of mainstream finance, which encompasses investment theory. Happily, the humanities offer the conversational space for critical thinking. That is, by the way, how economists like Knight, Von Mises, Keynes, Galbraith, McCloskey, and Klamer

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underpinned their criticism on mainstream economics. The history of finance will show other paradigms of finance, and how finance became a part of economics, that is financial economics. The philosophy of statistics will be put in discussion with its counterpart of the philosophy of uncertainty, which implies unpredictability. The analysis of the rhetoric of investment theory is another insightful way to understand its discourse, its metaphors, and its stories. Culture, an extension of a rhetorical analysis, provides another domain of critical analysis of investment theory. My book on investment theory may resemble a philosophical novel. A philosophical novel reflects on various ideas such as philosophy, human nature, society, science, culture, or ethics.

The four perspectives of the humanities, history, philosophy, rhetoric, and culture put investment theory in a critical light. The perspectives enrichen the picture of investment theory and support each other. If we accept that science is not merely about prediction but also about understanding, then mainstream investment theory has serious competitors: bubble finance, political finance, fractal finance, behavioural finance, and evolutionary finance. The *Werdegang* from epistemology ('what can we know?', which is understanding at most in investment theory) to ethics (what should a person do, and what has practical instead of theoretical reason to offer?) might eventually be a relief to those involved in investing. It frees up energy to the challenge of a heterodox finance: intellectually honesty on what to expect from prediction, how to invest according to the understandings of the competing, sobering, alternative theories of investing, and how to make investment decisions ethically and with practical wisdom.

1.2 The Assumption of Predictability

The Assumption of Predictability

As Robert Skidelsky (2009a) stressed, economics presents itself as a predictive discipline, claiming to be like natural science. Yet, the claim of predictability poses a problem, because economics is employed to make decisions which affect individuals and the society as a whole.

Philip Mirowski (2013, 246 and further) distinguished three reasons reinforcing the perception that economists predict:

1. Milton Friedman's methodological paper (1953) proposed prediction as a goal of economics.
2. Many economists have made a living out of predicting.
3. Since the 1980s finance and economics have made prediction central to the theory, founded among other things on the rational expectations theory.

But economics is similar to other social sciences, which do not predict either: 'It is only by imagining a mechanical world of interacting robots that economics has gained its status as a hard, predictive science (Skidelsky 2009b).' Skidelsky believed that the credit crisis of 2008 was aggravated as a consequence of the intellectual failure of the dominant neoclassical school of economics, which assumes a stable world, with rational agents and efficient use of information (Skidelsky 2009a). During the credit crisis, the ideology of the rational market as advocated by Alan Greenspan and others was put to a reality check (Fox 2009). The ideology of rational markets, which implies that the market delivers the true price, makes one forget that the financial market is 'a devilish thing' as well (Fox 2009, xv).

The way in which statistics interprets the financial market data, can also offer an explanation for the credit crisis of 2008. The assumptions behind the models in finance seem to imply that risk is manageable, yet turbulence is normal, not abnormal, in financial markets (Mandelbrot and Hudson 2004). If turbulence in financial markets is normal, modern finance is problematic indeed, in Mandelbrot's and Hudson's words:

> Financial economics, as a discipline, is where chemistry was in the sixteenth century: a messy compendium of proven know-how, misty folk wisdom, unexamined assumptions and grandiose speculation (Mandelbrot and Hudson 2008/2004, xv).

In line with the ideas of Mandelbrot, Taleb (2010) explained how the investment theory was a cause of the credit crisis of 2008, because it neglects the consequences of low probability events, which Taleb called 'black swans.'

The Problem with Prediction in Investment Theory

The modern investment theory assumes that future expected returns and standard deviations are predictable. Markowitz (1952, 1959), generally perceived as the father of the modern investment theory, leaves no doubt that he believed in the predictability of investment returns in the long run. Markowitz's investment theory evolved on mathematical statistics: though the subsequent investment theory of equilibrium on financial markets (Sharpe 1964) and its empirically based successors differ from Markowitz's approach, the investment decision still takes the statistical form of an expected return and a risk in the form of a standard deviation. The practices of financial risk management and the composition of investment portfolios in the financial sector have evolved out of the modern investment theory (MacKenzie 2006).

Because the academic investment theory also constitutes practice, the validity of using statistics to predict brings into question the sense of using the investment theory to make decisions. If we assume statistics-based predictability as valid, then statistics rules investment theory and its practice. Yet, if the arguments in the book persuade that the investment theory based on statistics does not predict, the theory becomes merely a support for decision making. Once more, the credit crisis of 2008 may clarify the sense of using the investment theory in investment practice. In the aftermath of 2008, an investor could typically have asked his investment manager:

> In the crash on the financial markets in 2008, the MSCI World, the global stock market index, dropped 38%. If you compare the expected maximal loss as indicated by the investment model before 2008, with the realized loss in 2008, a gap emerges. So, our model before 2008, based on investment theory, was wide of the mark. Is the investment model still correct?

The investment manager could have answered in two ways:

1. Yes and no. No, because the investment model failed in the crisis of 2008. Yes, because in the meantime we improved the model which now approximates the future reality of financial markets.

2. The question assumes that the investment model delivers real predictions of risk and return. Yet, we use the investment model merely to support decisions on investment policy, but not to predict.

Translated into the language of philosophy, the investment manager has answered:

1. The models of investment theory are based on scientific laws, and therefore predict. Thus investment models result in truth, in the sense of the correspondence theory of truth. The correspondence theory says that a proposition is true, if it corresponds to facts (Audi 1995). The proposed risk and return parameters of the investment model correspond to the 'factual,' objective future reality.
2. The outcome of the investment model interprets the future. The model produces fiction, not truth, unless by coincidence. The investment model enables the investment manager to get to grips with the future, and enriches judgment with historical and theoretical insights.

In the book is argued that answer 1 is wrong. Answer 2 is possibly correct, and originates from rational behaviour, instead of predictability. What rationality means will be an important theme in the book.

1.3 The Relevance of the Assumption of Predictability

The Relevance for Academia

The case of unpredictability in investment theory is not usually a topic in the field's textbooks, in its literature, or in its university courses. The broader literature on investment theory does not debate the possibility of unpredictability, because unpredictability opposes the ideas of neoclassical economics. Indeed, the field of modern investment theory seems to ignore the history of finance and current non-mainstream schools of

economics and finance, a reason why the book will discuss both items. We will now have a look at what the textbooks of investment theory tell us about predictability.

A textbook expresses the *normal science* of a field (Kuhn 1962). A scientific community founds its practice on normal science. To illustrate the ideas on the statistics-based predictability of investment returns, we will examine a number of textbooks on the investment theory. A first clue is whether the textbooks refer to Knight (1921) or not. Knight distinguished risk from uncertainty: risk is stochastically predictable, uncertainty does not provide predictability. The textbooks examined were part of my education as a master of science in finance and a financial analyst in the post-doctoral VBA-education (the Dutch equivalent of the CFA-education). None of the five textbooks in my sample refer to Knight: (Bernstein and Damodaran 1998, Bodie, Kane and Markus 1989, Maginn and Tuttle 1983, Reilly 1994, Solnik 1996). The textbooks do not refer either to other writers on uncertainty in economics such as Keynes (1936, 1937) and Von Mises (1949). The five textbooks seem to suggest that the probability distribution of returns can be estimated in a reasonable way. The fact that there is no mention of uncertainty in my sample was to be expected because the idea of being able to estimate probability distributions is at the heart of current economics and the investment theory. Not mentioning uncertainty does not disqualify the high level of the textbooks mentioned, because the books elaborate in depth on the paradigm of modern investment theory – though the paradigm should be re-evaluated because it has proven to be harmful in practice, as the risks of financial markets should not be underestimated. Though in my opinion the textbooks should incorporate uncertainty, one cannot blame the textbooks for their one-sidedness, learning necessarily 'indoctrinates' since in order to learn, one has to take basic assumptions for granted (Feyerabend 1975).

The Relevance for Society

From a societal point of view, working with the assumption that economics and investing are predictive, has had negative consequences for the economy, the financial wealth, and well-being of people, witness

the consequences of the credit crisis of 2008. Practice based on investment theory means that if the theory fails, risk management fails as well, and, that investment portfolios do not deliver a sufficient return, meaning that clients receive lower than expected returns on their investments and pensions. The general public suffered indirectly of the failing financial risk management: in the United States, the credit crisis of 2008 and its consequences caused a conservatively estimated loss of foregone economic growth of 40–90% of a one year's GDP, or $6 to 14 trillion, which equals $50,000–$120,000 for every household in the United States (Atkinson, Luttrell, and Rosenblum 2013).

Predictability in economics and financial markets relates to the domain of political economics as well. In the socialist calculation debate, Ludwig Von Mises and Friedrich Hayek disputed with proponents of the socialist economic model whether economics is able to calculate optimal outcomes for a socialist economy (Rothbard 1991). The proponents of a socialist economy won the theoretical part of the debate, because the techniques for neoclassical economics can be used for a socialist economy as well: if predictability in economics is a proper assumption, *both* the market and the socialist economy function, in theory, optimally. The conclusion of the theoretical part of the socialist calculation debate confronts one with the absurd consequences of the assumption of predictability: both a market and a socialist economy are optimal in theory despite their incompatible ideas about the role of markets and the state in the economy.

Thomas Piketty (2014) combined predictability of financial markets with the political economic topic of income and wealth inequality. Though he warned that the causes of future inequality cannot be reduced to economic mechanisms, he nevertheless proposed that inequality will grow, because the return on financial assets of the richest 1%, outpace economic growth. He founded his prediction on historical data, and thus supposed that the historical return is representative of the future return. My criticism on Piketty's view on future inequality is that if the return on the financial markets were specifiable above a rate beyond the risk-free rate, all we would have to do to diminish inequality, is to lend the other 99% of people money to buy stocks and other financial assets. If Piketty's assumption that the future return equals the historic return is true, the

result would be a sure gain for the 99%, if in practice there were enough financial assets available to be bought. The assumption that financial assets yield a specifiable return above the risk-free rate sounds too good to be true, and cannot be true, which will be argued in the book. Furthermore, common sense tells us that financial assets risk more than risk-free assets, so Piketty's prediction is too simple, because it does not take risk into account.

Another actual account within political finance is David Graeber's (2011) history on the nature of debt and its ethical side. To him, debt expressed a social relation in which debt is a promise where its repayment depends on power relations: to the powerless, debt is presented as a moral obligation; the powerful on the other hand are not held to the moral obligation to redeem. The credit crisis of 2008 illustrated Graeber's point: the losses of the financial sector were socialized as the government, the tax payer, paid the bill, seemingly leaving the responsible people in the financial sector relatively untouched. Graeber regarded money as a form of debt as well. If money is debt, then money does not need to possess intrinsic value, unlike a silver or golden coin. Graeber's historical account of the term 'stock' is interesting for investing. The term 'stock' derives from the twelfth century custom in England to notch the level of debt onto tally sticks, which represented the 'stock' for the debtor. The term 'stock holder' originates from the custom. Analogous to his political account of debt and money, it seems to me that one could perceive stocks as postulated in modern investment theory, as a power relation in the form of a promise of a specified return above the risk-free rate and a specified risk.

The Relevance for the Financial Services Industry, Regulators, and Policymakers

The discussion of the received view on predictability and its related idea of rational markets is relevant as well for the financial services industry, their supervisors such as central banks, and the policymakers.

The financial services industry can improve their risk management and their long-term added value for clients, which both help the continuity of their businesses in the long run. Central banks and policymakers should include unpredictability and irrationality in their policies of supporting trust, stability, and healthy growth, by distrusting low volatility, booms in the stock and housing markets, and, so-called optimistic new era thinking on the future of the economy (Shiller 2000), as a reason for loosening restrictions on the lending of banks, borrowing of households, and regulations and capital requirements for the financial sector.

1.4 The Purpose of the Investigation

Predictions pervade investing in its theory and practice. Specifically in the investment theory and its practice, *stochastical* predictions dominate. A stochastical prediction is a prediction of an average outcome with a probability distribution attached. But do statistics predict in investing? Is it, to paraphrase Oscar Wilde (1891), fair to use the brute reason of statistics for investing, if statistics cannot stand the test of the intellect? To test the assumption of predictability is relevant in investing because the opposite case of unpredictability and its consequences are *outside* the mainstream conversation in academia and practice, and therefore need attention.

Once again, the idea of stochastical prediction seems to be taken for granted in mainstream investment theory. But stochastical prediction is a problematic assumption of investment theory. As will be underpinned in the book, stochastical prediction is a subtle notion which must be based on solid arguments, which cannot be found in the textbooks. Because of the reflective nature of the book, history, philosophy, rhetoric, and culture form the major reference to discuss the foundations of stochastical predictability in investment theory. The combination of history, philosophy, rhetoric, and culture yields a rich analysis on the idea of stochastical prediction and its alternatives.

The central question of the book is: *On what is grounded the use of stochastical predictability in investment theory?*

The central question of the book is investigated by a number of sub questions:

1. *Do alternative investment theories offer a better explanation, modelling, prediction, or handling method?*
   The history of investment theory and current alternative investment theories offer various paradigms for investment theory which do not claim to predict, but focus on explanation or alternative modelling. It is important to show the alternative non-mainstream investment theories because they contrast and compete with the received view of investment theory.
2. *What philosophy of statistics is applied in investment theory?*
   The arguments for assuming stochastical predictability are founded on statistics, which is the theory of how to interpret randomness. The various theories of statistics have implicit assumptions on the structure of reality, in other words, they have different philosophies of probability.
3. *What are the arguments for uncertainty as the opposite of predictability?*
   Non-mainstream economics assumes unpredictability instead of predictability and has heavily debated predictability and statistics. Their arguments against predictability and statistics are an important source in making the case against predictability.
4. *What is the rhetoric of investment theory?*
   The rhetoric of investment theory translates into questions as: what are the rational arguments (logos), constitutional ideas (metaphors), and the discourse of investment theory? The analysis of the rhetoric of investment theory is grounded on the approach of *the rhetoric of economics* by McCloskey. The rhetoric of investment theory is under-researched.
5. *Can virtue and value ethics compensate the assumed epistemological deficiencies of investment theory in decision making?*
   If the epistemology of mainstream and alternative investment theories is not suited for predicting, practical reason in the form of virtue or value ethics become relevant, also because the ethics in economics and investment theory is reduced to merely the rationality of prudence.

6. *What does the investigation of the culture of investing offer as explanation for the use of the investment theory?*
   As an extension of rhetoric, the perspective of culture offers a fertile ground for explaining and exploring the behaviour of investors. Klamer's approach of *the culture of economics* will be followed here because it is relevant and applicable to investing. Also innovative practices within the culture of investing will be considered.

1.5 The Forms of Predictability and Their Denial

In the introductory chapter, a clarification of the notion of predictability and its counterarguments are now essential for understanding the discussion forthcoming: what forms of predictability exist, which notions of prediction are applied in investment theory, and, what are the main arguments against predictability in economics and the investment theory? In Markowitz's investment theory, predictability is to be understood as stochastical predictability. Stochastical predictability differs from forecasting: a stochastical prediction explicates probabilities, a forecast does not. Forecasting delivers a number, or a range between two numbers, for example of some future price or economic indicator. A stochastical prediction yields a probability distribution, meaning a range of outcomes with probabilities attached. The book examines the case for using statistics in investing, not merely for forecasting, though we will see in Knight's thinking (1921) in Chapter 4 that if probabilities and outcomes are uncertain, meaning non-measurable, stochastical probability and forecasting resemble each other.

The Forms of Predictability

Let us analyse what kind of predictions exist. The first form of prediction is a deterministic law in which a causal law extrapolates the present conditions to its future conditions (Audi 1995). A deterministic law also

shows the specific path to a future state. An example of a deterministic law from classical mechanics is the calculation of the landing place of a cannon ball. The deterministic law relates to an underlying stable structure which enables the prediction. In economics, price theory provides a good example of the appliance of deterministic laws, for example, how the demand for a good decreases after its price increases.

The second form of predicting is using teleological law in which predictability is possible because an end state is known (Audi 1995). Now, the starting point matters less and the path towards to the end state can vary as well. In physics, the teleological law is illustrated by the experiment in which a ball reaches a state of equilibrium at the lowest point of a bowl. In investment theory, the equilibrium theories of valuation (Graham et al. 1934) (Williams 1938) and the Capital Asset Pricing Model (CAPM) (Sharpe 1964) are such teleological theories. The theory of valuation assumes that the price of a security will tend to its intrinsic, equilibrium, value. In the CAPM, the continuation of Markowitz's portfolio theory, informational efficiency ensures an equilibrium. The equilibrium relates to an underlying stable structure.

Regularity is the third form of prediction. Regularity assumes that the future resembles the past. The analogy that future cases equal past ones assumes stability. A prediction of regularity is that the sun will rise tomorrow, because it did so in the past. Of course, a prediction of regularity, like the daily sunrise, is upgraded to a causal prediction if a more specific scientific theory is available. Yet, in more complex cases, like in economic phenomena, multi-causality denies simple causal predictions.

The three forms of prediction, causal, teleological, and by regularity, can take the form of a deterministic prediction, meaning 'having one outcome,' or a stochastical prediction, meaning 'having more than one outcome.' Once more, a stochastical prediction results in a number of outcomes with probabilities attached. An example of a stochastical prediction is the outcome of the rolling of a dice. The structure of the dice causes the outcomes 1-6 to appear in equal quantities at a large number of throws. The certainty of stochastical predictions restricts to artefacts such as dices, or in economics to actuarial affairs, in which stability for some period can be assumed

(Knight 1921). To fully profit from stochastical predictability, one has to have access to the results of the whole group of outcomes.

The teleological theories of investing, valuation theory as used in Markowitz's portfolio theory and the CAPM, have an evident stochastical nature: risk accompanies the equilibrium value of the CAPM, in the valuation theory it is uncertain when the price of a security will equal its intrinsic, fundamental value. Predicting regularities using past data is done in the empirical investment theory. The frequency theory of statistics provides the apparatus for predicting regularities through using past data. The frequency theory of statistics also uses the term predictability to indicate whether a sample can predict an outcome representative for a population. The use of the term prediction stems from the acceptance of the assumptions of the frequency theory of statistics and the particular probability distribution applied, the stability of the distribution in the future, and its method of testing. In the book will be argued that, whereas artificial probabilities yield certainty over the outcomes of a group of cases, past observations of financial markets in general *do not possess the apodictic quality needed for stochastical prediction.*

Profitable versus Unprofitable Predictability

Mainstream economics believes in *profitable* predictability, which is disputed from within economics:

> The best economic scientists, of whatever school, have never believed in profitable casting of the fores (McCloskey 1990, 109).

In the book *profitable* predictability is relevant; for sure, economics delivers all kinds of *non-profitable* predictions, such as general economic principles. An example of a non-profitable prediction is the certainty of the result of the mechanism of interest rate parity by risk-free arbitrage. General economic principles like in price theory, predict on a more general, non-specific, level. The same kind of non-profitable predictability exists for investing: for example that a period of rising stock prices will be followed by a period of falling

prices, that high levels of valuation will be followed by lower levels of valuation, that more risk is rewarded by a higher return.

The Case for Deterministic Unpredictability in Economics

After having analysed the forms of predictability, we will now discuss the denial of predictability in economics and investment theory. The introduction here focusses on the ideas of Frank Knight (1921), who is one of the most important thinkers on uncertainty in economics. Knight clarified the assumptions of neoclassical economics, and concluded the unpredictability of most economic phenomena. Knight reflected in the classic *Risk, Uncertainty, and Profits* (1921) on the price theory of perfect competition, a cornerstone of neoclassical economics. The mechanics part of physics has been the model for economics in the price theory of perfect competition; both are small but founding parts of physics and economics:

> An abstract deductive system is only one small division of the great domain of economic science, but there is opportunity and the greatest necessity for cultivating that field. Indeed, in our analogy, theoretical mechanics is a very small section of the science of physical nature; but it is a very fundamental section [. . .] (Knight 2009/1921, 2).

Yet, the analytical method of physics is effective *because few and important common elements dominate*:

> The laws of these few elements, therefore, enable us to reach an approximation to the law of the situation as a whole. They give us statements of what 'tends' to hold true or 'would' hold true under 'ideal' conditions, meaning merely in a situation where the numerous and variable but less important 'other things' which our laws do not take into account were entirely absent (Knight 2009/1921, 1).

The analytical method in physics works in practice because its models are approximately true: the laws of physics allow us to build bridges and put people on the moon. But the analogy with physics does not hold for

economics: Knight argued that price theory, and most of economics, has complicated causes, unlike mechanics in which a few common elements dominate. An extended account of the analogy of physics and economics would be out of the scope here, and can be found in Mirowski (1989). Knight claimed that economics along the lines of the method of physics is speculative and dangerous, because theorists and practitioners tend to forget that the assumptions are necessarily too simple:

> [...] the allowances and corrections necessary in the case of theoretical economics are vastly greater than in the case of mechanics, and the importance of not losing sight of them is correspondingly accentuated. The general principles do not bring us so close to reality; there is a larger proportion of factors in an economic situation which are of the variable and fluctuating sort (Knight 2009/1921, 5).

To clarify the difference between the outcomes of mechanics and price theory in practice, Knight investigated the postulates of price theory. His investigation addressed uncertainty as the reason why the outcomes of the price theory of perfect competition do not match the outcomes in practice. In theory, profit should not arise in a perfect competition, but it does so in practice because of uncertainty. Though Knight's ideas on uncertainty in economics remain influential, uncertainty never became leading in economics as Wubben (1993) showed in an investigation of the history of uncertainty in economics:

> In tracing trends in the treatment of uncertainty in neo-classical economics, following its introduction into economics by Knight, we have found two major trends. First, during the interwar period the Knightian concept of uncertainty was first of all restricted to the domain of profit theory; later, it became a side issue; and finally it was shunted into a scientific railway siding (Wubben 1993, 53).

Knight's ideas on uncertainty in economics and his investigation of the price theory contribute to the critical investigation of the investment theory and will be explained in detail in Chapter 4 of the book.

Knight's criticism of economics does not necessarily imply a criticism of idealized theory as such. Economics in the form of pure theory has a purpose as well: a utopian theory informs us about the difference between the theory and the world, and thereby enhances our understanding of the world. For example, the price theory of perfect competition gave Knight the contrast to express his ideas on uncertainty in economic phenomena. In neoclassical economics and investment theory, the theory takes the form of a model. The nature of models is an important subject in the philosophy of science. A model is a simplification and, usually, an idealization of a phenomenon (Reiss 2013). The purpose of a model can be to explain the causal mechanism behind a phenomenon, or to predict. It makes sense to model economic phenomena: the mathematics used in the models naturally invites us to be more precise on the economic mechanisms involved. To be complete, some models, like the interest rate parity, do explain and predict like physical mechanics, yet, to repeat, Knight's criticism stresses that models in economics usually lack dominant explanatory features and therefore have to cope with multi-causality.

Let us now contrast the case for stochastical predictability in investment theory, whether teleological or through regularity, with that for unpredictability. The argument for unpredictability is grounded in the instability of the probability distribution of investment returns. The cause of instability is the unpredictable nature of the changes in the substrate which 'produces' investment returns. Unpredictable changes happen in, for example, the structure of the economy, society, environment, investor attitudes, or in expectations about them. Of course, historical investment returns technically add up to some probability distribution: but the distribution should be *qualitatively* judged as representative or non-representative for the future. Future stability or instability of a probability distribution is a matter of belief, which is to be justified with arguments. The argument about future instability or stability of investment returns cannot be settled using the statistical method, because the argument lies outside the scope of statistics. Prediction in statistics, and in science in general, is grounded on stability, *not* on instability. A nuance needs to be made regarding the stability assumption because

some economic phenomena are more stable than others: say, the sales of foodstuff is more stable than the sales of chemicals or steel which tend to depend on the economic cycle: the key is that one needs arguments for stability, its determinants, and its expected duration.

1.6 The History of Investment Theory and Its Alternatives

Thomas Kuhn (1962) advocated the study of the history of a scientific field. An analysis of the history of a field clarifies its current paradigms and contrasts them with the previous and the competing paradigms. Studying history is full of surprises: investment theory is nowadays regarded as a part of economics, though in Chapter 2 on the history of investment theory it will be demonstrated that investment theory as a part of finance has a separate history, and is only since the 1960s regarded as economics, that is *financial economics*. As is customary in academic finance, finance is used in the book to denote investment theory as well. The sociology of science explains the promotion of the new scientific movement of finance since the 1960s. Modern finance had to be 'new' because of its new paradigms. Yet, the history of finance as described in Chapter 2 starts from the beginning of the thirteenth century, when Fibonacci published his *Liber Abaci*. The roots of finance since the thirteenth century probably emerged from actuarial science and the probability theory. The importance of actuarial science for finance is that it relates to the valuation of options, which was needed to solve the practical problem of the value of a life annuity. In France of the 1860s, the theory of behaviour of financial markets developed from manipulation and bubbles to the efficient market theory. The first half of the twentieth century is full of interesting research on finance.

The current mainstream investment theory is founded on Markowitz's portfolio theory (1952, 1959). The portfolio theory aims to enable an investor to compose a statistically legitimate portfolio of individual stocks, bonds, and other assets. After Markowitz

determined how a rational investor would act, the next logical step in financial economics was a formulation of the market equilibrium of expected risk and return. So, for example, William Sharpe (1964) builds a theory of equilibrium in investment markets, that is the CAPM. Another continuation of the CAPM is an empirical branch in investment theory, which tries to identify anomalies in the efficient market hypothesis. The option theory is also a part of the modern investment theory.

After treating the history of modern investment theory, in Chapter 3 the alternative, heterodox investment theories are discussed. The ideological criticism of modern finance, political finance, uses elements of behavioural and bubble criticisms, and combines them with the criticism on free markets in general. Mandelbrot provided, within the rational mathematical tradition, an alternative fractal statistical theory, which explains seemingly predictive patterns in financial markets, wild volatility, and bubbles. The bubble theory explains bubbles on financial markets and their bursting. Behavioural finance is also insightful and helps to reflect on decision making, and explains the behaviour of investors. The bottom-up approach of evolutionary finance yields an interesting alternative to the top-down approach of the modern investment theory.

1.7 The Theories of Probability and Uncertainty

Chapter 4 explains the foundations of the probability theory as applied in investment theory, and discusses the arguments against predictability and statistics of Knight (1921), Keynes (1936, 1937), Von Mises (1949), McCloskey (1990), and (Taleb 2007). The arguments for unpredictability in economics and investing all stem from a lack of future information and the denial of the mainstream statistical theory. Chapter 4 also presents a thought experiment on stochastical predictability in the investment theory. The possibly new argument discusses the idea of predictability through the rational mechanism of risk-free arbitrage: there cannot actually be stocks of the kind postulated by the investment theory.

Let us now introduce the two elementary theories of probability used in mainstream economics and the investment theory with a quotation of the Post Keynesian Paul Davidson:

1. **The objective probability environment**
   Decision makers believe that the past is a statistically reliable, and hence unbiased, guide to the future. This is the rational expectations hypothesis, where knowledge regarding future consequences of today's decisions involves a confluence of subjective and objective probabilities.
2. **The subjective probability environment**
   In the individual's mind, subjective (or what Savage calls personal) probabilities regarding future prospects at the moment of choice govern future outcomes. These subjective probabilities need not coincide with objective distributions, even if well-defined objective distributions happen to exist [...] (Davidson 1991, 130–131, his insertion).

The objective, frequentist approach uses the relative frequency in past observations to determine the probability of an event, and is *the theory of statistics often used in empirical science*. The subjective, or personal approach, uses the machinery of probability to explicit beliefs, but mixes with the probabilities of the objective approaches as well (Savage 1954). Leonard Savage (1954) claimed that the use of personal probabilities is consistent with rational behaviour, which has been heavily debated in economic literature. The notion of rationality needs to be given careful attention in investment theory, and will be treated at length in the book.

1.8 The Rhetoric of Economics

In Chapter 5 of the book will be presented a rhetorical analysis on predictability in the investment theory along the lines of McCloskey's project of *the rhetoric of economics*. Rhetoric is a way of reflecting on science, like sociology, philosophy of science, and cultural analysis. McCloskey pioneered the analysis of the rhetoric of economics (1983,

1985a, 1990, 1994, 1996, and 1998). Her analysis of rhetoric combined the techniques of classical rhetoric with those of literary criticism, the latter being a twentieth century theory of rhetoric. With literary criticism she bridged the gap between literature and science: 'The scientific report is itself a [literary] genre, whose conventions have changed from time to time (McCloskey, 1990, 30, my insertion).'

To gain an understanding of McCloskey's rhetorical approach, we will first explain her ideas on economics as a science in general. Despite being a critic of economics, she considered economics as the queen of social sciences (1996). Economics is about prudence, which is an important virtue in human action. Economics is successful as a historical science, but not as a predictive one in the sense that it delivers easy profits (1998). In her words:

> Economics is a sort of social history. For all the brave talk about being the physicists of the social sciences, economists do their best work when looking backwards, the way a paleobiologist or geologist or historian does (McCloskey 1990, 31).

Besides being a historical science, economics is a theoretical one as well. The value of pure economic theory is that it gains insights into the crucial assumptions in economic phenomena. The mathematics used in the models merely explicates relationships between economic variables and clarifies the working of the economic mechanism. When working at the University of Chicago, McCloskey wrote *The Applied Theory of Price* (1985b) on applying the mechanisms of price theory: she believes in the usefulness of applied mathematical models, which matter for the purpose of explanation and non-profitable general prediction.

To clarify what 'rhetoric' means in McCloskey's project of *the rhetoric of economics*, it is necessary to distinguish between the *phenomenon* of rhetoric (its practice), and the *discipline* of rhetoric (its theory). One can distinguish two meanings of the phenomenon, and two of the discipline:

1. the phenomenon of rhetoric with a negative connotation
2. the phenomenon of rhetoric in a neutral sense
3. the discipline of rhetoric for the creation of rhetoric
4. the discipline of rhetoric for the analysis of rhetoric.

'Rhetoric' as the phenomenon in the negative sense means hollow speech, that is speech which merely aims at persuasion by arousing the emotions of the audience. The popular use of the term 'rhetoric' as hollow speech is often associated with politicians. Rhetoric in the negative sense can also mean flowery speech. In a neutral sense, the phenomenon of rhetoric signifies that every argument, good or bad, consists of rhetorical elements which aim to persuade. The discipline of rhetoric applies to both its creation and its analysis. McCloskey investigated the rhetoric of economics *as a neutral phenomenon*. With the *discipline* of rhetoric she analysed the *phenomenon* of the rhetoric of economics. We will do the same for stochastical predictability in investment theory. Rhetorical criticism sensitizes us to the possibility that a writer, possibly unconsciously, tries to make us look in a particular way.

To get an introductory impression of the discipline of rhetoric, we will briefly present the ideas of Aristotle (2006). Aristotle is regarded as having developed the first full theory of rhetoric and defined rhetoric as: '[. . .] the faculty of discovering the possible means of persuasion in reference to any subject whatever (Aristotle 2006, § I.i.12.2).' Yet, the brief description of Aristotle cannot arguably represent the full scope of rhetoric. In contemporary usage the possible range of meanings of rhetoric is even wider than in the classical use and incorporates for example discourse, literary criticism, and theories of discourse or language. In *A Companion to Greek Rhetoric* its editor lists the meanings of rhetoric as employed by its contributors:

> [. . .] one can discern the word 'rhetoric' or 'rhetorical' being used to denote a wide range of phenomena, including oratory, parts of speech, prose genres, figurative language, performance, pedagogical practices, discourse, the strategic use of language, persuasion, and various *theories* of discourse, language or persuasion. [. . . .]. Notably, there are a goodly number of other disciplinary terms that are just as broad in scope, including anthropology, sociology, psychology, and politics (Worthington 2010/2007, 4, his italics).

McCloskey's rhetorical investigations have a wide reach as well. The investigations are about style and the implicit or explicit reasons for the particular

style employed. They also cover the analysis of the metaphors, arguments, narratives, methodology, philosophy, science, and the discourse of economics. Chapters 2, 3, and especially 4 will focus on the *logos*, the rational arguments of using stochastical predictability in investing by *close reading*. To gain a deeper understanding, we will focus in Chapter 5 on the *metaphors*, the models, of investment theory, as well as the *discourse* of investment theory, including what needs to be changed in the discourse, among other things the inclusion of virtue ethics. To my knowledge, no specific literature exists on the rhetorical analysis of the use of statistics in investment theory.

1.9 The Culture of Investing

Investigating culture enrichens its rhetorical analysis. In Chapter 6, we work along the lines of Klamer's approach (2001, 2003, 2006, 2007, 2014) on the investigation of the culture of economics, which also is applicable to the investment theory as a part of economics, that is financial economics. The analysis of culture helps to explain the behaviour of investors. The central claim of the book, namely that predictability does not apply to investing, raises the question why investors hold on to their practices of prediction, and what constitutes the practices of investors, seen through the perspective of culture.

Klamer's cultural approach fits in with the rhetorical approach applied in the book, which was Klamer's point of departure as well (1988, 1992, 1995, 1994 with McCloskey, 2001 with Leonard). Although a conversation is similar to rhetoric, Klamer (2007) preferred the term conversation because it relates to a community and its cooperative character. Within the cultural approach Klamer concentrated on conversations and values. By relating culture to economics, Klamer (2014) posed a question in the Weberian tradition of distinguishing between procedural and substantive rationality. Economics is about procedural rationality, culture is about substantive rationality. Both substantive rationality and culture centre at values, or, at the answer to 'What is important?'

The field of culture also relates to uncertainty. Hofstede (1997) investigated cultural differences between countries in a research project for IBM. The way a culture handles uncertainty was a part of Hofstede's

explanatory model. Uncertainty is a feeling of anxiety and as a matter of culture, uncertainty avoidance begs for predictive ability by some method. Using a predictive method such as stochastical prediction handles uncertainty by replacing the feeling of uncertainty with a rational, technical method. Thus, risk as such is not the problem of uncertainty: the *ambiguity* of uncertainty is the reason of anxiety. Ambiguity aversion is also a subject of behavioural finance.

Chapter 6 also investigates three innovative practices in the Dutch institutional investment world by means of interviews with their proponents and their literature. The alternative approaches concern 'the management of investment risk,' 'the Shell scenarios approach,' and 'investment beliefs.'

The conclusion of the book follows in Chapter 7.

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2

The History of Investment Theory

2.1 An Introduction to the History of Investment Theory

History Enriches

The study of the history of investment theory shows the merging of finance, statistics, predictability, and economics into current investment theory, discusses its seminal texts, and treats its rivals of heterodox finance. Thomas Kuhn (1962), a historian, philosopher, and sociologist of science, advocates the study of the history of a scientific field. An analysis of the history of a field clarifies its current paradigms and contrasts them with the previous and the competing paradigms. His approach implies that science can have incompatible theories, and does not label earlier theories as unscientific. The textbooks of a field present the image of science that Kuhn opposes: 'Inevitably [...] the aim of such books is persuasive and pedagogic [...] (Kuhn 1996/1962, 1).' Textbooks are merely meant to explain the leading paradigms of a field, are unhistorical by nature, and suggest that science is accumulated: 'Textbooks thus begin by truncating the scientists's sense of his discipline's history and then proceed to supply a

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substitute for what they have eliminated (Kuhn 1996/1962, 137).' In their purpose, textbooks refer to the work and persons that easily can be seen as a part of the leading paradigm. But the unhistorical practice of textbooks is not constrained to the scientific community: 'The temptation to write history backward is both omnipresent and perennial (Kuhn 1996/1962, 138).'

Kuhn's historical approach to science highlights that an orthodox scientific methodology constrains the answers to scientific questions. To him science is a way of seeing, which is mixed arbitrarily by personal and historical elements, and grounded on a set of received beliefs. The study of the history of science as proposed by Kuhn yields no formula for choosing the right theory, but helps understanding the sociology of science, what scientists do, and provides insight into the historically competing currents within a field.

Because investment theory is a part of finance, the term 'finance' is now clarified. The broad term 'finance' has several meanings:

1. The practice of manipulating and managing money.
2. The capital involved in a project, especially the capital that has to be raised to start a new business.
3. A loan of money for a particular purpose, especially by a finance house.
4. An academic discipline within the general field of economics dealing with funding, financial markets, and the funding implications for managing businesses (Law 2014, keyword 'finance').

The fourth meaning of 'an academic discipline' is relevant here. Finance as an academic discipline can be divided into two subdisciplines: the 'economics dealing with funding [...] and the funding implications for managing businesses (Law 2014, keyword "finance")' belong to the subdiscipline of corporate finance. The remaining part that deals with 'financial markets' is the subdiscipline of investment theory. Corporate finance and investment theory differ from perspective. Corporate finance takes the perspective of the organisation central, while investment theory focusses on the investor in financial markets. The theories of corporate finance and investment theory overlap. As is customary in academic finance, finance is used here to denote mere investment theory. Financial economics is

another name for finance because modern finance has been applying price theory, a cornerstone of neoclassical economics.

Finance and economics have had separate histories. In the fifties, Milton Friedman denied investment theory as a part of economics during Markowitz's defence of his PhD thesis on investment theory (Markowitz 1990). Though Friedman could not remember the remark later on, he nevertheless could agree to it because Markowitz's theory was indeed about applied mathematics, and not about economics (MacKenzie 2006). Finance and economics being separate fields was no strange idea in the 1950s, because the fields have separate roots. Finance and economics have usually been taught at different institutions: finance has been a subject at business schools, economics has been taught at universities. The business schools were '[. . .] use-oriented and populated by a faculty of practitioners, operating at the margins of university academia (Poitras 2007, 7).' Yet, institutional developments have been of importance to the evolution of finance (Poitras 2007). Since the 1960s, business schools have often become a part of universities and their intellectual norms. Since then, the evolution of finance has resembled that of mainstream economics; like economics, finance has switched its institutional account for a modernistic one. In the twentieth century economics of an institutional sort, meaning historical, qualitative and measurement driven, was succeeded by economics of a modernistic sort, being mathematical, statistical, and theoretical. Financial economics is an offspring of modernistic economics.

Since the 1960s, finance has become incorporated in economics and probably few would argue now against the inclusion of finance in economics. Modern finance is grounded on the theory of full competition, the cornerstone of price theory. Because of arbitrage under full competition, the price of a good moves to its cost price. Full competition in finance implies to the Capital Asset Pricing Model (CAPM), the equilibrium model of financial markets, that the risk and return of securities will be balanced. Yet, a financial market differs from a goods market because expectations can be priced instantaneously in a financial market. Therefore, financial markets stand as a perfect model for other markets. Immediate processing of information is usually not a feature in a goods market, because the competitors need time to adapt their production levels, which after a time lag manifest in the price of a good.

In its canonical history, modern investment theory is founded on Markowitz's portfolio theory (1952, 1959). Markowitz constructed his portfolio theory on statistics. Portfolio theory aims to compose a statistically legitimate portfolio. The CAPM, invented by Sharpe (1964) and others, assumes that all investors behave like a 'Markowitz-investor' and analyses the resulting equilibrium in financial markets. The equilibrium model is founded on the efficient market hypothesis, which means that investors cannot beat the market because all available information has been incorporated in the market prices. The efficient market hypothesis in its elaborated form is invented by Samuelson (1965) and Fama (1965a, 1965b). Markowitz's approach, the efficient market hypothesis, and the CAPM constitute the core of modern portfolio theory (Poitras 2007, 5). Efficient market theory also results in the option theory of Black and Scholes (1973) and Merton (1973b), another core of modern investment theory. Option theory treats the valuation of a contingent claim, a claim of which the outcome depends on an uncertain phenomenon, such as the future price of a stock.

The Pitfalls of History

We have to be careful though to perceive finance as a new science. The sociology of science explains the reason for the promotion of finance as a new scientific movement since the 1960s. Modern finance had to be 'new' because of its new paradigms:

> Because modern financial economics provides a textbook case of these processes [the processes dominated by sociological factors], it is necessary to disentangle the essential intellectual contributions from those that have gained attention due to the 'techniques of the huckster' involving 'repetition, inflated claims and disproportionate emphases' (Poitras 2007, 1–2, my insertion).

Thanks to education the promotion of modern finance as a new science has been successful. Usually, the authority argument of academic education persuades the student of a simplified history of a field: 'New students too often rely on the version of scholarly history conveyed to

them by their mentors, who themselves are too dependent on their mentors, and so forth (Rubinstein 2006a, xii).' Illustrated by literature, it is easy to find leading theorists who emphasize the scientific movement of finance since the 1960s, for example Robert Merton who claimed:

> The Modigliani-Miller work stands as the watershed between 'old finance,' an essentially loose connection of beliefs based on accounting practices, rules of thumb and anecdotes, and modern financial economics, with its rigorous mathematical theories and carefully documented empirical studies (Robert CM 1987, 'In Honor of Nobel Laureate, Franco Modigliani,' *Journal of Economic Perspectives*, vol. 1 no. 2, pp. 145–155, in Poitras 2007, 2).

Yet, 'old' finance, finance before the 1960s seems mathematically rigorous as well, and has carefully documented empirical studies. For example, Bachelier's random walk theory (1900) or Williams's valuation models (1938) are mathematically rigorous, and many of the empirical studies before the 1960s are documented, such as those of Cowles (1933, 1944) and Working (1934) on the unpredictability of the stock market. The 'watershed' mentioned by Merton in the previous quotation, has made the old finance appear less valuable, and therefore less cited by the new finance (Poitras 2007).

It is not surprising that the history of finance has been ignored as a consequence of the scientific movement of new, modern, finance. So, the notion that finance was not scientific before the 1960s seemed to be taken for granted until the 1990s, when the history of finance started to be investigated (Jovanovic 2006b). Contrary to the canonical version of modern finance, finance actually has deep historical roots, and had been thoroughly developed before the 1960s (Poitras 1996, 2006, 2007). Finance in the twentieth century before the 1960s, was concerned with accounting (financial statements), legal issues (securities law), and institutional issues; topics which are still relevant today (Poitras 2006). From the old finance also stem the theories of security analysis and valuation, which are still being practiced today. Another topic which was highly developed before the 1960s is the analysis of bonds as illustrated by the work of Frederick Macaulay (1938). Macaulay's work will not be treated here, because the analysis of bonds is outside the scope of the book.

A documented start of finance as the technique of providing loans and calculating interest can be traced back to around 2000 BC in Babylonia, but arguably finance existed before that time as well (Goetzmann and Rouwenhorst 2005). Because the scope of the chapter is mostly confined to the history of stochastical predictability for finance, the treatment of the history of finance begins at the start of the thirteenth century, when Fibonacci published his *Liber Abaci* (translated as 'The book of calculations') in 1202. In the work of Fibonacci is for example described how to calculate a net present value, a cornerstone of finance. Finance since the thirteenth century is grounded on actuarial science and probability theory: the confluence of finance and economics in the twentieth century is historically a more recent event (Poitras 2007).

Another question relevant to the history of science is which authors should get the credit for its main ideas. Inevitably, investigations into history often result in incomplete findings; our knowledge of history is necessarily incomplete. Even if all the required historical sources were available, it would take a long time before the sources were scrutinized and well understood. To make the search for the first author even more complex, research into the history of science has shown that authors often anticipate, or independently formulate, the same scientific ideas:

> In most of these cases, the individuals commonly given bibliographical credit in academic papers were actually anticipated many years, occasionally decades or centuries, earlier. In some cases, there were others with independent and near-simultaneous discoveries who are seldom, if ever, mentioned, offering one of many proofs of Stephen Stigler's law of eponymy that scientific ideas are never named after their original discoverer! This includes Stigler's law itself [. . .] (Rubinstein 2006a, xii).

The scope of the current chapter is not aimed at performing research into old and new primary sources. But different sources of historical research into finance will be consulted, in order to compose a history of finance for the purpose of the book of undoing the veil of stochastical predictability and proposing a heterodox finance. The authors of historical research consulted here are, among others, Peter Bernstein (1992, 1996, 2007), Geoffrey Poitras (1996, 2006, 2007), Colin Read (2013), and Mark Rubinstein (2006a). The investigations into the history of finance reveal

a number of great authors, from Louis Bachelier (1900) to John Maynard Keynes (1936) and Benoit Mandelbrot (1963a, 1963b), who are absent in the picture sketched by the textbooks of finance.

The Assumption of (Un-)Predictability

Of importance to the book is what the history of finance and economics tells about the predictability of markets. Besides the theoretical importance, the predictability of risk and return of investments matters for practice. As Bernstein wrote, all investors agree that it is hard to get rich by investing: 'Yet, in the face of admittedly high odds, enough people do try to predict stock prices to keep an entire industry humming (Bernstein 2005/1992, 17).' The history of finance and economics tells two tales about predicting: one tale tells that we *cannot* predict, and the other tale tells we *can* predict. The efficient market theory claims that predicting, in the sense of beating the market, is not possible. Though, the CAPM, grounded on the efficient market theory, claims that stochastical prediction of risk and return of the market *is* possible. Yet, a number of theories in finance and economics explicitly says that predicting beyond beating the market is impossible as well, see for example Knight (1921), Keynes (1936, 1937), Von Mises (1949), or Mandelbrot (1963a, 1963b, 2004 with Hudson).

The tale in finance in which predicting, in the sense of beating the market is possible, has many expressions, such as the theories of valuation, the Dow-theory, and theories on exploitable anomalies of the efficient market. The theories of the valuation of securities imply that if the price of a security on the market deviates from its intrinsic value, arbitrage opportunities arise (Graham et al. 1934, Williams 1938). The Dow-theory, a chartist theory, is an alternative theory of prediction based on historical patterns of prices on the financial markets. To summarize, the views on predictability in financial markets have, by closer inspection, three varieties:

1. the theories that assume that the market index can be beaten
2. The CAPM, which includes the efficient market theory, that assumes that beating the market is not possible, though risk and return of the market are assumed to be stochastically predictable

3. the theories of Knight, Keynes, Von Mises, and Mandelbrot which deny any stochastical and other forms of profitable predictability in financial markets.

We would like to establish that the book, which denies stochastical predictability of investments, is a logical extension of modern finance, with its denial that predictions can outperform the market. We do, however, not believe that market efficiency implies stochastical predictability of risk and return of investments; the impossibility of stochastical predictability will be discussed at length in Chapter 4. Then, we will also discuss the notion of uncertainty which is the epistemological transitional phase between stochastical predictability and total uncertainty, in which subjective judgment, instead of predictability, is central (Knight 1921). Judgment under uncertainty takes many forms, such as subjective probability, econometric analysis, qualitative opinion, ordinal probability, or a general prediction.

In the current chapter, a critical review of the modern portfolio theory receives a large part of attention, alongside historical investigations. Other relevant investment theories are also treated, such as the valuation of securities, Keynes's theories of the beauty contest, 'efficient market,' and animal spirits, and option theory. A number of more recent alternative, heterodox, investment theories will be treated in Chapter 3.

2.2 Finance in Europe in the Thirteenth to Eighteenth Century

The oldest evidence of finance as the technique of supplying loans stems from 2400 BC from the southern part of Mesopotamia, Babylonia, in the form of short-term loans (Van de Mieroop 2005). For reasons of scope, our historical discussion of finance begins in Europe at the beginning of the thirteenth century. Finance since the thirteenth century, concentrates on the analytical problems of discounting future cash flows and the valuation of contingent claims.

An important condition for the development of finance was the use of the numerical notation. Fibonacci, Leonardo da Piso (1170–1250),

introduced the numerical notation from the Middle East to Europe in 1202 (Rubinstein 2006a). Fibonacci elaborated the numerical notation to the finance problems of that time, such as the distribution of profit in partnerships, and the discounting and accruing of interest:

> Fibonacci illustrates his methods of calculation through several numerical examples. Among these are four types of applications to investments: (1) the fair allocation of profits to members of a partnership ('On Companies,' [. . .]); (2) the calculation of profits from a sequence of investments, with intermediate withdrawals ('Problems of Travelers,' [. . .]); (3) the calculation of future value ('A Noteworthy Problem on a Man Exchanging One Hundred Pounds at Some Banking House for Interest,' [. . .]); and (4) the calculation of present value ('On a Soldier Receiving Three Hundred Bezants for His Fief,' [. . .]) (Rubinstein 2006a, 4).

Finance before the Enlightenment must be considered from its ethical and theological context, in which usury and gambling were prohibited (Poitras 2006). Usury means that it is forbidden to charge interest on loans. A common division in the stages of the forbidding and reassessment of usury, is the period of 1150–1450, in which the scholastic theory of usury applied, and the period of 1450–1750, in which the scholastic theory of usury is reassessed; yet, the common division underplays that ideas on the loosening of usury were also expressed in the first period of 1150–1450 (Sylla 2006).

In business practice, usury had to be avoided because it was prohibited by canon law. But the interpretations of canon law allowed interest to be paid in concealed forms (Poitras 1996). Eventually, the insight grew that usury and payment of interest were two separate things: usury overcharges borrowers who are in need of money, but payment of interest compensates the lender for the opportunity cost of providing money. That lending money bears the opportunity cost of missed profits, was witnessed by the daily commercial practice (Sylla 2006).

In the fifteenth century the loosening of restrictions on usury and gambling enabled the development of pricing securities. The reckoning masters, or algorists, who had adopted the Indian-Arabic calculation methods such as presented in Fibonacci's *Liber Abaci*, were specialized in the theory on the pricing of securities. An example of a master algorist is

Nicholas Chuquet (1445–1500), who illustrates in *Triparty en la science des nombres* (1484) the arithmetic available at that time (Poitras 1996). Eventually, the theory on the pricing of financial assets expanded, among other things thanks to the growth and acceptance of commercial activity and the reformation. The development in finance was directed at the valuation of the then existing securities. Valuation fulfilled a practical need because it served as a calculation of the right, fair price of a financial asset. At that time, questions of valuation arose for bonds, annuities, life contingent claims, and partnerships in business.

An example of such a financial asset is a *census*, paid annually and backed by land or future taxes, which evolved into an annuity (Poitras 1996). As early as in the thirteenth century, the city of Venice issued a census, which was securitized in the fourteenth century. In the sixteenth century, the market for loans developed and the need emerged to compare the loans with the help of valuation theories. The calculation of compound interest was also needed, which was by that time allowed by canon law thanks to religious tolerance. In the second part of the seventeenth century more complex fixed income securities with redeemability, sinking funds, and lottery elements, were followed by elaborated valuation techniques.

Though usury prohibited loans with interest in the Middle Ages, partnerships of business in which profits and losses were shared, were customary (Sylla 2006). Relevant questions of finance at that time were how to divide profits between partners with different roles and over different timeframes. Finance answered the question what was a fair probability when dividing profits behind a Rawlsian veil of ignorance. When dividing profit among a fixed group of partners, such an ethical perspective of fairness on probability seems appropriate. So, pre-modern probability theory was grounded on contractual or institutional grounds, and not on the later adopted physical grounds of frequency theory.

The history of actuarial science is also relevant for finance because it encompasses the valuation of options. Both actuarial science and finance were involved in the pricing of contingent claims. Probability theory was needed to solve the practical, socially relevant, problem of the valuation of a life annuity: '[. . .] in an era pre-dating actuarially sound pension plans and life insurance the life annuity performed an essential social function (Poitras 2006, 79).' Because solving the problem of the

valuation of a life annuity was hard, it attracted scholars from outside the commercial arithmetic practice. We will illustrate some important contributors dedicated to solving the problem of the valuation of a life annuity following Poitras (1996). Among the first to mention is the mathematician Simon Stevin (1548–1620), who contributed, for example, to the tables of the present value of annuities. The Dutch statesman Johan de Witt (1625–1672) thought up an analytical solution to the price of a life annuity by involving the probability of dying, which was a novelty. After De Witt, Edmond Halley (1656–1742), famous for his work on comets, provided an improved solution to the valuation of a life annuity. Abraham de Moivre (1667–1754) completed the theory of life annuities by solving the theoretical gaps in the valuation of a life annuity.

Blaise Pascal and Pierre de Fermat discovered modern probability theory in the second half of the seventeenth century, followed in the first half of the eighteenth century by De Moivre, who proposed the normal, bell-shaped, curve and the dispersion measure of the standard deviation, and by Daniel Bernoulli who invented the decision theory (Bernstein 1996). The probability theory of Pascal, De Fermat, De Moivre, and Bernoulli still is the foundation of current finance: '[...] the tools we use today in risk management and in the analysis of decisions and choice [...] stem from the developments that took place between 1654 and 1760 [...] (Bernstein 1996, 5–6).'

Stocks such as now familiar emerged in the beginning of the sixteenth century. In the sixteenth century, the economic focus shifted from Southern to Northern Europa. At that time, Antwerp, Amsterdam, and London developed exchanges for commodities and securities, which included derivatives such as forwards and options (Poitras 1996). After 1620, the publicly traded securities of the joint-stock companies emerged. A joint-stock company had two distinct features in comparison to a private stock: a joint-stock is transferable and has a limited liability. Because the volume of joint-stocks and government debt expanded, some 100 joint-stocks are traded in London in 1695, securities markets became necessary.

Amsterdam preceded London in having a major modern securities market. The first stock traded on the Amsterdam Exchange in 1602 was the Dutch East India Company. The share trading practices in the

beginning of the seventeenth century in Amsterdam were marked by the manipulation of the stock market (Van Dillen, Poitras and Majithia 2006). Joseph de la Vega (1650–1692) wrote an eyewitness report on the stock market of Amsterdam. The title of De la Vega's book, *Confusion de Confusiones* (1688), to be translated as 'The confusion of confusions,' refers to the darkness of the workings of the stock market. The tulip mania from 1634 to 1637 in Amsterdam accentuated that speculation was a part of the era (Cardoso 2006). De la Vega's book was set up as a dialogue between a philosopher, a merchant and a stockholder. De la Vega claimed that, in spite of speculators and gamblers playing a large part in the stock market, the valuation of a stock is based on fundamentals as well (Poitras 1996). Cardoso (2006) concluded that De la Vega's book was meant to show that investing in the stock market was worthwhile. Nevertheless, the book demonstrated at the same time that the stock market is dangerous, because one can be captured by optimism and end up hit financially. Contrary to Cardoso, Petram (2011) concluded that De la Vega's book was meant to warn and to entertain.

A difference between stocks and other financial instruments in the seventeenth century is that the valuation of stocks was not as developed as the valuation of life annuities (Poitras 1996). Instead, the attention around stocks was directed towards manipulation and bubbles, as illustrated by Van Dillen (1935), De la Vega (1688), and Kindleberger (1978).

2.3 Efficient Market Theorists in the Nineteenth and Early Twentieth Centuries

Jules Regnault and Henri Lefèvre

In France in the 1860s, the theory of behaviour of financial markets took the leap from manipulation and bubbles to the efficient market theory. The development of the theory occurred against the background of the emerging stock market of Paris in the nineteenth century: the stock market expanded from three listed stocks in 1800 to more than 1000

stocks in 1900 (Jovanovic 2006a). Arguably, there was a need for analysis in the form of graphical presentations, statistics, probability theory, and financial-economic theory. In the nineteenth century, investing in stocks was associated with gambling, but how could investing in stocks be legitimized? The legitimization of investing in stocks was done by *vernacular* science. The vernacular science of financial investments attempted to dispose of the unethical connotation of investing by turning investing into a scientific object:

> 'Vernacular economics' is understood to comprise heterogeneous sets of practices, know-how techniques and rationalization procedures with the help of which social actors make sense of their economic environment and of the economic consequences of their own actions. [. . .] vernacular economics mixes tacit, commonly shared assumptions and knowledge about economic processes with non-systematic rationalizations (Preda 2006, 150).

So how did vernacular finance relate to the then emerging efficient market theory? Vernacular science drew the analogy between financial markets and physics and engineering, and adopted the idea of rational behaviour as the guideline for stock holders. Rational behaviour in the form of self-control and the study of information was promoted as the key to successful investing:

> They [the how-to brochures of vernacular finance] aimed to convince their readers that investments were not only lucrative, relatively sure, but also legitimate sources of income, given that a few rules were respected. These rules, incessantly repeated, concerned individual behaviour, on which financial success was made dependent. Lack of emotions, capacity of self-control, continuous study of the markets, and monitoring of the joint-stock companies were made into fundamental conditions of successful investments (Preda 2006, 153, my insertion).

A part of vernacular finance resulted in the efficient market theory, as it included probabilistic and abstract reasoning. Within the history of finance, Louis Bachelier (1870–1946) is generally considered to be the first efficient markets theorist. Efficient market theory, in

short, states that prices on financial markets behave randomly. Yet, his fellow Frenchmen Jules Regnault (1834–1894) and Henri Lefèvre (1827–1885) preceded Bachelier in inventing similar theories on the financial markets.

Regnault (1863) wrote on the random walk hypothesis of stocks in *Calcul des chances et philosophie de la Bourse* (Preda 2006). He invented a stochastical theory on financial markets. Bachelier's work (1900) was based on Regnault's, especially the random walk hypothesis (Jovanovic 2006b). Regnault's work is unique in a period in which even economics is merely becoming a part of the university institutions. To illustrate the claim of Regnault's importance: he invented the square root formula of risk and time, analogous to the diffusion theory of heat and gases (Read 2013).

In 1870, Lefèvre invented the graphical presentation of an option pay-off, which Bachelier used and which is still used today, and thought up an economic theory on the place of financial markets in the circulation of goods (Jovanovic 2006a).

Louis Bachelier

Bachelier (1900) could be acknowledged as the father of modern finance and should replace Markowitz, who is usually given the credit (Read 2013). Bachelier anticipated the Black and Scholes option formula and formulated the random walk of stock prices. He proposed to view the financial market as a phenomenon which can be expressed by scientific statistical laws, and presented an alternative for the financial markets as mere gambling on price changes. At the same time, his claims on the predictive capability of statistics were modest and nuanced. Interesting to note is that his PhD-supervisor Henri Poincaré (1854–1912), a mathematician and philosopher of science among other things, did not favour probabilistic modelling of dynamic systems such as financial markets, but nevertheless let Bachelier succeed (Zimmerman and Hafner 2006).

Bachelier's work was not recognized in his time. It took 60 years until his seminal work started to get noticed (Bernstein 1992). The ideas of Bachelier will be reflected here by a number of quotations.

Bachelier discerned two sorts of causes, the first being 'events' which influence the price of securities, and the second that the stock market is reflexive:

> The influences which determine the movements of the Stock Exchange are innumerable. Events past, present or even anticipated, often showing no apparent connection with its fluctuations, yet have repercussions on its course.
>
> Beside fluctuations from, as it were, natural causes, artificial causes are also involved. The Stock Exchange acts upon itself and its current movement is a function not only of earlier fluctuations, but also of the present market position (Bachelier 2011/1900, 1).

So many causes exist, that a forecast, a single point estimate, of the price of a stock is not possible. Moreover, probability theory is not applicable, meaning that the fluctuations of the stock market do not resemble the outcomes of the tossing of a coin:

> The determination of these fluctuations is subject to an infinite number of factors: it is therefore impossible to expect a mathematically exact forecast. Contradictory opinions in regard to these fluctuations are so divided that at the same instant buyers believe the market is rising and sellers that it is falling.
>
> Undoubtedly, the Theory of Probability will never be applicable to the movements of quoted prices and the dynamics of the Stock Exchange will never be an exact science (Bachelier 2011/1900, 1).

Bachelier was evidently aware that the probability theory for investing does not predict stochastically. His use of probabilities falls in the category of Knightian uncertainty, not Knightian risk (Read 2013). The probability theory had a different purpose in Bachelier's theory: it can be an instrument to capture momentary insight or opinion on the level of fluctuations of the stock market:

> However, it is possible to study mathematically the static state of the market at a given instant, that is to say, to establish the probability law for the price fluctuations that the market admits at this instant. Indeed, while

> the market does not foresee fluctuations, it considers which of them are more or less probable, and this probability can be evaluated mathematically (Bachelier 2011/1900, 1).

Bachelier did not mention information as the driver of changes in the prices on the stock market, but referred to 'innumerable factors' or causes. He seems to include more causes than Fama (1965a, 1965b, 1970), who reduced all causes to information associated with news on the external world, which should shed a light on the fundamental value of the securities traded on the market. Bachelier explicated his doubt on the transfer mechanism of influences or 'information' into the valuation of stocks. For Bachelier it meant that the expected return of the speculator is zero. Otherwise stated, investing is a fair game because the chances of winning and losing are equal. Originality characterized Bachelier's work on both the theory of financial economics and its modelling in which he discovered the formula for the random walk of stocks comparable to the so-called Brownian motion: '[. . .] Bachelier's book provided a mathematical formalization of the stochastic process later identified with the Brownian motion of molecules [. . .] (Dimand and Ben-El-Mechaieckh 2006, 225).'

Though actuaries have used the notion of probability to perform calculations in life insurance, the techniques were not related to financial markets or options. He was the first to develop a sophisticated option formula which resembles the Black-Scholes option formula (Read 2013). Volatility as a measure of risk is a part of Bachelier's approach to option pricing and is not invented by Markowitz. Bachelier's work is even compared to Einstein's work: 'Five years later, Albert Einstein (1879–1955) used the same reasoning in physics and went a step further by calibrating the model and the resulting diffusion rate to determine the size of atoms (Read 2013, 25).'

Bachelier's book of 1900 attracted the attention some fifty years later of Savage (Dimand and Ben-El-Mechaieckh 2006). Savage informed others such as Paul Samuelson of his discovery. But Savage's discovery of Bachelier is not a total coincidence, Savage was aware that interesting probability theorists had possibly existed in France: 'Savage was then browsing in the writings of early twentieth-century French probability theorists and was receptive to lost treasures [. . .] (Dimand and Ben-El-Mechaieckh 2006, 233).'

Read (2013) proposed two explanations why Bachelier's work, and that of Bruno de Finetti remained unnoticed for such a long time: the 'nationalization' of science at that time and the advanced level of their work.

2.4 Finance in the First Half of the Twentieth Century

Irving Fisher

After examining Bachelier and his French predecessors who introduced the notion of the random walk and option pricing, we continue with a number of theorists on other issues in investment theory in the United States and the United Kingdom, such as Irving Fisher, John Maynard Keynes, and John Burr Williams. The American economist Irving Fisher (1867–1947) is well known for his unfortunate prediction in October 1929, before the crash, that 'stock prices have reached what looks like a permanent high plateau (Dimand 2007).' Nevertheless, Fisher is highly regarded as an economist because of his lasting contributions in, for example, monetary economics, illustrated by his famous equation of $MV = PT$, his distinction between real and nominal interest rates, and his theory of debt deflation, in which the burst of a bubble is followed by a debt-fuelled depression and deflation (Tobin 2008).

With regard to financial economics, Fisher acknowledged a serious role for stocks as an investment, invented a portfolio approach, and systematized the net present value method for investments. He stressed that the perception that bonds are a safe investment when default risk is absent, is wrong, because inflation causes bonds to have purchasing power risk (Dimand 2007). Yet, stocks have the inherent capacity to rise with inflation because companies can adjust their selling prices; stocks and bonds are subject to different risks, but on the whole stocks can be expected to have a better return in an inflationary environment. Fisher was ahead of his time by advocating the diversification of a stock portfolio and constructed for the purpose an investment theory with an expected return (the dividend yield), an expected risk (the standard

deviation), and risk attitude (the coefficient of caution). Preceding Markowitz he advocated the use of probability distributions for making investment decisions.

Though the method of net present value has existed for a long time, it was Fisher who seems to have proposed that the method is appropriate for any investment decision, both for a firm and an investor on the financial market (Rubinstein 2006a). His idea is continued by the dividend discount model of Williams (1938) for the valuation of stocks.

John Maynard Keynes

Keynes (1883–1946) formulated a theory of investing under uncertainty which combined the psychology, reasoning, and consequences of human interacting. First, he illustrated the functioning of a financial market using the metaphor of a beauty contest. The beauty contest held in a certain newspaper at that time compared with a financial market under uncertainty in which its participants behave reflexively on each other (Keynes 1936). To win the beauty contest, the participants had to choose the six most popular faces out of a hundred pictures. To win, a participant had to predict which face the *other* contesters would choose. So, if the stock market resembles the beauty contest, stock prices are not about some fundamental value, but about the perceived ideas of other market participants and their interaction.

The lack of knowledge about the future implied for Keynes that the current market valuation is not correct in the sense that the valuation of, say, a stock properly discounts the future. The current price of a stock cannot be correct, unless by coincidence, because we lack the knowledge to calculate the correct price. Keynes summarized with three principles (the present is the best guide for the future, the current prices reflect the available information, the market 'knows' more than the individual) how to act under uncertainty, and then formulated an efficient market theory *avant la lettre*, in which the consequence of uncertainty is that financial markets are instable.

Keynes's three principles and his efficient market theory will be quoted at length as predecessor and competitor of the modern efficient market theory, with the fundamental difference that his theory does not assume predictability like the CAPM does:

> (1) We assume that the present is a much more serviceable guide to the future than a candid examination of past experience would show it to have been hitherto. [. . . .].
>
> (2) We assume that the *existing* state of opinion as expressed in prices and the character of existing output is based on a *correct* summing up of future prospects, so that we can accept it as such unless and until something new and relevant comes into the picture.
>
> (3) Knowing that our individual judgment is worthless, we endeavour to fall back on the judgment of the rest of the world which is perhaps better informed. [. . . .].
>
> Now a practical theory of the future based on these three principles has certain marked characteristics. In particular, being based on so flimsy a foundation, it is subject to sudden and violent changes. The practice of calmness and immobility, of certainty and security, suddenly breaks down. New fears and hopes will, without warning, take charge of human conduct. The forces of disillusion may suddenly impose a new conventional basis of valuation. [. . . .]. At all times the vague panic fears and equally vague and unreasoned hopes are not really lulled, and lie but a little way below the surface (Keynes 1978/1937, 114–115, his italics).

Moreover, besides reflexivity, irrational optimism of investors, that is their animal spirits, overshadows the importance of probability calculations:

> Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits – of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities (Keynes 1997/1936, 161).

For Keynes, decision making was about animal spirits, which in combination with uncertainty and interaction of market participants,

characterize financial markets. Interestingly enough, Keynes anticipated three arguments against neoclassical economics: decision makers are irrational, information about the future is to a great extent uncertain, and markets behave reflexively as witnessed by the beauty contest and his version of the efficient market theory.

Benjamin Graham and John Burr Williams

Another perspective on the theme of predictability is the idea that the value of a security is not the same as its price, and that the value of a security can be discovered. The notion of predictability stems from the conviction that price and value converge in the end. If the current value of a security is lower than its market price, valuation theory indicates a buying opportunity, a prediction that the price of the stock will rise in the future. Valuation is a cornerstone of old *and* modern finance, and at the same time ambiguous: is the value of a stock its book value (which can theoretically be sold on other markets), the net present value of its future cash flows or dividends (or the lowest of the two), or a product of supply and demand on the financial market (Bernstein 1992)?

Benjamin Graham (1894–1976) used security analysis to gain insight in the value of a stock. His theory proposed a defensive way of investing and was based on rules of thumb. Graham et al. (1934) used past data to estimate the value of a company, for example its book value. The investment theory of John Burr Williams (1900–1989) valued an individual security by looking at its future dividend. The valuation theory of Williams (1938) assumed that the value of a security equals the net present value of the future dividends of the security. In Williams's model, the interest rate is an appropriate part of the calculation. His approach combined theoretical and common sense: the value of a stock is the same as its future returns discounted, which makes his valuation theory theoretically superior to Graham's method. But Graham's method is more practical. Subsequent portfolio theory assumed the theory of valuation as valid; the seminal work of Markowitz (1952, 1959) and Fama (1965a, 1965b) referred to the valuation method as the way to discover the intrinsic value of a stock.

Yet, the theories of valuation are problematic: 'Even modern financial economics lacks a **theoretical** model of stock pricing with any practical accuracy [...] (Poitras 1996, 22, his emphasis).' To start with Graham's method, his practical backward looking method of valuation has the problem of the interpretation of accounting data: what does the book value tell us about the value of the stock? Concerning risk, Graham's approach incorporates risk in a practical way by investing in value stocks with a safety margin between the stock price and its supposed value. But his approach does not work if all stocks are expensive in a historical perspective, because all stocks will then have a high valuation. Anyway, the appropriate level of valuation, such as the ratio of book value to price, or price to earnings, is the key problem; for Keynes (1936) a reason to consider valuation as an unstable convention. Graham's method merely analysed whether a valuation is high or low relative to its past, but what if other factors determine the level of valuation, say the central bank policy or a positive economic outlook? We do not mean to suggest that historical valuation measures such as the price-earnings ratio are useless, but valuations such as the historical price to earnings ratio can stretch enormously and can stay that way for a long time. So, the expectation that valuation predicts teleologically cannot be met: valuation merely predicts in a general fashion, but renders no specific prediction. If valuation would predict, then the return of stocks would become stochastically predictable, which is not possible as we will try to underpin by arguments of economists, and a thought experiment invented by myself in Chapter 4.

Considering Williams's forward looking valuation method, it has, of course, the difficulty of forecasting the future earnings or dividends of a stock. A special difficulty arises in the valuation of growth stocks if the growth factor is higher than the discount factor: in William's model the value will then become infinite (Durant 1957). But valuation has to incorporate risk as well, so it is not merely about the expected value, but also about the probability distribution of the value. Yet, how should the investor, who is likely to be risk averse, weigh the probability distribution of the future earnings? First, we would have to investigate whether the value of a security is subjective, meaning depending on the

preferences of the investors, or objective, meaning that risk is neutrally valued. The utility theory informs us that preferences matter, and that because of risk averseness, the subjective element should be in the valuation of a stock. Thus, if investors find themselves in a financial crisis they become more cautious and might weigh negative outcomes of the probability distribution of earnings higher than before, which means that the value of stocks should go down in a financial crisis, irrespective whether future earnings will be lower.

Of course, the obvious solution to the problem of subjectivity would be to use the risk neutral valuation method as used in option theory. Yet, risk neutral pricing of options is grounded in the possibility that an option can be hedged by a position in stocks or by the put-call parity, a possibility which is absent for stocks. And, the pricing of an option has only one dimension, because the buyer and the seller of an option only have to agree about the future volatility of a stock, since an option price does not incorporate an expected value above the risk-free return. But stocks are assumed to have a return that differs from the risk-free return, which has to be distilled from its future earnings or dividends. To conclude, for a stock valuation, three estimates have to be made: its expected value, the probability distribution of the value, and the level of risk averseness to weigh the probability distribution. Though modern investment theory, as will be shown later on in the chapter, proposed a solution for determining the risk and return of stock in a portfolio context, neither modern investment theory nor valuation theory predicts stochastically, for which a number of arguments will be given in the Chapter 4 of the book.

Empirical Work on Predictability and the Random Walk

Predicting financial markets is hard, which both theory and empirical evidence illustrated (Bernstein 1992). In the first half of the twentieth century, Alfred Cowles, Holbrook Working, and Frederick Macaulay investigated the ability to predict financial markets. Alfred Cowles (1891–1984) founded the 'Cowles Commission for Research in Economics' in 1932 to promote research into financial markets

(Bernstein 1992). Cowles (1933) investigated the results of the advice of investment analysts for beating the market average and predicting the stock market. The outcome of his investigation denied that the advice of investment analysts outperformed the market index or predicted the market as a whole. Cowles wondered about the economic logic of offering advice about the outcome on financial markets for a fee, because exploiting the predictions, if correct, would result in a higher income than the fee provides: 'Market advice for a fee is a paradox. Anybody who really knew just wouldn't share his knowledge (Bloom, MT 1974, *Rogues to Riches*, Warner Books, New York, in Bernstein 2005/1992, 35).'

Another study of Cowles (1944) on the prediction of the stock market again concluded that investment advice for predicting the stock market makes no sense. But it turned out that investors and practitioners are deaf to investigations such as performed by Cowles, and stick to their habits of continuing to believe in forecasting (Bernstein 1992). Cowles suggested that investors are in psychological need of believing that experts possess knowledge about the future course of the stock market:

> Even if I did my negative surveys every five years, or others continued them when I'm gone, it wouldn't matter. People are still going to subscribe to these services [about the predictions of investment advisors]. They want to believe that somebody really knows. A world in which nobody really knows can be frightening (Bloom, MT 1974, *Rogues to Riches*, Warner Books, New York, in Bernstein 2005/1992, 38, my insertion).

The public was not interested in Cowles's studies of unpredictability, but neither were academia at that time. There seem to be two reasons for the lack of interest in academia in his research: economists did not regard financial markets as a serious topic at that time, and, the majority of economists were not yet educated in mathematics or statistics in those days (Bernstein 2005).

Besides Cowles, Working and Macaulay were prominent investigators of the predictability of financial markets. Working (1934) studied wheat prices and concluded that the price changes largely followed a random walk by comparing wheat prices with random outcomes.

Macaulay (1938) refined the idea of random outcomes to a more complex level of randomness, and compared the stock market to 'a loaded pair of dice, with the load shifted from time to time (Fox 2009).' The reason, according to Macaulay, for denying the normal distribution as a valid assumption, was that people make decisions about the future by reacting to the decisions of others, which is not reflected in a normal distribution:

> Of course, the disturbing effects that such factors as presence of emotion, lack of logic and insufficiency of knowledge have on the economic behavior of *individuals* would not merit the attention we are giving them if *socially* they always 'cancelled out.' If the vagaries of individual conduct were always 'normally' distributed round a strictly rational 'mode,' in other words, if the 'deviations' were of the nature of 'accidental' rather than, for example, 'systematic' or 'constant' *errors*, their curbing effects on the development of economics as a strictly logical social science might be small or negligible [. . .]. [. . . .]. It [the normal distribution] is and always will be thoroughly unreal (Macaulay 1938, 11–12, his italics, my insertion).

In the first half of the twentieth century, the pioneering research of Cowles, Working, and Macaulay, resulted in an empirical proof that investment advice did not predict. Macaulay (1938) took the analysis of returns on financial markets a step further by denying that financial markets displayed the type of randomness that can be captured by the normal distribution; an outcome which has not been adopted in the subsequent modern investment theory.

Chartist Theory

To complete the highlights of the development of finance theory in the first half of the twentieth century, chartist theory, or technical analysis, is treated briefly now. The central idea of the chartist theory is that past data of the stock market reveal everything an investor needs to know about the market. The Dow Theory is worth mentioning because it is an

example of a chartist theory, which together with the theory of valuation still belongs to the current practice of investing. The Dow Theory is named after the work of Charles Dow (1851–1902) on predicting stock prices (Bernstein 1992). Dow's name is familiar because he invented the well-known Dow Jones Average. Underlying Dow's theory was the idea that trends tend to maintain until the market sends a signal for its reversal. Dow used the metaphor of ebb and flood. The expression often used in practice of a 'correction' of the market, is a term from Dow's theory. He actually never used the term 'Dow Theory' himself. He was more interested in interpreting history than making a theory for predicting the future.

2.5 Markowitz's Investment Theory

Portfolio Theory

Harry Markowitz's portfolio theory (1952, 1959) is conventionally regarded as the starting point of modern finance (Poitras 2007). With portfolio theory, an investor composes a statistically legitimate portfolio of individual securities, or an asset mix of bonds, stocks, and real estate (Markowitz 1952). He founded his theory on mathematical statistics: he assumes that '[. . .] "beliefs" or projections about securities follow the same probability rules that random variables obey (Markowitz 1999, 5).' The metaphor that investing *is* mathematical statistics is the modern aspect of investment theory. In short, the mathematics in Markowitz's article of 1952 illuminated that a higher return is accompanied by a higher risk and that diversification is a sensible idea: 'It boils down to nothing more than a formal conformation of two old rules for investing: Nothing ventured, nothing gained. Don't put all your eggs in one basket (Bernstein 2005/1992, 44).'

In his *Nobel Lecture*, Markowitz summarized his contribution to price theory by showing how a rational individual investor would invest:

> My work on portfolio theory considers how an optimizing investor would behave, whereas the work by Sharpe and Lintner on the Capital Asset

> Pricing Model (CAPM for short) is concerned with economic equilibrium assuming all investors optimize in the particular manner I proposed (Markowitz 1990, 279).

The price theory of consumers and producers differs from the price theory of capital markets: price theory relates price to quantity, while Markowitz (1959) leaves out quantity. Instead, he relates the expected price gain, the investment return, to risk, because risk features in the future price of a security. Though he did not model quantity, the probability beliefs about investment returns could include the influence of quantity, because the probability beliefs can include *any* theory of economics.

The portfolio approach of Markowitz changed the notion of investment risk. According to Bernstein (1992) Markowitz was original on distinguishing individual stock risk and portfolio risk. A portfolio risks less than an individual security, because a portfolio benefits from diversification as the ups and downs of its individual securities partly compensate. An *efficient* portfolio makes the most of diversification. Efficient means that a portfolio returns maximally at a particular level of expected risk, or to put it another way, risks minimally at a particular expected level of return. As the measure of risk, Markowitz proposed the standard deviation of investment returns. The standard deviation measures the dispersion around the expected return.

Portfolio theory *specifies and maximizes* the potential of diversification. Markowitz's reading of history is that no such theory of diversification then existed: 'What was lacking prior to 1952 was an adequate *theory* of investment that covered the effects of diversification when risks are correlated [...] (Markowitz 1999, 5, his italics).' John Burr Williams applied in his seminal work *The Theory of Investment Value* (1938) the law of large numbers to discover the diversification potential of a portfolio. The law of large numbers implies that the returns of the securities involved behave stochastically independently: then, the risk of the portfolio disappears with a large number of securities in the portfolio. Yet, Markowitz became aware that Williams overestimated the potential of diversification: 'The returns from securities are too intercorrelated.

Diversification cannot eliminate all variance (Markowitz 1952, 79).' The risk that can be eliminated stems from idiosyncratic risk, that is the specific risk of securities. But systematic, or market, risk, cannot be diversified. The notion of market risk will be explained further on in the current chapter. In Appendix 2A of the current chapter, the mathematics of diversification is explained.

Mathematical statistics supplied the portfolio theory with ideas for efficiency criteria and computing procedures. The efficiency criteria in portfolio theory focussed on what is important to an individual investor: '[. . .] determine the type of conclusions sought. [. . . .]. The criteria of an analysis is its guide to what is important and unimportant, relevant and irrelevant (Markowitz 1991/1959, 205).' The criteria of risk and return select the efficient portfolios, and are mirrored in the investor preferences in the utility function. Markowitz proposed for individual investors a quadratic utility function (Markowitz 1991/1959, 286 and further), here in a simplified form:

$$Utility = expected\ return - risk\ aversion \cdot (expected\ return)^2$$

The utility function treated the *expected return* as positive, and the $(expected\ return)^2$, the standard deviation, or expected value of the squared returns, as negative. Markowitz elaborated his choice of utility function and efficiency criteria in his seminal work of 1959. He chose to reduce the probability distribution to the criteria of mean and standard deviation, because the standard deviation is familiar in statistics, and has computational ease.

The beliefs on expected returns, risks, and correlations are, together with the efficiency criteria, put in Markowitz's optimisation procedure to calculate the efficient portfolios. The efficient portfolios, also called the efficient set, contains, to repeat, portfolios with the highest return at a particular risk. An investor chooses the portfolio which maximizes her utility. In Fig. 2.1 the indifference curves, curves with combinations of risk and return at which the investor is indifferent approach from the top left to meet the efficient set, which approaches from the bottom right: the indifference curves of the investor and the efficient set meet at the point of tangency.

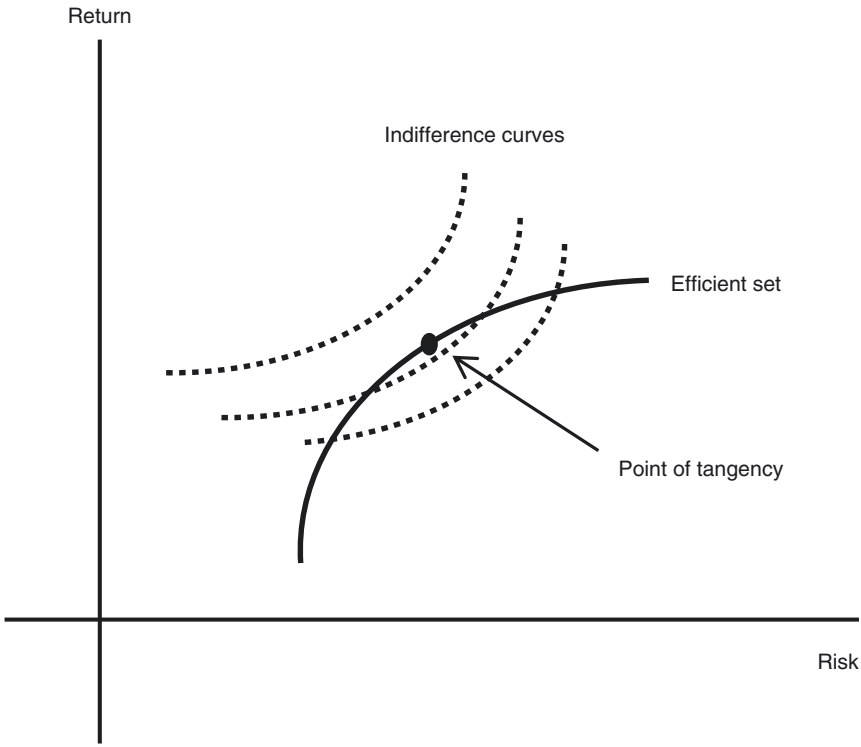

Fig. 2.1 Utility maximization in capital markets according to Markowitz

Evaluation of Markowitz's Contribution

In the evaluation of Markowitz's theory, we will review the impact of diversification on risk, the use of the standard deviation as the measure of risk, Markowitz's ideas about his possible predecessors, the role of Markowitz's theory for further theory development, and the practical use of Markowitz's approach.

Markowitz found a way to calculate the most interesting portfolios with respect to return and risk by optimizing the benefits of diversification. But, how big is the effect of diversification? 'How big is big' is a question of relevance of a theoretical or empirical finding that McCloskey proposes to ask (McCloskey 2000). As mentioned, Markowitz has noted that a

correlation of zero between securities is too optimistic. Let us perform a simple test on the contribution of diversification to lower the risk of a portfolio. The risk, the standard deviation, of a worldwide portfolio of equities was 17.7% annually measured during 1900–2011: the risk of 17.7% *includes* the diversification effect of a huge amount of stocks (data from Dimson et al. 2012). Thus, within an asset class, diversification benefits to a certain extent by eliminating the idiosyncratic risk of individual securities, but a large part remains undiversifiable as illustrated by the level of the standard deviation of 17.7% of a well-diversified portfolio. The interested reader is referred to Appendix 2A on the mathematical statistics of diversification for a technical understanding on the level of correlation and the related maximum capacity of risk reduction in a portfolio.

A correlation of higher than zero means that investment returns of individual stocks are not independently distributed, in contrast to the outcomes of throwing a dice. We will see in a next section that Sharpe (1963) invented a common cause, bèta, to determine which part of the return of a security is caused by the stock market as a whole. Of course, stocks are not the only asset category, and the combining different asset categories could diversify as well. The diversification over diverse asset classes could be rewarding, if a low correlation is accompanied with benign risk and return features: yet, in practice such categories are difficult to find.

Besides diversification by adding more securities, time could diversify investment returns as well. One can make the tossing of a coin amount to 50% heads and 50% tails, by tossing many coins at the same time, or, by tossing the same coin many times. Both ways result in the same probability distribution of approximately 50% heads and 50% tails, if the number of trials is large. Yet, *time diversification in investing* is not analogous to the tossing of coins. When tossing a coin, the basis of the calculation expands proportionally. But the case of coins is different from investing: with investing, the basis of invested capital is fixed at the starting point and merely diminishes or increases because of the returns obtained. Thus, the standard deviation around the mean return is a wrong measure for time diversification, because an investment portfolio is a capital at risk which is multiplied by returns. Therefore, risk, as measured around the value of invested capital, increases during time; think about the risk of multiple

years of negative stock market returns. Samuelson (1969), Merton (1973a), and Bodie (1995), demonstrated that time diversification does not exist in investing. Another way to illustrate the denial of time diversification is the relation of risk and time in option pricing as expressed by the so-called square root of time formula in which risk enlarges with the square root of time; not many people will deny that an option with a longer horizon is more expensive than the same option with a shorter horizon. Because it would be out of scope, we will not go into the debate on time diversification which offers other arguments, such as human capital, for the benefits of a longer investment horizon: the interested reader is referred to a summary of the subject by Mark Kritzman (50–57, in Bernstein and Damodaran 1998), or Pistorius (2004).

Markowitz (1959) chose to reduce the probability distribution of investment returns to the criteria of mean and standard deviation. Markowitz's choice of efficiency criteria can be compared with alternatives, such as stochastical dominance, the inclusion of skewness, and criteria which focus on downside risk (Pistorius 1991). Among other things, my conclusion was that stochastical dominance serves as a better efficiency criterion when probability returns are not normally distributed. The inclusion of skewness as a third criterion next to the mean and the standard deviation is superior as well when probability returns are not normally distributed. Markowitz (1959) himself favoured the use of the semi-deviation, measuring only the downside deviation instead of the two-way measurement of the standard deviation. Nevertheless, Markowitz's choice for the standard deviation as the measure of risk seems defensible, because the standard deviation is familiar in statistics, and has computational ease in calculating efficient portfolios.

What is Markowitz's place in the history of finance? To answer the question, we will discuss the competing theories of Arthur Roy (1952) and Bruno de Finetti (1940), who seem to be the most important competitors of Markowitz. Other candidates could have been Fisher, John Hicks, and Dickson Leavens, who touched on the subject of risk in investing, though not as systematically as Markowitz did (Bernstein 1992). Roy (1952) sought to explain the practice of diversification and proposed, instead of Markowitz's criterion of the standard deviation, a level of disaster as the main measure of risk, of which the probability has

to be weighed against the expected return. Roy's criterion of 'level of disaster' anticipated the value-at-risk approach, which has later become popular in risk management. With the level of disaster as a risk criterion, he aimed to get closer to the intuition about risk as a situation one wants to avoid. According to Bernstein, Roy's article of 1952 reaches the same conclusions as Markowitz's article: ' "Portfolio Selection" and "Safety First" are similar in their lines of argument, and I am at a loss to explain why's Roy's paper failed to cut the swath that Markowitz's paper did (Bernstein 2005/1992, 55).'

Bernstein's best guess why Roy is forgotten is because he was the second to publicize (1992). In an article on the history of investment theory Markowitz (1999) is willing to share the fatherhood of modern portfolio theory with Roy. Roy himself (1961) was critical about Markowitz's monograph on portfolio theory (1959) on a number of points – his criticism on how to obtain probability beliefs is a subject which will be thoroughly analysed in the Chapter 4 of the book:

> Before probability concepts can help us with the selection of our investments, we must be able to translate our expectations about future yields and process into subjective joint probability distributions. While Dr. Markowitz emphasises that past experience is unlikely to be a very good guide to future performance, he gives no clear indication of how either we, or our investment advisers, can provide ourselves with sufficiently precise or generally agreed expectations to merit their processing in an elaborate way (Roy 1961, 99).

Roy and Markowitz published in the same period, but Bruno de Finetti (1940) made an earlier contribution along the same lines as Markowitz (Rubinstein 2006b). So, another claim to the fatherhood of modern portfolio theory can be given to Bruno de Finetti: 'De Finetti's line of analysis bears a remarkable resemblance to what Markowitz would develop completely on his own twelve years later, and for which Markowitz won the Nobel Prize (Bernstein 2007, 108).' It is not mere speculation that Finetti's theory could have been known before Markowitz's theory, despite being written in Italian (Bernstein 2007).

In the investment practice of today, Markowitz's 'mean variance' approach is frequently used to specify diversification and to underpin a diversifying investment strategy. But, hardly anyone uses the optimization procedure that Markowitz proposed, as his algorithm for calculating efficient portfolios has been replaced by more efficient, simpler, ways of calculation. One simplification stemmed from James Tobin (1918–2002), who found a weakness in Markowitz's theory, namely that the riskless asset is absent (Bernstein 1992). Adding the riskless asset to the analysis led to Tobin's (1958) so-called separation theorem: the selection of a Markowitz efficient portfolio is separate from the decision to divide the portfolio in riskless cash and the risky portfolio. The risky portfolio turned out to be the same in each linear combination of cash and risky assets. Tobin's innovation simplified portfolio theory to calculating the risky portfolio, but could not make the calculations of Markowitz's risky portfolio easier.

Markowitz's optimization rule was difficult to execute in practice because the calculation procedure was complicated, and demanded a lot of estimates for each individual security (Bernstein 1992). For the practical application of the portfolio theory, Markowitz himself made a suggestion in his monograph (1959). Because the returns of most stocks are correlated, all that had to be done was to consider whether each stock was more or less volatile than the stock market, and whether other influences were of relevance for a stock (Bernstein 1992). Sharpe (1963) dealt with the problem of the application of Markowitz's portfolio theory. He called his model the diagonal model, though in general it is called the single-index model. The diagonal model related the risk of stocks to that of the market. Sharpe's tool worked well as an approximation of Markowitz's model (Bernstein 1992).

2.6 Efficient Market Theory

Paul Samuelson

The empirical findings of the first half of the twentieth century, implying that the stock and commodities markets resemble a random walk, were continued in the second half of the twentieth century. Maurice

Kendall (1953) analysed stock data and confirmed Working's earlier findings for the stock market. Later in the fifties, Harry Roberts (1959) investigated technical analysis and suggested that all the typical patterns of technical analysis can be produced by chance as well (Bernstein 1992). Michael Jensen (1968) corrected the relative performance for risk, because higher returns can also stem from taking more risk, and denied the outperformance of mutual funds. Many later studies (see for example: Shefrin (1999) denied the idea that the advice of investment analysts is profitable for investors.

The efficient market theory tries to explain the results of the empirical studies on the impossibility of beating the market index. One of the founding fathers of the efficient market theory was Paul Samuelson (1915–2009). Samuelson was a prominent economist, a Nobel Prize winner in 1970, and also contributed to the theory of financial markets. He clarified that the predictability of financial markets is not worthwhile pursuing as a way to make a living: 'But a respect for evidence compels me to incline toward the hypothesis that most portfolio decision makers should go out of business – take up plumbing, teach Greek, or help produce the annual GDP by serving as corporate executives (Samuelson 1974, 17).'

According to Samuelson (1965), the market price was the best estimate of its value. Indeed, if the intrinsic value of a stock were higher and everyone agreed, then the stock price should go up. But, maybe some investors possessed better information, for example through a better analysis of the fundamentals of a security. Yet, looking at empirical studies on the performance of investment advice, or the performance of mutual funds, such a conclusion did not follow, on the contrary, the market performed better than a portfolio based on investment advice or mutual funds. Samuelson stressed that information is relevant for financial markets, because information leads to changes in market prices (Bernstein 1992).

His interest in informational efficiency came from his interest in option pricing (Read 2013). He seems the first to formulate the hypothesis of informational efficiency for financial markets:

> In his 'Proof that Properly Anticipated Prices Fluctuate Randomly,' Samuelson put forth a simple proposition: in an informationally efficient market, prices must incorporate all information available to market

> participants. This implies that it must not be possible to forecast any additional price changes. Five years later, Eugene Fama more economically stated Samuelson's result by saying that 'prices fully reflect all available information' (Read 2013, 77).

Non-predictability resulted from the economic law of full competition and was done in financial markets by arbitrage: 'Samuelson's innovation that arbitrage is a condition of equilibrium was of course not completely novel in finance (Read 2013, 79).' Fama took Samuelson's ideas further into a comprehensive theory (Bernstein 1992).

Eugene Fama

According to Fama (1970) the theory on efficient markets was not rigorous until the work of Mandelbrot (1963a, 1963b) and Samuelson (1965). Though a lot of empirical work had been done in the securities and commodities markets, the empirical work lacked, according to Fama, an economic theory. The research before Mandelbrot and Samuelson was based on the random walk as a fair game of probability with an expectation of zero, starting with Bachelier (1900):

> Thus, though his contributions were ignored for sixty years, the first statement and test of the random walk model was that of Bachelier in 1900. But his 'fundamental principle' for the behavior of prices was that speculation should be a 'fair game'; in particular, the expected profits to the speculator should be zero. With the benefit of the modern theory of stochastic processes, we know now that the process implied by this fundamental principle is a martingale (Fama 1970, 389).

The stochastic process to which Fama referred is a martingale process, which to his opinion is a better representation of the theory of the random walk. A martingale means: '[. . .] a mathematical model of a fair game, or of some other process that is incrementally random noise (Karr 2008).' Besides the technical betterment of the random walk by introducing the martingale, Fama developed the theory of the efficient

market. His definition of an efficient market was 'A market in which prices always "fully reflect" available information [...] (Fama 1970, 383).' The efficient market model did not expect the actual market behaviour to behave as an exact random walk, but the point for practice is whether a market participant could make profit by exploiting stock price patterns of the past (Fama 1965a).

Fama introduced as the cause of the randomness of price fluctuations new and re-evaluated information:

> The price changes in a speculative series can be regarded as a result of the influx of new information into the market and of the re-evaluation of existing information. At any point in time there will be many items of information available. Thus price changes between transactions will reflect the effects of many different bits of information (Fama 1963, 425).

The definition of an efficient financial market was the same as for a goods market in the theory of full competition, in which information is available to all participants at the same time:

> Random walk theorists usually start from the premise that the major security exchanges are good examples of 'efficient' markets. An 'efficient' market is defined as a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants (Fama 1965a, 56).

Essential is that Fama believed in the possibility of valuing a security correctly by using a fundamental analysis. In other words, he supposed that such a fundamental value exists. He said that the work of security analysts is worthwhile: otherwise the market would behave in another way. So, analysts make the market efficient. Because of uncertainty, however, the intrinsic value cannot be calculated exactly. Therefore the price will fluctuate randomly around the intrinsic value. Fama backed the idea that a stock has a fundamental value which can be analysed if one is willing to take the trouble, and which leads to the predictability of the price of a stock. Fama will also be

quoted at length on the topic of fundamental value and predictability because of its importance for the book:

> The assumption of the fundamental analysis approach is that at any point in time an individual security has an intrinsic value (or in the terms of the economist, an equilibrium price) which depends on the earning potential of the security. [. . . .]. Through a careful study of these fundamental factors the analyst should, in principle, be able to determine whether the actual price of a security is above or below its intrinsic value. If actual prices tend to move toward intrinsic values, then attempting to determine the intrinsic value of a security is equivalent to making a prediction of its future price; and this is the essence of the predictive procedure implicit in fundamental analysis (Fama 1965a, 55).

As a standard for rational behaviour in price theory, using fundamental analysis was the right thing for investors to do: it is sensible to find out new information about a security. But economists are also interested in the outcome if *many* analysts perform fundamental analysis:

> That is, the existence of many sophisticated analysts helps make the market more efficient which in turn implies a market which conforms more closely to the random walk model. Although the returns to these sophisticated analysts may be quite high, they establish a market in which fundamental analysis is a fairly useless procedure both for the average analyst and the average investor (Fama 1965a, 58).

Surprisingly, the market is right, meaning that the price on the market is an accurate estimate of the intrinsic value of the security, because the estimates of security analysts are freely available:

> In an efficient market, competition among the many intelligent participants leads to a situation where, at any point in time, actual prices of individual securities already reflect the effects of information based both on events that have already occurred and on events which, as of now, the market expects to take place in the future. In other words, in an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value (Fama 1965a, 56).

Fama (1970) distinguished a number of variations in market efficiency, strong, semi-strong and weak, of which the semi-strong is, in his opinion, supported by empirical evidence:

> He defined strong form efficiency as the most demanding information concept, in which all available public and private information has been incorporated and arbitraged into the price of a publicly traded security. [. . . .].
>
> More common is semi-strong market efficiency, in which market prices reflect only all publicly known information about the overall economy and the fundamentals of a particular asset, perhaps based on financial analyses and corporate news releases (Read 2013, 105).

The intrinsic value changes because of new information, which will be priced in correctly.

Fama (1965b) explained the random walk theory as consisting of two statistical hypotheses: '(1) Successive price changes are independent, and (2) the price changes conform to some probability distribution (Fama 1965b, 35).' The first and most important hypothesis of independence meant that price changes are not related in time, meaning that the price in a former period does not influence the current price, so one cannot predict on the basis of historical information. Being consequent, Fama (1965b) rejected the predictability of chartist theories such as the Dow Theory because of the independence of historical prices.

The second hypothesis of the random walk theory was that 'the price changes conform to some probability distribution (Fama 1965b, 35).' The shape of the probability distribution did not need a specification for the theory to be valid, though the parameters of the distribution should be stationary. Though, even stationarity was not necessary if independence is strictly met. Yet, for the investor the probability distribution mattered because it determined the risk of the investment. The type of distribution was relevant for using statistical tools in empirical work as well. The normal distribution was an 'obvious' candidate for stock market returns, an assumption which was questioned by Benoit Mandelbrot (1963a, 1963b, 2004 with Hudson) who claimed that distributions of financial markets have larger tails and peaks than

assumed in the normal distribution: 'Mandelbrot's main assertion is that, in the past, academic research has too readily neglected the implications of the leptokurtosis usually observed in empirical distributions of price changes (Fama 1965b, 42).'

Mandelbrot's theory will be explained at length in Chapter 4. He also happened to be Fama's PhD-thesis supervisor. Fama agreed to Mandelbrot's view that outliers in the data should not be easily ignored for investors. Fama (1963) acknowledged Mandelbrot's points that under the alternative Paretian probability distribution:

- the variance as the measure of dispersion becomes meaningless
- if the variance is infinite, statistical tools for the normal distribution become unfit
- the measure of the central tendency becomes doubtful because one extra data point can change the average
- investing is more risky
- stop-loss orders do not work because of discontinuity of prices.

Fama confirmed in his dissertation that the data analysis of changes in stock prices showed that the Paretian hypothesis that Mandelbrot advocated, was valid: 'The conclusion of the book is that for the important case of stock prices the stable Paretian hypothesis is more consistent with the data than the Gaussian hypothesis (Fama 1963, 428).' Though later in his career Fama no longer followed Mandelbrot's theory and restricted himself to conventional statistics.

Evaluation of the Efficient Market Theory

In his evaluation of the efficient market theory, Fama (1965b) distinguished between two possible theories on financial markets which are consistent with the independence of historical market prices. The first theory, a psychological one, asserted that the price mechanism on the financial markets has no relationship to the economic and political

reality, and is primarily based on noise related to the speculative behaviour of investors:

> Independence of successive price changes for a given security may simply reflect a price mechanism which is totally unrelated to real-world economic and political events. That is, stock prices may be just the accumulation of many bits of randomly generated noise, where by noise in this case we mean psychological and other factors peculiar to different individuals which determine the types of 'bets' they are willing to place on different companies (Fama 1965b, 36).

The second theory, the one which Fama advocated, is based on economic and political analyses. By analysing, investors try to find out the intrinsic value of securities. The notion of an intrinsic value is consistent with the efficient market theory. An intrinsic value is non static, and changes because of new information. The intrinsic value of a security is not known for sure and will be estimated differently by participants, which creates noise.

Fama (1965b) found the psychological view unappealing, but what did he mean by that? That such a view is not realistic as an explanation because the behaviour assumed is irrational? His argument was that many people in the industry, analysts and fund managers, do not agree, as is noticed by their behaviour. But that argument does not hold ground, as it is not because something is common practice, that it is automatically true:

> Even random walk theorists, however, would find such a view of the market unappealing. Although some people may be primarily motivated by whim, there are many individuals and institutions that seem to base their actions in the market on an evaluation (usually extremely painstaking) of economic and political circumstances. That is, there are many private investors and institutions who believe that individual securities have 'intrinsic values' which depend on economic and political factors that affect individual companies (Fama 1965b, 36).

Fama presented the psychological alternative for his theory of intrinsic value of a security as an extreme one: for him the alternative theory was that the market is merely psychology. But eliminating psychology from markets is a rather limiting move, a move intended towards full rational behaviour.

It seems more plausible that both psychology and economic factors play a role in the stock market. For example, that there is some relation between the financial market and the external world over which a psychological overlay is placed, like in Keynes's beauty contest.

A criticism from within mainstream economics on the efficient market hypotheses was voiced by for example Lucas (1978). He claimed that rational investors using all available information is a necessary, but not a sufficient condition, for a random walk.

For example McCloskey and Klamer (1995) claimed that there is another fundamental problem with the efficient market theory: what is the available information about? Does information lead to predictability and equilibrium, or is the flow of information merely loosely reflected in the market, because the transfer mechanism from information to valuation is ambiguous because of the interpretation of information and the problems of valuation? Only simple information has straightforward implications for the value of a stock, say a takeover bid which is certain to take place, but most information has no clear implication. Fisher Black (1986) wrote about the phenomenon of noise to clarify its difference with information. Simple information is processed instantaneously because its effect on the value of the stock is clear. The other information, noise, is priced in a subjective way, which is harder to predict or to arbitrage.

Besides the existence of a fundamental value, early writers such as Bachelier and Keynes, and the critics of the efficient market theory which will be treated later on in Chapter 4, showed that the reduction to information as the cause of randomness, ignores other causes, such as internal market dynamics, self-reflexivity, expectations, beauty contest dynamics, bubbles, behavioural causes, and other psychological mechanisms.

2.7 CAPM

Capital Asset Pricing Model

There is a continuum of old and modern finance through security valuation. Fama agreed with Markowitz on the added value of security analysis, but Fama took the activities of stock analysts one step further in

the analysis of financial economics by examining the effect of competition; full competition in a goods market leads to absence of profits, full competition under security analysts leads to zero extra profits in the securities market. The subject of the current paragraph, the Capital Asset Pricing Model, CAPM, incorporates Fama's and Markowitz's approach. After Markowitz determined how a rational investor would act, the next logical step was a formulation of the market equilibrium of expected risk and return. The CAPM is a product of the economic logic of diminishing marginal utility, meaning that risk is rewarded, and of full competition, meaning that the market index cannot be beaten. According to Bernstein (1992) a number of people worked independently on the formulation of such a model: Jack Treynor (1962), John Lintner (1965), Jan Mossin (1966), and Sharpe (1964). We will focus on the contribution of William Sharpe (1964), who is probably the most well-known founder of the CAPM.

As shown in Fig. 2.2 an optimal portfolio in the CAPM is always at the *capital market line*, which is a combination of the risk-free return and the market portfolio. To repeat, the capital market is grounded on the *two fund theorem*, which results in a higher level of efficiency than the efficient set of Markowitz. The market portfolio consists of all securities, which are assumed to be priced correctly, so no advantage could be gained by choosing another portfolio than the market portfolio. Because risk diminishes automatically by putting securities in a portfolio, only undiversifiable risk yields an extra return above the risk-free rate. Thus, unsystematic, or idiosyncratic, risk, the risk belonging to a specific stock, does in the CAPM not matter for the value of the stock because it can easily be diversified. Indeed, the stock should have a return which relates to merely the market risk.

For reaching the market equilibrium in capital markets, Sharpe (1964) made a number of assumptions for the CAPM in line with Markowitz (1952, 1959) and Tobin (1958): investors follow the Markowitz's model for making investment decisions, the same rate of interest for lending and borrowing applies to all investors, and all investors have homogenous expectations about expected returns, risk and correlations.

In the CAPM, more reward means to take more risk. Because investors want the extra return *without* the extra risk, they compete in the market for getting an edge in the form of information, but will not succeed because of

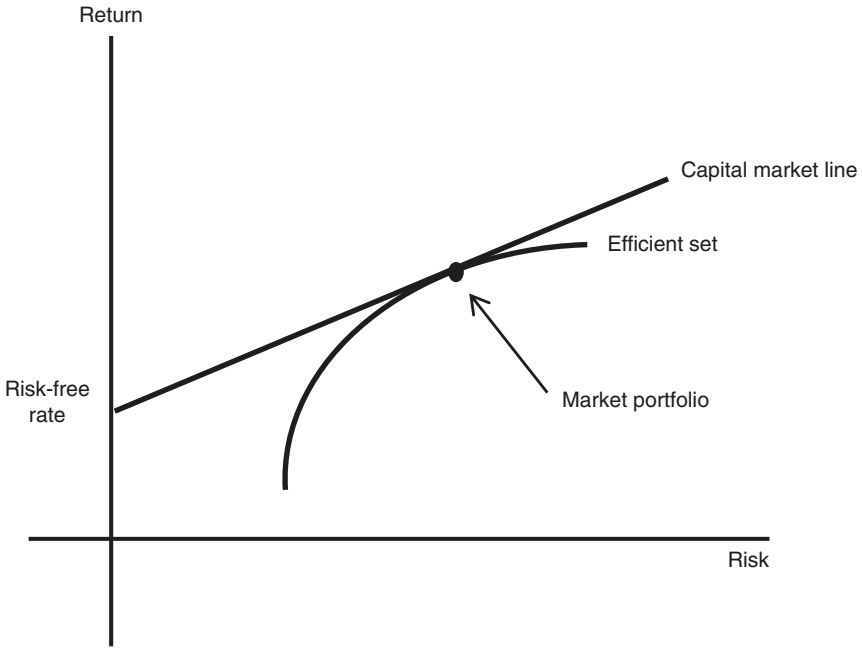

Fig. 2.2 Equilibrium in capital markets

the mechanism of full competition. CAPM presupposes informational efficiency, which means that prices of securities accurately reflect all available information (Fama 1970).

In other words, efficient markets are based on the rational expectations of investors. Lucas (1978) said that rational expectations and informational efficiency are the same. Or in the words of Read: 'This full information and full rationality approach in finance at the time was analogous to the rational expectations school of macroeconomics that was also developing in the 1960s (Read 2013, 102–103).' John Muth (1961) had introduced the notion of rational expectations, meaning expectations from common sense, as opposed to adaptive expectations. His argument was that the professor of economics cannot predict, say, hogg cycles better than the hogg farmer. Why is it an expectation from common sense? Because the argument tells us that economists would be rich, if they could make better predictions than hogg farmers (McCloskey 1998).

Concerning the relation between the CAPM and the efficient market hypothesis, Fama (1970) noted that market efficiency cannot be determined without a theory on equilibrium. So, without presupposing equilibrium, there can be no expected return or risk, and no stochastical predictability of investments. Fama (2011) called the logical combination of the postulates of market efficiency and market equilibrium the joint hypothesis problem. Fama echoes Hayek (1948), a representative of the Austrian School, who saw foresight (predictability) and equilibrium as a tautology. But Hayek differed from Fama, in the sense that he did not believe in either part of the tautology. Hayek's argument against predictability was that economic knowledge is dispersed over the individual participants, which do not know each other's future plans. It is the market which brings the participants and their plans together: the precise outcomes that will emerge are unpredictable.

After the CAPM: APT and the Anomalies

The successor of the CAPM is the Arbitrage Pricing Theory (APT) (Ross 1976). The APT allowed for other explanatory factors than CAPM's market risk to determine an expected risk and return of a security. The assumptions of APT were deliberately less restrictive than those of the CAPM: 'The primary goal of Stephen Ross' APT was to relax the implication that every investor chooses the same portfolio (Read 2013, 130).' Unlike the CAPM, which reduces all risk to market risk, APT is an open empirical theory; therefore, it does not prescribe the factors that determine the expected risk and return of a security.

Another follow-up of the CAPM is a large empirical branch in investment theory, which tries to identify anomalies in the efficient market hypothesis. Well-known anomalies were found by Fama and Kenneth French (1993), who discovered three factors explaining returns: besides the market, factors for small caps, and stocks with a low book to price ratio, explained returns. Haugen (1995) suggested to renew modern finance because value stocks had a higher return and a lower risk, implying that Markowitz's portfolio theory and the CAPM were no longer appropriate. Besides Fama and French's findings, lots of articles have been written on

for example calendar, momentum, and behavioural anomalies. It would be out of scope here to treat and comment all the anomalies.

Though a criticism of the econometric method would be out of scope here as well, it is nevertheless important to express my view on the predictive power of the anomalies found. The empirical investigations attack the theory of the efficient market in the sense that all available information is not reflected in the market price, but that does not mean that financial markets have become predictable. If some predictable pattern in the stock market continues to exist, than market forces will exploit the phenomenon, after which it stops existing: it resembles the non-existing 100 euro notes on the pavement near your house. In so far, the efficient market theory is useful because it explains that easy profits will not persist because of arbitrage. Of all the information available, the easy piece with clear consequences will be priced in for sure. Yet, full arbitrage is not possible, because arbitrage is restrained by the availability of capital needed and the capacity to take the risks involved (Shleifer and Vishny 1997).

2.8 Option Theory

Another important part of the modern investment theory is the option theory. The option theory treats the valuation of contingent claims and calculates the price of the right to sell or buy, for example a stock, against a specified price in a specified period. The theory of options has, of course, a history beyond the conventional notion that it was invented in the 1970s. Anecdotal history tells the story of the Greek philosopher Tales of Milete (624–545 BC), who successfully bought options on olive-presses (Aristotle 1912). De la Vega (1688) described the option market of the Amsterdam stock exchange of the seventeenth century. Bachelier (1900) seems to have made the first serious contribution on the pricing of options. Another early contributor to the option theory was Vinzenz Bronzin in 1908:

> While Bronzin's approach is more pragmatic than Bachelier's, every element of modern option pricing can be found: risk-neutral pricing, no-arbitrage

> and perfect-hedging pricing conditions, the put-call parity, and the impact of different distributional assumptions on option values. [. . . .].
>
> His equation [. . .] is closer to the Black-Scholes formula than anything published before Black, Scholes and Merton (Zimmerman and Hafner 2006, 238).

Because it is out of scope for the book, the reader interested in the history of the option theory is referred to Espen Haug and Taleb (2011).

The credit for finding the solution for option pricing is usually given to Fisher Black and Myron Scholes (1973), and Robert Merton (1973b). Black, Scholes, and Merton were able to solve the formula for option-pricing, because they demonstrated that the risk premium above the risk-free rate becomes irrelevant in the derivation of the formula. Black and Scholes (1973) derived a formula for the pricing of an option from both the CAPM and the so-called put-call parity. The Black and Scholes formula is explained mathematically in Appendix 2B of this chapter. Robert Merton (1973b) demonstrated that the Black-Scholes formula depends on risk-free arbitrage: a position in stocks can dynamically hedge the exposure of an option. The option price equals the statistically expected loss of the hedging portfolio. A long position in stocks, the holding of stocks, hedges a call option, a short position, selling the stocks short, hedges a put option.

Black, Scholes, and Merton imply that the risk of the underlying investment of an option can be estimated. Otherwise, a market maker in options faces possible losses, because the dynamic hedging costs can be higher than expected if the risk realized is higher than the risk expected. Yet, in the line of my argument in the book, *both* risk and return are unpredictable: an option price reflects a subjective level of risk. Option theory has had a huge influence on the practice of option trading and the development of financial engineering (Hull 1997). Some, though, are critical of the perceived role of option theory in practice: Derman and Taleb (2005) do not believe that dynamic hedging is possible in practice: instead, they claimed that static hedging with the put-call parity is the fundamental principle of option pricing.

The option theory differs from the CAPM in the expected level of return on risky assets: the option theory expects that risky assets return the risk-free

rate; CAPM expects a risk premium above the risk-free rate. Option theory and the CAPM differ in the expected return of risky assets because they relate differently to risk preferences. Option pricing is independent of risk preferences, and founded on the principle of risk neutral valuation (Hull 1997). The CAPM adheres to the preference of risk aversion, the economic principle of a diminishing marginal utility, and expects therefore that a higher return should compensate for a higher risk.

How does option theory fit in with portfolio theory? Using options as a part of Markowitz's optimization procedure to find the efficient set of portfolios seems problematic, because the usual risk measure of the portfolio theory, the standard deviation, is not fit for the asymmetric risks that options create. Of course, the semi-deviation, which measures the volatility below a certain level, say, the risk-free rate, could be an alternative measure of risk. However, the semi-deviation would also measure the risk with imprecision where options are involved. On top of that, call options should profit from the risk premium of stocks, which the option formula excludes. Furthermore, put options should have a disadvantage due to the positive tilt of the risk premium. The option theory and the portfolio theory also differ fundamentally in handling risk: the portfolio theory merely *postulates* theoretical risk reduction as a free lunch, the option theory instead, delivers a derivate that *guarantees* risk reduction at a real cost. To conclude, Markowitz's optimization procedure is simply not designed to handle the asymmetric risk profile of options, the absence of the risk premium in option theory, and the fundamentally different character of risk reduction by options.

Appendix 2A The Mathematical Statistics of Diversification

To understand Markowitz's theory, some technical exploration into the characteristics of the probability distribution and the effect of diversification is helpful. Mathematical statistics provide the mechanics of diversification. The expected return, the standard deviation, and the correlation specify the statistics in the portfolio theory. The expected

return is the average or mean return: 'expected' used here has a statistical meaning. 'Expected' in statistics means the value of the investment return at 50% of the *probability mass* of the distribution (Newbold 1984). The probability mass is the sum of the probabilities of possible returns: the mass amounts by definition to 100%. For investors, the probability of actually receiving the mean return is low: an expected return is not to be understood as a return that an investor can anticipate. The expected return is to be understood as a minimal (or maximal) return with a probability of 50% – if the probability beliefs are correct. The standard deviation, the risk, measures the dispersion around the expected return. The standard deviation weighs larger deviations more heavily; the deviations from the mean are squared in the calculation of the standard deviation. In Fig. 2.3 a probability distribution of returns relates to Markowitz's efficiency criteria of mean and standard deviation:

In the portfolio theory, expected return and risk are the main characteristics of an *individual* security. Yet, at the portfolio level, the interplay between individual securities matters: the correlation coefficient expresses the interplay. The correlation coefficient measures the linear relationship between two variables on a scale from –1 to +1. If the

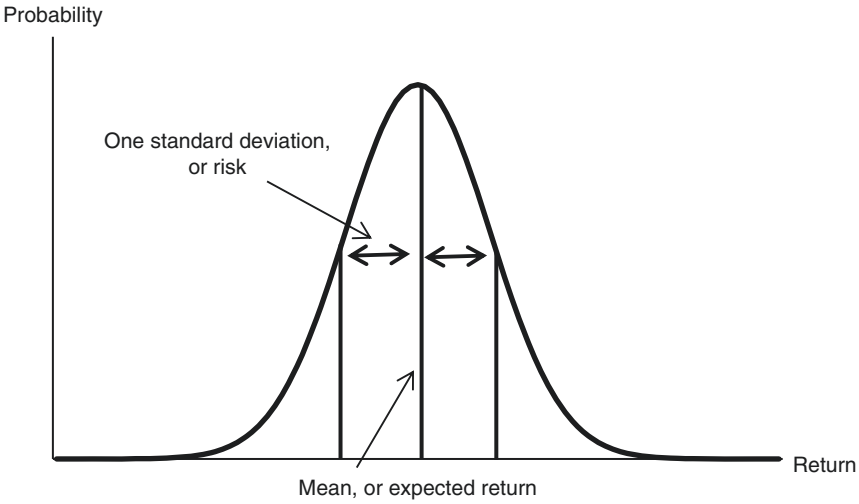

Fig. 2.3 Probability distribution, standard deviation, and mean

correlation coefficient is +1, the returns always move together in the same direction, a correlation of 0 implies that the returns have no linear relationship, and a correlation coefficient of –1 means that the returns behave in exactly the opposite direction.

We will now show mathematically, how diversification between two securities lowers the risk of a portfolio (Bodie et al. 1989). Please note that the calculation of the expected return of a portfolio does not demand an elaboration: it is simply a weighted average of the expected returns of the securities in the portfolio. The standard deviation, or risk, of a portfolio of two securities is formulated as:

$$\sigma_{\mathrm{p}} = \sqrt{(w^2\sigma_{\mathrm{a}}^2 + (1-w)^2 2\sigma_{\mathrm{b}}^2 + 2\mathrm{w}(1-\mathrm{w})\rho\sigma_{\mathrm{a}}\sigma_{\mathrm{b}})}$$

The symbols used mean:

σ_p = standard deviation of portfolio p
σ_a = standard deviation of security a
σ_b = standard deviation of security b
w = weight in the portfolio
ρ = correlation coefficient

The formula illustrates that the risk of a portfolio depends on the standard deviations of the individual securities, σ_{a} and σ_{b}, their weights, w, and on the correlation coefficient, ρ, between them. A correlation coefficient less than one, yields a diversification benefit. If the correlation coefficient is at its upper limit of +1, the portfolio risk equals the weighted sum of the risks of the individual securities. If the correlation coefficient is at its lower limit of –1, the third term of the right hand side of the formula becomes negative, and leads to an extraordinary diversification benefit. In the special case that the correlation coefficient is 0, the third part of the right hand side of the formula becomes 0. Then, the risk of a portfolio reduces to the weighted risks of the individual securities:

$$\sigma_{\mathrm{p}} = \sqrt{(w^2\sigma_{\mathrm{a}}^2 + (1-w)^2\sigma_{\mathrm{b}}^2)}$$

The formula with two securities illustrates the general mechanism of diversification. Yet, normally an investor can diversify over a lot of securities. Now, the analysis will cover the effect of an increasing number of securities. To benefit the analysis, the securities in the portfolio have the same risk, expected return, and correlation coefficient.

If the correlation coefficient between the securities is 0, the risk of the security, divided by the square root of the number of securities, determines the portfolio risk:

$$\sigma_p = \frac{\sigma_a}{\sqrt{n}}$$

Symbol used:

n = number of securities

The formula demonstrates that more securities lower the risk of the portfolio. Because of the square root in the denominator of the right hand side of the formula, an extra security in the portfolio leads to a diminishing marginal risk reduction. If the number of securities is high, the portfolio risk eventually becomes 0. A correlation coefficient of 0 resembles an insurance-like activity, because insurance assumes individual risks to be more or less uncorrelated. The formula expresses the *law of large numbers*, which reduces the risk of an insurance-like portfolio to 0 at a large number of 'cases.'

The general formula for calculating portfolio risk, when securities have the same expected return, risk, and correlation coefficient, is expressed like (Bodie et al. 1989):

$$\sigma_p = \sqrt{\frac{1}{n}\sigma^2 + \frac{n-1}{n}\rho\sigma^2}$$

Supposing that the risk of the individual security is 25%, Fig. 2.4 illustrates the risk reduction as a function of the number of securities and the correlation coefficient:

Risk reduction by adding securities is at its most effective at a correlation coefficient of 0, represented in Fig. 2.4 by the solid bold line. Suppose the correlation coefficient was –1, then two securities would be enough for an optimal risk reduction to 0. If the correlation coefficient is 1,

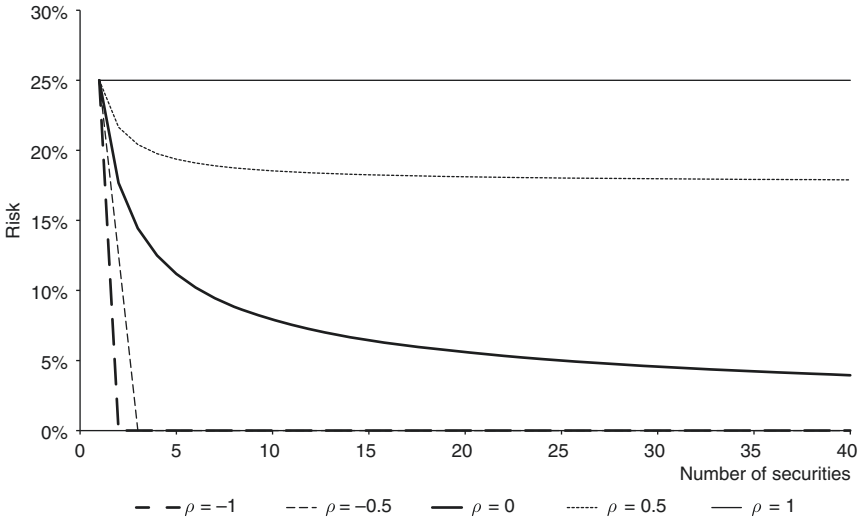

Fig. 2.4 Idiosyncratic risk reduction with correlation coefficients of +1, 0, and –1

risk cannot be reduced. At a level of correlation coefficient of 0.5, some risk reduction can be achieved, but the optimal reduction requires fewer securities in comparison with a correlation of 0. Diversification cannot eliminate all variance (Markowitz 1952). To repeat, in modern portfolio theory the correlation coefficient is above 0, because merely idiosyncratic risk of individual securities can be diversified, in contrast to systematic risk, that is market risk. The idealized example of the mechanism of diversification meant to clarify Markowitz's notion of risk reduction, but of course the correlation coefficients between securities will mostly differ, just like their expected risk and return.

Appendix 2B The Black and Scholes Option Formula

The Black and Scholes option formula deals with the so-called European option, in which a holder can only exercise his right to buy or sell at the end of the duration of the option. In the formula, Black and Scholes

assume that the stock will not deliver a dividend. The Black and Scholes call option formula is expressed as (based on Hull 1997):

$$C = SN(d_1) - Xe^{-rT}N(d_2)$$

where:

$$d_1 = \frac{\ln(S/X) + (r + \sigma^2/2)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

The meaning of the symbols used is:

C = the current value of the call option
S = the current price
$N()$ = the standardized normal distribution
$N(d)$ = the probability that a drawing out of N is lower than d
X = the exercise price of the call option
e = the base of the natural logarithm
r = risk-free interest rate (continuously compounded with e)
T = time to maturity
ln = natural logarithm
σ = standard deviation

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3

Heterodox Investment Theory

3.1 The Criticisms of Modern Investment Theory

Robert Shiller's ideas relate to various branches of heterodox investment theory. Shiller (1981) is an early opponent of the efficient market theory: 'The chief advocate for the popularization of a reconsideration of the efficient market hypothesis was Robert Shiller (Read 2013, 188).' Shiller (1981) found that the variance of stock prices was five to thirteen times higher than an efficient market model would predict on the basis of available information. Later on, Schiller (2000) explained in his book *Irrational Exuberance* that the bull market of the 1980s and 1990s was not related to economic fundamentals and should be considered as a bubble. He expressed a number of possible causes for the irrational rise of the stock market in the 1980s and 1990s, such as positive feedback models of for example adaptive expectations, cultural causes like media and 'new era'-thinking, and behavioural causes like herd behaviour.

Shiller (with Akerlof 2009) thinks along the lines of Keynes's ideas of the psychology of markets in the form of animal spirits, which translates into bubbles and Keynes's beauty contest which emphasizes the

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reflexivity of markets, meaning that the market reacts to itself. So, to explain behaviour, Shiller replaced rational economic explanations by psychological and cultural explanations such as confidence, fairness, bad faith, money illusion, and stories. In Chapter 6 on the culture of finance, the ideas of Shiller will be further examined.

A number of alternative, heterodox investment theories are now discussed. The ideological criticism of modern finance, political finance, uses elements of behavioural and bubble criticisms, and combines them with the criticism on free markets in general. Fractal finance provides, within the rational mathematical tradition, an alternative fractal statistical theory, which explains seemingly predictive patterns in financial markets, wild volatility, and bubbles. Bubble finance explains bubbles on financial markets and their bursting. Behavioural finance is also insightful and helps to reflect on decision making, and explains the behaviour of investors. The bottom-up approach of evolutionary finance yields an interesting alternative to the top-down approach of the modern investment theory. Please note that another important criticism from non-mainstream economics and finance concerning uncertainty and unpredictability will be treated at length in the next chapter.

3.2 Political Finance

In 2008, the credit crisis led to a crisis on the financial markets. In the credit crisis, the ideology of the rational market as advocated by Alan Greenspan and others was put to a reality check. Central in the rational market theory is the efficient market hypothesis (Fox 2009). Once again, the efficient market hypothesis assumes rational expectations, which mean that individuals cannot have better information than provided by the markets. Though the efficient market hypothesis is a useful scientific model, it has become stretched by the idea that the rational market comes up with the right price: 'Financial markets knew best. They moved capital from those who had it to those who needed it. They spread risk. They gathered and dispersed information (Fox 2009, xii).'

The rational market theory makes one forget that the financial market is 'a devilish thing' as well (Fox 2009, xv). Cassidy explained that the stability of markets is an illusion because of the effect of bubbles:

> Once a bubble begins, free markets can no longer be relied on to allocate resources sensibly or efficiently. By holding out the prospect of quick and effortless profits, they provide incentives for individuals and firms to act in ways that are individually rational but immensely damaging – to themselves and others (Cassidy 2010/2009, 9).

To repeat the earlier findings of Chapter 2, the perspective that financial markets resemble gambling is an old one, witnessed by the De la Vega's (1688) eyewitness report of the Amsterdam Exchange in the seventeenth century. In the nineteenth century, investing in stocks is still associated with gambling, but the vernacular science of financial investments turned it into a scientific topic, in which rational behaviour in the form of self-control and the study of information is promoted as the key to successful investing (Preda 2006). A part of vernacular science included probabilistic and abstract reasoning and resulted in the efficient market theory. The perspective that financial markets can be managed by a scientific approach is enforced since modern finance emerged in the 1960s.

Though investing has unknown probability distributions and therefore possesses a higher level of uncertainty than gambling in a casino with its known probability distributions, investing is not seen as gambling because it has a rationale, arguments to believe that it is worthwhile. Marieke de Goede (2005) took a genealogical approach to investigate finance: 'A genealogy, in short, is a practice of criticism that is motivated by finding insecurities and uncertainties in that which is represented as stable, coherent, and self-perpetuating (De Goede 2005, 14).'

Finance is now seen as a respectable scientific and public subject, instead of as gambling associated at times with fraud and manipulation. Money on a savings account would best be replaced by investments, so that instead of standing idle it is activated in the financial market. The move away from investing being perceived as

gambling, towards being perceived as a rational activity, took time and emerged with the surge of financial markets, where the actors needed respectability:

> In the eighteenth and nineteenth centuries, the lack of a conceptual distinction between 'finance,' 'gambling,' and 'speculation' increasingly became an obstacle to the respectability of trading in stocks, shares, and credit certificates. A separation between gambling and finance became thinkable only through a prolonged political, cultural, and legal struggle surrounding the meanings and boundaries of 'the financial sphere' and the character and behavior of 'financial man' (De Goede 2005, 48).

The genealogical approach stressed that the distinction between finance and gambling is merely political, ideological, instead of based on the nature of financial markets (De Goede 2005).

A defence of modern finance against ideological criticism and other criticisms to come lies partly in the definition of rational markets. Finance adheres to the idea of rational markets as guided by arbitrage. The mechanism of arbitrage is a paradigm of modern finance. The mechanism of arbitrage implies that individual participants on the financial markets behave rational by applying arbitrage. For successful arbitrage, not all market participants need to be rational, even many irrational participants pose no problem. Moreover, arbitrage is a relatively simple form of rationality because it is about getting a riskless profit and merely assumes that people want more money without extra risk. The rationality of arbitrage is far less demanding than the rationality of a market equilibrium following the CAPM. Of course, the argument of arbitrage has its limits, only plain information can be arbitraged, noise cannot.

Whether the benefits of financial markets outstrip its negative sides, is outside the scope of the book. Yet, the question of how people should cope with financial markets is relevant: is the current scientific approach of modern finance to the handling of investments

appropriate, or does its epistemology, or lack thereof, urge us to look for an alternative finance theory?

3.3 Fractal Finance

As McCloskey (1990) said, facts constrain stories. The point now is what facts are in finance, because statistical theories frame facts. Benoit Mandelbrot (1963a, 1963b, 2004 with Hudson) started with undoubtable facts, mostly simple data, that of prices on financial or commodity markets and their fluctuations. Then, the choice of statistical theory, normally the theory coupled to the normal distribution, decides the description of the data for the purpose of explanation or prediction. But Mandelbrot proposed an alternative statistical theory, the theory of fractals, to explain the data on financial and commodity markets. The normal distribution could not explain Black Monday, the stock market crash of 19 October 1987, on which the American stock market fell by 29.2%: the odds of such a crash were less than 10^{50} following a normal distribution (Mandelbrot and Hudson 2004). The received view of perceiving facts on the financial markets by its participants can also offer an alternative explanation for the credit crisis of 2008:

> The worldwide market crash of autumn 2008 had many causes: greedy bankers, lax regulators and gullible investors, to name a few. But there is also a less-obvious cause: our all-too-limited understanding of how markets work, how prices move and how risks evolve (Mandelbrot and Hudson 2008/2004, xi).

So, the assumptions behind the models in finance are part of the problem. The standard assumptions imply that risk is manageable, but instead turbulence is normal, not abnormal, in financial markets.

Mandelbrot recognized Bachelier's random walk process as an important theory on the behaviour of financial markets, but replaced the normal probability distribution with the so-called stable Paretian

probability distribution. He did so because the statistical properties of the distribution of price changes on financial markets are deviant from the normal distribution in the sense that the probability distribution are too peaked to be normal distributions:

> Despite the fundamental importance of Bachelier's process, which has come to be called 'Brownian motion,' it is now obvious that it does not account for the abundant data accumulated since 1900 by empirical economists, *simply because the empirical distributions of price changes are usually too 'peaked' to be relative to samples from Gaussian populations* (Mandelbrot 1963a, 394, his italics).

Besides the probability distribution, the efficient market hypothesis which relates information, news, and fundamental analysis to the pricing of a security, is flawed (Mandelbrot and Hudson 2004). An example of a flaw in the efficient market theory is that prices are dependent, instead of independent as presumed by the efficient market hypothesis, though the dependence of prices does not mean that the prices become predictable. Another flaw is that the efficient market hypothesis does not explain the endogenous working of financial markets – a financial market does more than reflecting outside events.

The hypothesis of the efficient processing of information seems inadequate as explanation of the behaviour of financial markets. For Mandelbrot, the economic significance of the efficient market hypothesis that prediction is impossible remained valid. Though he did not believe in the prediction of markets, having a theory which explains the behaviour of financial markets is worthwhile as a product of science. His theory was not meant to make money, but to enlarge wisdom.

Mandelbrot used the mathematics of so-called fractals, a small geometric form which accumulates to some complex phenomenon, to simplify the understanding of phenomena:

> A fractal, a term he [Mandelbrot] coined form the Latin for 'broken,' is a geometric shape that can be broken into smaller parts, each a small-scale

> echo of the whole. The branches of a tree, the florets of a cauliflower, the bifurcations of a river – all are examples of natural fractals (Mandelbrot and Hudson 2008/2004, xx, my insertion).

The theory of fractals translates into the Pareto probability distribution, a power law distribution. Vilfredo Pareto (1848–1923) was an Italian economist, sociologist, statistician among others (Kirman 2008). Other names for the Pareto probability distributions are 'Lévy,' 'Lévy-Mandelbrot,' 'L-stable,' or 'stable Paretian.'

The Pareto probability distribution is known by the public as the 20/80 rule, for example 20% of the habitants tend to earn 80% of the income in a country. The Pareto distribution is featured by a long, fat tail. Mandelbrot saw the Pareto distribution as representative of many economic phenomena: '[. . .] not only the 'tail' of the distribution of personal income, but also the tails of the distributions of firm sizes and of city sizes (Mandelbrot 1963b, 421).' Mandelbrot and Hudson (2004) distinguished three forms of randomness: mild, slow, and wild. Modern finance assumed mild randomness which is represented by the normal distribution. But finance is represented by wild randomness: 'It is of the very essence of many natural objects – and of economic ones (Mandelbrot and Hudson 2008/2004, 125).'

The Paretian distribution which Mandelbrot proposed for finance has next to its wild randomness, another feature which explains theories and ideas about financial markets: it creates the illusion of causality in stock markets:

> I shall also show the following: when the 'spontaneous activity' of a system is ruled by a Paretian process, the causally structural features of the system are likely to be very much more hidden by noise than is the case where the latter is Gaussian. Causal structures may even be totally 'drowned out.' On the other hand, Paretian noise generates all kinds of 'patterns' that seem to be perfectly clear-cut but have no value for purposes of prediction (Mandelbrot 1963b, 422).

Another consequence of accepting the Paretian distribution is that the standard deviation becomes useless because it becomes infinite, and that the usual statistical methods do not work:

> It is well known that second moments are heavily used in statistical measures of dispersion or of 'standard deviation' and in 'least-squares' and 'spectral' methods. Hence, whenever the considerations of Section V are required to explain the erratic behavior of sample second moments, a substantial portion of the usual methods of statistics should be expected to fail (Mandelbrot 1963b, 432).

If the Paretian distribution holds, Markowitz was wrong in choosing the standard deviation as the measure of risk. The CAPM was wrong to assume a normal distribution.

If probability distributions are Paretian, normal statistical analysis does not work, and finance becomes a science of interpretation like history. Interestingly enough, Mandelbrot is on the same line as Von Mises, Keynes, Knight, but has another theory, from a source within economics based on the ideas of Vilfredo Pareto:

> Broadly speaking, a pattern is scientifically significant and is felt to have chances of being repeated, only if in some sense its 'likelihood' of having occurred by chance is very small. This kind of significance is obviously to be assessed with the help of the tools of statistics; unfortunately, those have been mostly designed to deal with Gaussian alternatives and, when the chance alternative is Paretian, they are not conservative or 'robust' enough by far. [. . . .]. But, when one works in a field where the background noise is Paretian, one must realize that one faces a burden of proof that is closer to that of history and autobiography than to that of physics (Mandelbrot 1963b, 433).

Though the Paretian distribution is probably not predictive because it is difficult to establish the relevant parameters, it has a chance of being a better theory on the random walk hypothesis than a normal (or lognormal) distribution. The consequences of adopting the Paretian distribution are huge: regular statistics do not function anymore,

meaning that the standard deviation is no longer representative, which is negative for the assumed benefits of diversification. Concerning the CAPM, it could not function because it follows the normal distribution.

The implications of Mandelbrot's theory are devastating for finance and regular statistics: stocks are riskier than modern finance postulates, diversification does not work well, and volatility is unstable. Initially, Mandelbrot's ideas spread in finance but were ignored later on. Though for example Taleb (2007), a popular opponent of modern investment theory and its related risk management practices, adheres to Mandelbrot's ideas, Mandelbrot remains in the periphery of finance theory.

3.4 Bubble Finance

Kindleberger (1910–2003) is an economic historian specialized in the history of financial crises. Financial crises happen over and again. To mention some crises in the last 20 years: the credit crisis of 2008, the dot-com crisis of 2000, the Russia-crisis of 1998, and the Asia-crisis of 1997. He stressed that crises are part of the economic system and have always existed. Crises relate to the behaviour of individuals and crowds. Bubbles and their bursting behave according to a fixed pattern (Kindleberger 1978):

- A bubble starts with a displacement, an outside shock to the economy, such as a new invention, or a monetary or political change. A displacement brings opportunities for profits.
- Then credit expands and fuels the boom. Banks expand the money supply.
- Prices rise and positive feedback develops with the entry of new buyers.
- The bubble reaches the stage of euphoria. Speculators step in.
- Then the bubble bursts with the accompanying panic.

- Finally, the phase of capitulation is reached. People lose their confidence.

Kindleberger used the ideas of Hyman Minsky (1982) for the interpretation of bubbles. He regarded Minsky's model as a classical economic model:

> Indeed, in its emphasis on the instability of the credit system, it is a lineal descendant of a model, set out with personal variations, by a host of classical economists including John Stuart Mill, Alfred Marshall, Knut Wicksell, and Irving Fischer. Like Fisher, Minsky attached great importance to the role of debt structures in causing financial difficulties, and especially debt contracted to leverage the acquisition of speculative assets for subsequent resale (Kindleberger 2000/1978, 14).

Kindleberger did not mean, of course, that all economic upswings end in bubbles. Nor did he seek the kind of regularity to make predictions, like some business cycle theorists have done, such as Kitchin, Juglar, Kuznets, and Kondratieff.

Kindleberger's research showed that people behave irrationally in markets. Though behaviour usually is rational, he related manias and panics with temporal mass irrationality or mob psychology. More precisely, irrationality of the whole can emerge from rational individual behaviour. He called the idea that rational individuals act rationally as a whole, a fallacy of composition. Emergence of irrationality out of individual rational behaviour happens on other occasions as well, for example when people stand up in a theatre to get a better view, with the consequence the irrational outcome that other people get a worse view. Individuals can be irrational as well, as for example illustrated by the phenomenon of cognitive dissonance: people possessing the same facts use different personally coloured 'theories,' and reach other conclusions on the basis of the same facts. Another example of irrational behaviour is that information is interpreted on different levels of expertise, as not everyone is an expert, which leads to irrationality in the market.

3.5 Behavioural Finance

In a general critique of the assumption of rational behaviour in economics, Herbert Simon (1955) introduced the alternative notion of *bounded rationality*. Bounded rationality limits the knowledge and the calculative ability of the decision maker. Yet, in the classical decision theory the rational decision maker is omniscient, and does not make mistakes in his calculations. A consequence of bounded rationality is that a decision maker does not optimize, but satisfices. The school of behavioural finance continues along the path of bounded rationality. Behavioural finance has emerged as a new branch of investment theory. Behavioural finance studies the psychology of decision-making in investing.

Daniel Kahneman (2011) distinguished two systems of thinking, the heuristic automatic mode (system 1) and the effortful attentive mode (system 2). The heuristic mode of thinking that leads to behavioural biases, is the regular way of thinking, the effortful mode can cope with heuristic biases. Behavioural finance has found that 'Uncertainty is poorly represented in intuition, as well as in perception (Kahneman 2003, 701).' Thus, translating intuition into a probability estimate is troublesome. For example, Amos Tversky and Kahneman (1974) showed that judgment under uncertainty is biased by the heuristics of representativeness, availability, and anchoring. The heuristics of representativeness shows that probability judgments based on representativeness, similarity, can be flawed, because probability is influenced by a larger array of factors than mere similarity. The availability bias explains why people misjudge the probability of an event merely because some events can be brought to mind easily. The anchoring bias suggests that judgments are influenced by the information presented at the starting point.

Relevant to the discussion on investment decisions in the book is the fact that historical data are often available as a basis to form judgments about future returns, and that the investment theory 'prescribes' how to present the data; so judgment under uncertainty is biased at a higher level than presented by the examples of the behavioural theory of Tversky and Kahneman. Behavioural finance also offers an explanation

why decision makers on investments are captivated by the perspective of the investment theory. Ellsberg (1961) described the phenomenon of ambiguity aversion, meaning that people do not like uncertainty and prefer a presentation which is more elaborate, more generally described as attribute substitution (Kahneman and Frederick 2002). For the investment theory in particular, it means that models are the attribute of substitution:

> [. . .] our brain has the latent tendency to substitute complex problems with less complex problems. And these less complex, though often mathematically rigorous problems are then resolved as a substitute solution for the complex problems. That is called attribute substitution (Kocken 2012, 18).

Shefrin (1999) expressed an important lesson from behavioural finance: investors should be aware of their overconfidence. Research showed that most investors make psychological errors while making investment decisions. Overconfidence also applies to the use of models in finance, which investors use to confirm their earlier choices (Rosenberg and Kocken 2013). Behavioural finance offers insight into why investors keep on using the flawed model because the cognitive biases pervade their thinking. As consequence of their critique of the expected utility theory, Tversky and Kahneman developed an alternative, the *prospect theory* (1979). For a summary of behavioural finance, see Shefrin (1999), Kahneman (2003, 2011) and Thaler and Sunstein (2008).

Gerd Gigerenzer (2000) is a critic of the program of heuristics and biases as used by Tversky and Kahneman. In the conventional program of behavioural finance heuristics and biases are measured against the norms of the probability theory. But the norms of the probability theory adapted are doubtful:

> What in the heuristics-and-biases literature is called the 'normative theory of probability' or the like is in fact a very narrow kind of neo-Bayesian view that is shared by some theoretical economists and cognitive psychologists and to a lesser degree by practitioners in business, law, and artificial intelligence (Gigerenzer 2000, 244).

Gigerenzer advocated the notion of ecological rationality: '[. . .] rationality that is defined by its fit with reality (Gigerenzer et al. 1999, 5).' Ecological rationality is a form of bounded rationality and explains how people cope with uncertainty. The difference between ecological rationality and the rationality assumed by Tversky and Kahneman is that ecological rationality does not focus on the probability theory. Ecological means that, instead of the probability theory, the structure of the environment is relevant for decision making. The specific circumstances determine what is rational to include in decision making; the probability theory is too general and therefore unfit in most circumstances for practical decision making.

Measured by the acceptance of academic finance, behavioural finance is successful as an alternative for neoclassical finance. It seems that no other alternative investment theory has gained the level of attention in the academic world and in the investment practice as behavioural finance has. The explanations of behavioural finance overlap with the rhetoric of investment theory concerning the shortcomings of the investment theory. For example, the metaphor that investing is mathematical statistics could be seen as a framing effect that makes us see in a particular way. Behavioural finance also shows the conceptual difficulty that people experience with statistics. The strength of behavioural finance is that it predicts individual behaviour in decision making, and that it has a coherent theory on why people act the way they do. But as a matter of predicting financial markets, behavioural finance has no other status than other alternative investment theories, it explains but does not predict financial markets.

3.6 Evolutionary Finance

Finance applies statistics to financial markets as a top-down approach. Statistics assume implicitly that the underlying process produces random outcomes which are stable and stochastically predictable. The arguments for applying the stability hypothesis in finance, such as rationality, the efficient market hypothesis, arbitrage, fundamental intrinsic value, and market equilibrium have been discussed in Chapter 2 and will be

analysed at length in Chapter 4 of the book. An alternative approach, however, is evolutionary finance, which is a bottom-up approach that starts with the behaviour of market participants. The evolutionary approach has gained ground in a variety of sciences. The constitutional metaphor of the bottom-up approach is evolutionary biology, instead of mechanical and statistical physics as used in neoclassical finance. The Santa Fe Institute, a research centre for the evolutionary approach in science which was founded in 1984, has played an important role in promoting the evolutionary approach.

Evolutionary finance is grounded on a number of related theories, such as dynamic systems, reflexivity, complexity, and emergence.

Dynamic systems

In evolutionary finance, the financial markets are seen as a dynamic system, in which the causes of change are endogenous, from within the system (Beinhocker 2006). For example, the interaction between the behaviour of individuals can result in a self-fulfilling prophecy (Merton RK 1948). An example of a self-fulfilling prophecy starts with a false rumour that a certain bank has become insolvent, after which some customers of the bank start to withdraw their money, and attract other customers who do the same. The bank will indeed fail if left by itself, and the prophecy becomes self-fulfilling. A self-fulfilling prophecy is an erroneous belief on a situation, which becomes true as behaviour adapts to the belief: '[. . .] public definitions of a situation (prophecies or predictions) become an integral part of the situation and thus affect subsequent developments. This is peculiar to human affairs (Merton RK 1948, 195).'

A self-fulfilling prophecy is fed by feedback loops: in the example of the insolvency of the bank, at first merely a small amount of people believe the rumour, then the withdrawal of money creates more believers, thus the bank eventually fails. But such feedback loops are no part of neoclassical economics. Another form of a feedback loop is the phenomenon of reflexivity. An advocate of reflexivity is George Soros (1987, 2008). Soros described reflexivity

as a circular feedback loop between beliefs and reality: beliefs and reality influence each another. Thus, beliefs in financial markets influence the economic reality, which reinforces the beliefs. In contrast to neoclassical finance, in Soros's view the beliefs of market participants are flawed by definition because of uncertainty. The consequence of the flawed beliefs of financial markets leads to boom and bust cycles, in which optimism feeds optimism and pessimism feeds pessimism. In the case of financial markets, optimism and pessimism are instantaneously visible in the market prices.

Complexity

Another aspect of evolutionary finance is that financial markets are a non-linear system, which can result in complex patterns (Beinhocker 2006). Thomas Schelling (1978), an economist awarded the Nobel prize in 2005, investigated how individual behaviour related to the outcome at the collective level: if individual behaviour depends on the individual behaviour of others, then collective behaviour is probably more than merely the total of all individual behaviours, because the individual behaviours interact. Schelling performed his analysis in a qualitative manner that is non-mathematical. We will see later on in the current paragraph that mathematical and experimental methods have also been employed in evolutionary economics and finance.

An important feature of complexity is the so-called tipping point, in which the state of a system changes to another form, like water transforms to ice (Popescu 2015). A tipping point in financial markets is for example a regime shift from a bull to a bear market. The technique of agent-based modelling enables us to simulate bottom-up behaviour and interaction between individual agents including institutions, and helps understand tipping points in finance and macroeconomics. Networks, as in the way in which agents are connected and clustered in finance and economy, are an important part of understanding tipping points and complexity in general (Beinhocker 2006). Agent-based modelling reveals how small changes in individual behaviour (because of interactions between people and institutions) can lead to dramatic consequences at

the collective level. Agent-based modelling also provides clues to policy-makers on how to interfere in the markets to improve stability or to reduce the consequences of tipping points.

Emergence

Emergence is typically an output of bottom-up processes: 'The movement from low-level rules to higher-level sophistication is what we call emergence (Johnson 2001, 18).' Emergence results from complex systems: the properties of the total of individual parts cannot be reduced to the properties of its individual parts, but emerge from the interaction of the individual parts. Examples of emergence are phenomena such as ant colonies, life, consciousness, intelligence, and music (Hofstadter 1979).

Formal and Experimental Evolutionary Finance

We will now illustrate some insights from formalized models of evolutionary finance in which the behaviour of the market is simulated. Hommes (2005) reviewed heterogeneous agent models in which agents have a bounded rationality and act behaviourally on simple heuristics. Another feature of the agents is that they are heterogeneous, they act differently. For example, agents belong to different groups such as fundamental investors, who focus on intrinsic value and chartists, who focus on trends in historical market prizes. The models stemming from heterogeneous, bounded rational agents result in dynamic behaviour and can explain phenomena such as excess volatility and stock market crashes. Though the evolutionary finance models reviewed by Hommes (2005) are equipped with sparse bottom-up assumptions, they succeed in explaining the actual outcomes of the financial markets.

Evolutionary finance is also suited for an experimental approach, meaning that a group of people can engage in an experiment as financial market participants. Such an experiment enables to study for example the relationship between past performance and expectations on financial markets. Anufriev and Hommes et al. (2013) found in explaining the outcomes of such an experiment, that a model in which behaviour

switched between adaptive and trend-following behaviour was best suited to explain negative and positive feedback loops.

3.7 Evaluation of the Criticisms

Concerning the depth of the rival theories of finance, they all have substantial backing and empirical proofs which can compete scientifically with the modern investment theory. The ideological criticism uses elements of behavioural and bubble criticisms and combines them with the criticism on free markets in general. In essence, the ideological criticism says that investing in financial markets resembles gambling which is politically sanctioned. The investment theory seen through the ideological perspective is the rationalisation of a dubious practice. Ideological criticism is related to a broader criticism of money, economics, and free markets, which lies outside the scope of this book.

Mandelbrot provided, within the rational mathematical tradition, an alternative statistical theory which does not predict, but can model market phenomena in ways not possible for traditional statistics. Fractal finance includes seemingly predictive patterns in financial markets, such as wild volatility and bubbles. His contrasting statistical theory shows that empirical research in finance is highly theory-driven, meaning here the regular theory of statistics. In my opinion, Mandelbrot's theory is an interesting mathematical-statistical alternative to modern finance, because it provides a better model for the dynamics of financial markets. Interestingly enough, Mandelbrot's idea roots in economics as well: the economics of Vilfredo Pareto.

Minsky's bubble theory has a different view of markets than modern finance and explains bubbles and their bursting. Kindleberger has a large collection of historical cases which follow Minsky's model. Shiller also advocates the bubble theory of markets. The bubble theory is persuasive and recognizable. The theory does not claim predictability of markets.

Behavioural finance is insightful and explains the behaviour of market participants. The interesting point of behavioural finance is that it has a

coherent way of explaining what investors do wrong in given circumstances. Behavioural finance can also explain why investors persist in using the investment theory, or more generally, keep on believing in the prediction of financial markets by the biases of attribute substitution, the confirmation bias, and overconfidence.

Evolutionary finance seems a promising alternative to the finance theory because the evolutionary approach can explain the instability of financial markets out of the bottom-up outcomes of the interaction of market participants. The evolutionary approach to finance is meant to explain and does not intend to predict – evolutionary biology does not claim to predict either. Evolutionary finance does not exclude other alternative finance theories and relates to elements of the alternative investment theories of behavioural finance, bubble theory, and fractal finance which have been treated in the current chapter of the book.

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4

Investment Theory, Probability Theory, and Uncertainty

4.1 The Logos of Probability

Markowitz's portfolio theory (1952, 1959) claims that it can handle investment decisions with mathematical statistics. As discussed in Chapter 1, Markowitz's theory is not merely of theoretical importance: the theory *constitutes* investment and risk practice in the financial sector and believing in it has caused financial damage. Markowitz argued that statistical knowledge about future investment returns is possible by invoking the *theory of subjective probability*. To repeat, the stochastical predictability used differs from deterministic predictability: ideally, a deterministic prediction results with certainty in a particular outcome; a stochastical prediction yields certainty over a range of possible outcomes with probabilities attached.

Though financial literature has commented extensively on Markowitz's portfolio theory, the epistemological part on probability beliefs in portfolio theory seems to have been ignored, probably because the validity of the subjective probability theory is a basic assumption in mainstream economics. The focus of the current chapter is primarily directed at the *logos*, the rational arguments, of the probability beliefs

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used in the portfolio theory. The probability beliefs used in the Capital Asset Pricing Model (CAPM), the continuation of Markowitz's theory, will be discussed as well. My intention is to explain Markowitz's reasoning and its implications, and to show that the assumption of stochastical predictability in the portfolio theory is flawed. The discussion has been partly presented in Pistorius (2014).

4.2 Probability Beliefs in the Portfolio Theory

We now investigate Markowitz's ideas on the predictability of investment returns. He explored in *Portfolio Selection* (1959) how beliefs on investment returns fit in with the theory of probability. Markowitz founded his theory on mathematical statistics: he assumed that '[. . .] 'beliefs' or projections about securities follow the same probability rules that random variables obey (Markowitz 1999, 5).'

The portfolio theory *applies* decision theory, which uses the probability theory to predict or estimate the probability of future outcomes. He left no doubt that investment returns are uncertain, and that security analysts cannot overcome uncertainty:

> Uncertainty is a salient feature of security investment. Economic forces are not understood well enough for predictions to be beyond doubt or error. Even if the consequences of economic conditions were understood perfectly, non-economic influences can change the course of general prosperity, the level of the market, or the success of a particular security. [. . . .]. We are expecting too much if we require the security analyst to predict with certainty whether a typical security will increase or decrease in value. [. . . .]. The existence of uncertainty does not mean that careful security analyses are valueless. [. . . .] Carefully and expertly formed judgments concerning the potentialities and weaknesses of securities form the best basis upon which to analyze portfolios (Markowitz 1991/1959, 4).

Markowitz said that investment returns are uncertain because of multiple economic and non-economic causes, and that both causes are difficult to predict. As a consequence, a security analyst cannot predict the

future return of a security with certainty. Nevertheless, the judgment of a security analyst contains information on the value of a security and its uncertainties. Markowitz's predecessors, Williams (1938) and Graham et al. (1934), provided the theories on how to calculate the value of a security. The portfolio theory as such has no economic theory about the beliefs applied, and can incorporate any economic theory which brings in probability beliefs.

Markowitz preferred probability beliefs derived from the judgments of security analysts above probability beliefs based on merely historical observations:

> Portfolio selection should be based on reasonable beliefs about future rather than past performances *per se*. Choice based on past performances alone assumes, in effect, that average returns of the past are good estimates of the 'likely' return in the future; and variability of return in the past is a good measure of the uncertainty of return in the future (Markowitz 1991/1959, 14, his italics).

He said that reasonable probability beliefs *include* the past, but that merely past performance seems no good guide for future returns. But on what is his argument based that past returns do not equal future returns? It could be the instability of the probability distribution of returns, which results from the multiple economic and non-economic causes. Obviously, he seemed to believe that the economic theory of valuation, as used by security analysts, offers a solution to *overcome instability*, because the market price of a security will, in the future, return to its equilibrium value. But the judgments of security analysts, derived from the theory of valuation, are not directed at making a probability distribution. So, the judgments needed to be translated into beliefs about the probability distribution of investment returns.

Markowitz explained the nature of a probability belief by a hypothetical example, in which a person wins the same amount of money by choosing between two probability events (1959). The person has to choose between the event that 'it does not rain tomorrow,' and the probability of 80% of winning in a fair 'wheel of fortune.' He will try to discover the probability that 'it does not rain tomorrow': if the

probability is lower than 80%, he will choose the wheel of fortune, otherwise he will choose the event that 'it does not rain tomorrow.' The example illustrates that a probability could be estimated by comparing an uncertain event with a lottery, or more generally with a probability distribution. The outcome of the comparison is, that some probability distribution will be felt as representative for the uncertainty of an event. The lottery metaphor that a probability belief *is* a lottery bet, is the centrepiece of the theory of subjective probabilities.

Markowitz founded his theory on subjective, also called personal, probabilities. Subjective and objective probabilities refer to two distinct theories: 'In an objectivist theory, probability is seen as an attribute of the world. [. . . .]. In the subjectivists' theory, probability is [. . .] an indication of a particular individual's state of knowledge about uncertain events (Langlois 1982, 7).' In the portfolio theory, objective probabilities could only refer to the past, of which Markowitz is, to repeat, no advocate because the past lacks the judgment of security analysts. Neoclassical economics, to which Markowitz' theory belongs, adheres to subjective probability for the purpose of decision theory. Adherents to the subjective probability theory, should not be confused with adherents to methodological subjectivism in economics (Langlois 1982). Adherents to methodological subjectivism, such as economists of the Austrian school, found economics on subjective people, but reject subjective probability theory; the Austrian school does not consider statistics an appropriate tool for most decisions in economics anyway.

The distinction between objective and subjective, personal, probabilities relates to the various approaches within the probability theory. Three ways to estimate probabilities are: 'classical,' 'frequentist,' and 'subjective' (Gilboa 2009). The objective classical approach assumes that all outcomes are equally probable. The 'principle of indifference' explains the classical approach: the indifference stems from the absence of a good argument to give *unequal* probabilities to the outcomes. The classical approach restricts to artificial producers of chance, such as the tossing of a coin. The objective, frequentist approach regards the probability of an event as the relative frequency in past observations: the approach is *the statistics often used in empirical science*. The frequentist approach assumes that the law of large numbers applies: the law of large

numbers relates the mean of a sample to the mean of its population. The subjective, or personal approach, uses the machinery of probability to explicit beliefs, but mixes with the probabilities of the objective, that is classical and frequentist, approaches as well (Savage 1954).

Subjective probabilities are connected to the term 'Bayesian': yet, Bayesian has two meanings. First, in statistical theory Bayesian means that new evidence updates probabilities. The Bayesian method of updating probabilities, or Bayes's rule, competes with the frequentist approach in making inductive inferences on observations. But, because the frequency theory can express Bayes's rule, the rule 'does not serve as the distinguishing mark of subjectivism (Langlois 1982, 7).' The second meaning of Bayesian refers to the theory in neoclassical economics that, to maximize expected utility, subjective probabilities can replace objective ones when objective probabilities are not available (Gilboa et al. 2008).

Leonard J. Savage (1954) invented the paradigm that it is rational to maximize expected utility with subjective probabilities, if objective probabilities are absent. He deducted from a number of axioms of rational behaviour, that decision making under uncertainty maximizes expected utility under subjective probabilities. In short, the axioms of rational behaviour are about completeness and transitivity of preferences between bets, separation of tastes from beliefs, and the *sure thing principle*, in which the dominance of the probability distribution suffices to make a decision (Gilboa et al. 2008). Savage preferred the term 'personal' instead of 'subjective' probability. Here both terms mean the same.

Savage claimed that the use of personal probabilities is consistent with rational behaviour. Thus, even if probability beliefs are uncertain or vague, it is rational to quantify the beliefs to make decisions. It is rational, because all the information the decision maker possesses, is fully expressed in a rational, coherent manner. Economic literature has heavily debated Savage's assumptions of rationality. For example Gilboa (2009) presents an overview of the criticism of Savage's axioms. For Markowitz's portfolio theory, especially the *Ellsberg paradox* seems relevant, because the paradox clarifies a difference between objective and personal probability. The paradox (Ellsberg 1961), also known as

ambiguity aversion, showed that decision makers favour objective to personal probability. To illustrate the paradox, Ellsberg designed two experiments, of which one will be explained here. A decision maker has to choose between two urns: he is told that in one urn 50% of the balls are red, and 50% black. The other urn contains red and black balls as well, but no indication is given about the distribution between the red and black balls. Probably, the decision maker will estimate the personal probabilities for the second urn at 50% probability of red, and 50% of black. Thus, the probabilities of taking a red ball in the first and the second urn are both 50%. But if the decision maker is asked to choose between taking a red ball out of urn one or urn two to win a prize, he will prefer *urn one*. The reason for preferring urn one, is that objective probability feels safer than personal probability. Ellsberg's critique undermines Savage's personal probability theory: if people would maximize expected subjective utility, they would be indifferent to choosing between urn one and urn two.

Besides ambiguity aversion, behavioural finance has other criticisms on Savage's assumption of rational behaviour. To repeat some findings of Chapter 3, Simon (1955) introduced a general critique of the assumption of rational behaviour in economics with the alternative notion of bounded rationality. Bounded rationality limits the knowledge and the calculative ability of the decision maker, with the consequence that a decision maker does not optimize, but satisfices. The school of behavioural finance continued along the path of bounded rationality. Behavioural finance has found that 'Uncertainty is poorly represented in intuition, as well as in perception (Kahneman 2003, 701).' Thus, the mere translation of intuition into personal probability is troublesome as well.

The criticism on the rationality of maximizing expected utility in economics also relates to ethics: the source of ethics in economics is the notion of utility, which belongs to the virtue of prudence (McCloskey 2006). We will in Chapter 5, among other things, contrast the 'prudence-only' rationality of investment theory to the broader virtue approach of McCloskey (1996a, 1996b, 2006). Klamer's approach of values (2003, 2014) will be treated in Chapter 6 and provides another alternative for the rationality as assumed in

neoclassical economics. Klamer's value approach inquires which values are important and relates values to decision making.

4.3 Markowitz's Defence of Personal Probabilities

Markowitz used personal probabilities in the portfolio theory for two reasons: it is rational coherent behaviour, and personal probabilities in investment theory should be able to predict. But rational behaviour and predictability are two separate arguments: rational behaviour does not automatically lead to predictability. Moreover, Savage's approach is about rational decision making, and not necessarily about prediction: '[. . .] that theory [the theory of personal probability] is a code of consistency for the person applying it, not a system of predictions about the world around him (Savage 1954, 59, my insertion).'

Let us now discuss how Markowitz (1959) related the use of personable probabilities to predictability. Out of his discussion on Savage's theory of probability beliefs, he drew, in his own words, 'two morals,' on the predictability of the probability distributions of investment returns, which we will fully quote to support my analysis:

1. The existence of personal probabilities does not necessarily imply that, as of the moment, the individual is positive that his beliefs are 'good beliefs.' He may admit the possibility that he currently is either always overoptimistic or always overpessimistic, or in some other way subject to biased judgment. However, the idea of probability beliefs does imply a belief in an ability to learn with time and experience, to end a long life of predictions and constant education without substantial biases on the whole.
2. The connection between objective and subjective probabilities is quite close. We noted that they mixed on a par with each other in the calculation of expected utility. The discussion of this section indicates another connection. To assert that some physical experiment has a 0.6

> probability of producing a result *A* is to assert that, if this physical experiment is carried out and if a large number of other *physically independent* experiments (of the same or different kinds) all with a probability of 0.6 of producing some particular (though perhaps different) result *A* are also carried out, then the relative frequency of *A* will almost certainly be 0.6. Similarly, to assert that a 0.6 personal probability is associated with an event is to assert the belief that it is virtually certain that the relative frequency of correct predictions among a set including this and a large number of other *psychologically* independent events is 0.6. Thus personal probabilities and subjective probabilities are connected via the notion of relative frequency in the long run (Markowitz 1991/1959, 272–273, his italics).

Concerning Markowitz's first conclusion on subjective probability beliefs: he acknowledged that the exercising of personal probabilities can lead to a possibly biased judgment, but it also implies an ability to learn and become better at estimating. His argumentation suggests that he assumed that the probability distribution of investment returns can be known in principle, which means the probability distributions are not ontological, but merely epistemologically uncertain.

Yet, we have to ask ourselves under which conditions it is possible to learn about probability beliefs. We can learn about the 'real' probability distribution of investment returns *if* the distribution is stable over time, or *if* changes of the properties of the distribution can be predicted. My claim is that the probability distribution of investment returns is *unstable*. The current chapter 4 reviews later on the arguments against stability in economic phenomena such as returns on financial markets, and presents my own thought experiment on the possibility of predictability for investment theory.

Let us illustrate what happens when probability beliefs are updated. The probability distribution of investment returns applied could be manifestly different from reality, if an event such as the credit crisis of 2008 with the accompanying negative results in the financial markets occurred. In the reasoning of Markowitz, the answer to a phenomenon like 2008, is the Bayesian approach of

updating the probability estimates with the new information. But if the probability distribution of investment returns is unstable, updating does not lead to a better level of predictability, because the 'real' distribution of investment returns cannot be learned. It is uncertain how often a crisis such as that of 2008 will happen, and a next crisis could turn out even worse than 2008. If the probability distributions were stable, objective probabilities would become available if the number of observations were sufficiently high: both the frequentist and Bayesian method in statistics can be used to update and learn from new observations, both by being based on a bigger sample. My conclusion is that personal probability beliefs on investment returns can only be correct by coincidence because of instability. So, though personal probabilities sharpen the intuition, they are not able to stochastically predict the future.

Markowitz's second conclusion claimed that personal probabilities are like subjective probabilities by the notion of relative frequency in the long run. Meant here is seemingly that personal probabilities are individual probabilities, and that subjective probabilities are the accumulation of personal probabilities. My view is that he referred to Savage's point that the personalistic view of probability can contain reasonable, objective views like the notion of relative frequency as well:

> I would reply [to the critics] that the personalistic view incorporates all the universally acceptable criteria for reasonableness in judgment known to me and that, when any criteria that may have been overlooked are brought forward, they will be welcomed into the personalistic view (Savage 1954, 67, my insertion).

My view is that Markowitz's second moral, about similarity to the objective frequency approach, is only valid if the probability distribution is, again, stable, or if the changes in the distribution are predictable. Just like his first moral, the second moral is founded on the assumption of stability. So, both his morals to justify the predictability of probability beliefs in investment theory, depend on the assumption of stability, or the ability to predict changes in the stability.

4.4 Investment Theory after Markowitz's Portfolio Theory

After Markowitz discovered how a rational investor would act, the next logical step in price theory is a formulation of the market equilibrium of expected risk and return. As discussed in Chapter 2, Sharpe (1964) built a theory of equilibrium in financial markets, the CAPM. The CAPM is assumed to predict stochastically on the basis of objective probability theory. Objective probability is assumed to work in the CAPM because of informational efficiency. Informational efficiency and rational expectations are the same (Lucas 1978). Sargent (2008) explicitly assumed stability in the pattern of the economic variable to be predicted. Rational expectations for financial markets mean that the possible levels of risk and return on investments are known in advance, which is the same as stochastical predictability of risk and return.

Equilibrium in financial markets is a centrepiece of the CAPM, and an indirect subject of the portfolio theory, since Markowitz referred to the valuation theory as a source for probability beliefs. Valuation is a sort of equilibrium theory: the theory assumes that the price of a security converges to its fundamental value. The portfolio theory and the CAPM act at different levels: the portfolio theory is about the individual investor and CAPM about the market equilibrium, which emerges if all investors act like Markowitz assumed rational investors do. Yet, one can wonder, whether the personal probability approach of Markowitz differs much from the rational expectations approach of the CAPM, because both assume stochastical prediction. If the stability of expected risk and return of investments is a valid assumption, the portfolio theory resembles CAPM in its assumptions on statistics: Markowitz's rational investor learns about the real probability distribution over time, and, CAPM's rational investor can be wrong and learns over time as well, though the market as a whole is correct.

4.5 Evaluation of the Probability Theory within Investment Theory

To select investment portfolios in practice, the portfolio theory needed *reasonable* future expected returns and standard deviations (Markowitz 1952). Reasonable expected returns and standard deviations are to be interpreted here as *more or less predictive*. Markowitz left no doubt that he believed in the predictability of investment returns in the long run: to repeat, he concluded about personal probabilities that they are meant to learn from and then end in '[. . .] without substantial biases on the whole (1959, 272–273).'

Markowitz's theory is grounded on Savage's personal probability theory. Savage claimed that rational, coherent behaviour under uncertainty is accompanied by personal probabilities. Whether the probability beliefs are reliable is not relevant for Savage's theory: the use of probability beliefs is rational and coherent. So, even if the probability beliefs about the investment returns according to Markowitz are unreliable, in other words, if investment returns are stochastically unpredictable, it still makes sense to use mathematical statistics in the investment theory because it is rational and coherent behaviour under uncertainty. Of course, one has to agree with the definition of rationality applied by Savage to support his ideas. As mentioned, the economic literature has heavily debated Savage's assumptions of rationality. In Chapters 5 and 6 the scope of rationality in neoclassical economics, which reduces ethics to utility, will be examined in depth.

What does using personal probabilities mean for decision making in investing? Let us start with answering the question by investigating the meaning of the expected return of an investment. With personal probabilities, one cannot claim as certain that the probability of obtaining an expected return of stocks of, say, 6%, will be met at least in 50% of the cases: but the claim would be true by definition, if the expected 6% was the true expected return. An investor could choose a more cautious estimate to compensate for the uncertainty. But even so, the correction would be too small: one seldom encounters expected stock returns below

those of risk-free bonds. The estimation of risk cannot be sure either, though one could prefer a more cautious estimate of that as well. But how can one judge what is the right amount of caution (think about the credit crisis of 2008)? The point of the examples is that the gap between the personal and the true probabilities cannot be bridged. Using personal probability beliefs in practicing investment theory gives us no clue to the probability as such that the probability beliefs for the investment decisions are correct.

Moreover, using personal probabilities following the investment theory leads to the same decisions as using true probabilities: so, personal 'become' true outcomes, which is dangerous, because decision making on the basis of personal probabilities should not be based merely on statistics: under the condition of Knightian uncertainty, statistics should merely be used to explicit the intuition on probability beliefs to help making judgments.

Let us now turn to the theory of objective probabilities, which founds the CAPM). Davidson (1982/1983, 1991, 2009) has extensively reflected on current mainstream economics in the light of Keynes's ideas on uncertainty in economics. Current mainstream economics, following Samuelson and Lucas, believes that economics must be based on stochastical predictability:

> Acceptance of the presumption of an ergodic economic environment is often rationalized by the necessity of developing economics as an empirically based science (Lucas and Sargent 1981, xi–xii). Indeed, Samuelson (1969, 184) has made the acceptance of the 'ergodic hypothesis' the sine qua non of the scientific method in economics (Davidson 1991, 132–133).

The ergodic hypothesis as used in the rational expectation hypothesis assumes that objective probability information is available from past data. The assumption is needed to make economics a predictive science, and accommodates a stochastical framework as well. Yet, Davidson's point is that past data cannot predict the future stochastically because unexpected changes occur.

In Knight's (1921) terms, stochastical predictability is a situation of 'risk.' But if probability distributions in investing are unstable, portfolio

theory and the CAPM ignore Knight's situation of 'uncertainty,' in which probabilities are unknown. Statistics under Knightian uncertainty become 'merely' an argument, not a stochastical prediction. Yet, defenders of the received view express the general atmosphere which ignores Knightian uncertainty as:

> While the distinction between risk and uncertainty so defined is often encountered in the literature, its role until recently has been reduced to the ceremonial: economists, especially those working in the neoclassical tradition, invoke the distinction only in order to rule out uncertainty. [. . . .]. There are good reasons for doing so. In the modern theory of choice, subjective probabilities are derived from agents' orderings over lotteries. Hence (simplifying) it follows that to deny the existence of subjective probabilities is to deny that agents are able to choose consistently among lotteries. Most economists are unwilling to do without the assumption of consistent choice (LeRoy and Singell 1987, 395).

The discourse of modern investment theory as part of mainstream economics simply does not 'allow' talking and thinking in Knightian terms of risk and uncertainty, as risk means the same as uncertainty.

Explicating subjective probability beliefs seems useful. Though the beliefs are not predictive, they still could be of importance for theoretical or historical analysis: they can *imagine* the future as a probabilistic restatement of intuitive beliefs, or of alternative scenario's, or *analyse* the past, with historical observations as input. But to be rejected is that investment returns are stochastically predictable, and therefore the role of the portfolio theory cannot be prediction. It follows that if one does not believe in the 'weaker' form of the predictability of subjective probability, the stronger assumption of predictability as assumed in the CAPM cannot be persuasive either.

We cannot prove by empirical induction with statistics that predictability is impossible: the proof of unpredictability lies outside the paradigm of statistics, because statistics assumes that the substrate that produces probability outcomes, is stable. The inference to the best explanation that investment returns are unpredictable, seems more persuasive than the arguments of investment theory that personal or

objective probability beliefs predict. Savage's second pillar of rationality seems a better argument for using Markowitz's theory. But rationality in economics has been critically evaluated as well, and cannot 'repair' unpredictability.

4.6 Risk against Uncertainty

Current investment theory advocates the use of the probability theory, though other currents within economics and finance oppose such a use and prefer the assumption of Knightian uncertainty instead of calculable risk. The literature review about uncertainty in economics and investment theory in the current paragraphs, treats the accounts of statistics and uncertainty, the arguments against predictability, and both its meanings for investment theory. At the end of the chapter a thought experiment on predictability in investment theory will be treated. The review selects those ideas from the history of uncertainty in economics which are relevant for investing. The ideas about uncertainty in economics apply to investment theory as well because it has become a part of economics since the 1960s. The review does not intend to present a full history of uncertainty in economics, for that is referred to Wubben (1993). From the history of economics the ideas of Knight, Keynes, and Von Mises seem the most relevant here. The three economists appear to be the most important writers on uncertainty for investment theory: besides being original thinkers, they involve statistics in their analysis. Of course, other economists thought about uncertainty in economics too. For example, Hayek (1948) highlighted the dispersion of knowledge as a cause of unpredictability: yet, to my knowledge, Hayek, though introducing a theory on economic uncertainty, did not specifically criticize the traditional philosophy of probability. Israel Kirzner (1985), another Austrian economist, highlighted the role of the entrepreneur, whose alertness discovers opportunities in the market. Kirzner, however, did not seem to have reflected on the philosophy of probability either. Shackle (1955) did write extensively on probability and economics, but does not seem to contribute to my purpose of clarifying the nature

of stochastical predictability in investment theory after having treated the ideas of Knight, Keynes, and Von Mises.

From contemporary literature on the topic of uncertainty, Deirdre McCloskey and Nassim Taleb are original thinkers on statistics and investing. We will discuss their ideas later on in the chapter.

Knight

Knight (1921) was probably the first to treat uncertainty in economics in full. He distinguished uncertainty from risk. Risk means that probability distributions are known, and uncertainty that probability distributions are unknown, because a group of instances, representative cases, is lacking to make a probability distribution:

> The practical difference between the two categories, risk and uncertainty, is that in the former the distribution of the outcome in a group of instances is known (either through calculation a priori or from statistics of past experience), while in the case of uncertainty this is not true, the reason being in general that it is impossible to form a group of instances, because the situation dealt with is in high degree unique (Knight 2009/1921, 121).

He classifies three types of probabilities, of which 'a priori probability' and 'statistical probability' belong to risk, and the third one 'estimates' belongs to uncertainty:

1. **A priori probability**. Absolutely homogeneous classification of instances completely identical except for really indeterminate factors. This judgment of probability is on the same logical plane as the propositions of mathematics [. . .].
2. **Statistical probability**. Empirical evaluation of the frequency of association between predicates, not analysable into varying combinations of equally probable alternatives. It must be emphasized that any high degree of confidence that the proportions found in the past will hold in the future is still based on an a priori judgment of indeterminateness.

> [. . . .]. The main distinguishing characteristic of this type is that it rests on an empirical classification of instances.
> 3. **Estimates**. The distinction here is that there is no valid basis of any kind for classifying instances (Knight 2009/1921, 115–116, my emphasis).

Artefacts, like games of chance, produce a priori probability. A priori probability allows mathematical calculation because cases are perfectly homogeneous. The second type of 'statistical probability' cannot achieve the perfection of a priori probability:

> The practical difference between a priori and statistical probability seems to depend upon the accuracy of classification of the instances grouped together. In the case of the die, the successive throws are held to be 'alike' in a degree and a sense which cannot be predicated of the different buildings exposed to fire hazard (Knight 2009/1921, 112).

A priori probability and statistical probability share the law of indifference. The law of indifference implies that the outcome of an individual case is unpredictable, because the specific causes which decide the outcome of an individual case are unknown. Suppose that the outcomes of a group of particular cases within a larger group differ from the ones of the larger group, then a narrower group of instances could achieve statistical probability once again: therefore, an insurance company may differentiate the insurance premium for groups of customers, depending for example on age or residence. To predict a priori probability and statistical probability, we assume that the probability distribution remains the same for some future period. Knight called the third type 'estimates' uncertain because the probabilities are unknown. Estimates lack past cases to represent the future because the case at hand is unique: the lack of a '[. . .] valid basis of any kind for classifying instances (Knight 2009/1921, 116)' separates estimates from a priori and statistical probability. For Knight, economics was in general about uncertainty, and thus about estimates.

Keynes

Keynes expressed his account of probability in *A Treatise on Probability* (1921). He was the first to treat the idea of *logical probability* in a structured way (Hacking 2001). A theory of logical probability aims to discover the probability, the degree, to which an inconclusive argument is true. In the theory, the probability that an argument is true depends on the knowledge available. Keynes's theory of logical probability belongs to the logic of inductive inference, and assumes objective probability (Cottrell 1993). Logical probability is nowadays less in vogue than subjective or objective probability.

How does Keynes's early probability theory relate to his later account of uncertainty in economics as displayed in *The General Theory of Employment, Interest, and Money* (1936)? Efforts to connect Keynes's probability theory to his later account of uncertainty have led to various interpretations (Dequech 2000). His probability theory and his economics seem to be independent: Keynes (1936, 1937) hardly refers to his theory of logical probability in his account about radical uncertainty in economics (Cottrell 1993). An explanation for the apparent discontinuity between *The Treatise on Probability* (1921) and *The General Theory* (1936) could be merely a matter of accent: *The Treatise* is about induction from assumed true premises, while *The General Theory* investigates the content of the premises as such (Cardim de Carvalho 1988). For the current discussion here his theory of logical probability seems less relevant, because it assumes true premises.

In the current section we will use Skidelsky's account (2009a) of Keynes's breakdown of types of probability in *A Treatise on Probability*. Keynes distinguished cardinal and ordinal probability, and irreducible uncertainty. A cardinal probability is a measurable probability such as used in insurance. In economic practice, cardinal probability is rare. Ordinal probability ranks probabilities of events in a qualitative sense, and occurs often. Ordinal probability lies in between the certainty of cardinal probability and irreducible uncertainty. Irreducible uncertainty neither compares nor quantifies: its

probability is unknown. In *The General Theory* Keynes left out ordinal probability to contrast irreducible uncertainty to cardinal probability as proposed by mainstream economics. Keynes's account of irreducible uncertainty is comparable to Knightian uncertainty:

> By 'uncertain' knowledge, let me explain, I do not mean merely to distinguish what is known for certain from what is only probable. The game of roulette is not subject, in this sense, to uncertainty [. . .]. [. . .]. The sense in which I am using the term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealth-owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know (Keynes 1978/1937, 113–114).

Von Mises

Like Knight and Keynes, Von Mises distinguished between known and unknown probabilities:

> There are two entirely different instances of probability; we may call them class probability (or frequency probability) and case probability (or the specific understanding of the sciences of human action) (Von Mises 2012/1949, 107).

Von Mises related class probability to a closed group such as a lottery or a table of mortality, in his words:

> [. . .] We know or assume to know, with regard to the problem concerned, everything about the behaviour of a whole class of events or phenomena; but about the actual singular events or phenomena we know nothing but that they are elements of this class (Von Mises 2012/1949, 107).

Class probability resembles Knight's situation of risk and Keynes's cardinal probability. In class probability a pool diminishes risk to the certainty of some cost. Von Mises stressed that the pooling of the class is essential, though not the calculus of probability:

> Insurance, whether conducted according to business principles or according to the principle of mutuality, requires the insurance of a whole class or what can reasonably be considered as such. Its basic idea is pooling and distribution of risks, not the calculus of probability. [. . .]. The calculus of probability is mere by-play.
>
> This is clearly evidenced by the fact that the elimination of hazardous risk by pooling can also be effected without any recourse to actuarial methods (Von Mises 2012/1949, 109).

Von Mises coined uncertainty as 'case probability.' Case probability applies to economic phenomena. Non-economic examples of case probability are elections, sport games, and medical advice. Von Mises related uncertainty to multi-causality: 'Case probability means: we know, with regard to a particular event, some of the factors which determine its outcome; but there are other determining factors about which we know nothing (Von Mises 2012/1949, 110).'

Knight, Keynes, and Von Mises shared a common denominator about uncertainty in economics: risk, cardinal probability, or class probability merely deal with a small group of economic phenomena, and, uncertainty and case probability reign over economic phenomena.

4.7 Arguments for Uncertainty in Economics

Knight

What were Knight's arguments for his idea that economic phenomena belong to uncertainty instead of risk? Let us start with the metaphor that he proposed for economics in order to include the dynamics of

economic phenomena. He perceived economic phenomena as organic rather than mechanical:

> Perhaps the most straightforward way to approach Knight's philosophy is to recall the distinction he constantly makes between the mechanical and the organic (biological) frameworks. Mechanistic thinking views human behaviour and institutions as static, machine-like entities, whereas organicistic thinking invokes notions such as change and process. [. . . .]. Knight's distinction between risk and uncertainty contrasts the mechanical and organic domains (Langlois and Cosgel 1993, 458).

Only if economics were to take uncertainty as its premise, it would acknowledge Knight's organic metaphor. The organic metaphor brings change to the fore. Economic change is the major theme of Joseph Alois Schumpeter: '[. . .] he [Schumpeter] strongly felt that capitalism was unique in history because of its ceaseless and self-generated changefulness (Heilbroner 1997/1996, 299, my insertion).' Schumpeter stressed the role of the entrepreneur, who changes the economy because he innovates. After Schumpeter (1911) introduced the theme of change, Knight (1921) followed up and elaborated on uncertainty (Wubben 1993).

Knight's second argument illuminated the organic metaphor by investigating the assumptions of perfect competition in classical economics. His account of classical economics came close to Alfred Marshall's *Principles of Economics* (1890); Knight's assumptions on knowledge of the future in particular, and its consequences, resembled Marshall's (Knight 1921). Perfect competition assumes omniscience, perfect information, which guides the competitors to a profitless equilibrium. But in practice, the assumption of perfect information did not appear to hold, because companies make profits:

> The primary attribute of competition, universally recognized and evident at a glance, is the 'tendency' to eliminate profit or loss, and bring the value of economic goods to equality with their cost. [. . . .]. But in actual society, cost and value only 'tend' to equality; it is only by an occasional accident that they are precisely equal in fact; they are usually separated by a margin of 'profit', positive or negative (Knight 2009/1921, 8).

Knight claimed that companies make profits (and losses) *because of* uncertainty. Though change creates uncertainty, change would not cause a problem for the theory of perfect competition if it could be predicted: 'Hence it is our imperfect knowledge of the future, a consequence of change, not change as such, which is crucial for the understanding of our problem (Knight 2009/1921, 101).' In short, omniscience is a sufficient condition for the absence of profit, yet profit occurs in practice, therefore Knight could refute the assumption of omniscience.

Knight's argument that uncertainty leads to profits, relates directly to the investment theory. My view is that omniscience would turn stocks into risk-free bonds. A stock can, like a bond, be valued as the sum of its discounted future cash flow. The cash flow to the owner of a stock consists of the dividends, the parts of the profit that return to the stockholder. Yet, perfect competition eliminates profit. Without profit, a dividend merely equals a return at the risk-free interest rate. A dividend under omniscience bears no risk, because in a world of perfect information pooling insures risk. Thus, in classical economics, stocks should behave like perpetual risk-free bonds, and deliver the risk-free rate of return. Analogously, perfect monopolies and oligopolies would imply predictable profits, which would be priced as risk-free bonds as well because of risk-free arbitrage. In practice, listed companies make profits because of uncertainty; otherwise stocks would become risk-free bonds. To summarize: transposing Knight's thought experiment on classical deterministic price theory to stochastical investment theory leads to absurdity: omniscience and the phenomenon of stocks exclude each other: profits and stocks exist *because of* uncertainty.

Keynes

Knight and Keynes differed in their starting point in arguing against predictability in economics: Knight began with the assumption of uncertainty and showed that profits cannot be made without uncertainty, while Keynes invented an alternative economic theory which involves uncertainty. Moreover, Keynes invented as well a theory on investing. Uncertainty implied for Keynes a different understanding of

economics and human behaviour. He criticized classical economics, in which uncertainty reduces to risk, and ethics to utility calculations:

> The calculus of probability, though mention of it was kept in the background, was supposed to be capable of reducing uncertainty to the same calculable status as that of certainty itself; just as in the Benthamite calculus of pains and pleasures or of advantage and disadvantage, by which the Benthamite philosophy assumed men to be influenced in their general ethical behaviour. [. . . .]. Thus the fact that our knowledge of the future is fluctuating, vague and uncertain, renders wealth a peculiarly unsuitable subject for the methods of the classical economic theory (Keynes 1978/1937, 112–113).

While Post Keynesians stress that Keynes (1937) upgraded uncertainty to the core of his economics, New Keynesians incorporated Keynes's economics into the mainstream, and left uncertainty out (Skidelsky 2009a). We will opt here for the Post Keynesian interpretation of Keynes, because they try to stay close to his ideas on uncertainty. For Keynes, uncertainty implied that the government should interfere in the market, because markets are instable and not always self-correcting. Instability and a lack of self-correction imply that a deep recession is not exceptional, but a feature of the market (Skidelsky 2009a). One cause for instability is that negative economic conditions undermine animal spirits, naïve optimism, which underpin a downturn. Whereas Knight stressed that classical economics excludes profit, Keynes claimed that classical economics excluded the influence of money, interest rates and financial markets. Please see Chapter 2 for a discussion of Keynes's ideas on his theory of financial markets under uncertainty, which combines the psychology, reasoning, and consequences of human interaction.

Von Mises

Uncertainty usually has a negative connotation in economics (Wubben 1993). But the Austrian school has taken a positive stance towards uncertainty, and made it central to its theory. As a

consequence, the school has denied the aspiration of prediction in the social sciences. In his opus magnum *Human Action* (1949), Von Mises opposed mechanical causality and, instead, proposed *teleological* causality, because mechanical causality cannot explain human, intent, behaviour: only teleological causality can. Furthermore, it is not merely one person who acts intently: many people interact with each other. Therefore, *human action* is a sufficient condition for uncertainty in economics: 'The uncertainty of the future is already implied in the very notion of action. That man acts and that the future is uncertain are by no means two independent matters. They are only two different modes of establishing one thing (Von Mises 2012/1949, 105).'

Another argument for uncertainty in economics is that no reasonable person would ask the same sort of certainty from the natural sciences:

> Natural science does not render the future predictable. It makes it possible to foretell the results to be obtained by definite actions. But it leaves unpredictable two spheres: that of insufficiently known natural phenomena and that of human acts of choice. Our ignorance with regard to these two spheres taints all human actions with uncertainty (Von Mises 2012/1949, 105).

Von Mises's second argument is compelling because it reduces the scope of what is predictable: though natural sciences can predict specific parts of the world ceteris paribus, it cannot predict how the world will look in the future. So why expect economics to predict the future economy, knowing that intent human choosing is teleological and interactive?

McCloskey

McCloskey (1990) is a contemporary critic of predictability in economics. She regarded economic forecasting as a narrative of the claim to economic expertise. The narrative originates out of society's expectation that economists can perform the magical task of forecasting. But such easy and profitable forms of predicting do not exist, just as there is no 20 euro bill on the pavement outside your house: easy opportunities of that kind would

just be seized, and therefore do not exist (McCloskey 1994). She puts the forecasting ability of economists to the test by asking the American question: 'If You're So Smart Why Ain't You Rich? (1990).' The answer to the question is one of common sense: economists earn a living by 'selling' their predictions. To earn a living by actually trying to make a profit from putting the predictions to the test in the markets is difficult. Forecasters would otherwise be rich by exploiting their forecasts. Her criticism of predictability is aimed at one-dimensional predictions such as the expected return of an investment or the expected level of an economic indicator, but is applicable to stochastical predictability as well.

Taleb

Taleb (2007) is a popular contemporary opponent of predictability in financial markets. He rejected the statistical fundaments of the CAPM, in which investment returns are supposedly stationary and normally distributed. He claimed that investment returns have 'extreme' instead of normal distributions, which leads to radical uncertainty. He advocated Mandelbrot's fractal theory of uncertainty. Unlike the normal distribution, a fractal distribution allows for exceptional events with a low probability. Taleb's key point is that black swans determine the risk of investment portfolios by the changes they provoke. A black swan for Taleb is an event which is: rare, very influential, and unpredictable. A black swan is Popper's exemplar of the fallibility of induction: only one black swan had to be found to falsify the statement that 'all swans are white.' The black swan has become a popular expression in talking about the unexpected. Yet, Davidson (2010) argued that a black swan is merely a variation on Knightian uncertainty, in which past instances lack to predict the future.

4.8 Coping with Uncertainty

In the book we use Knight's distinction between risk and uncertainty, on which Keynes and Von Mises have comparable accounts. To prevent possible misunderstanding, we will further clarify the

meaning of Knightian risk and uncertainty. Uncertainty is the opposite of certainty *and* risk. Both certainty and risk are species of determinism; certainty determines causally, and risk determines stochastically. The arguments against predictability persuade that Knightian risk is a by-product of certainty, and not relevant for most of economics including investment theory. Though risk does not apply to economics and investment theory, *irreducible* uncertainty doesn't either. Under irreducible uncertainty, predictability of economic phenomena would be impossible. Irreducible uncertainty would as well deny predictability on more general, non-profitable levels. But few probably would argue against the rationale of the general tendencies of price theory, or against those of diversification and a certain level of informational efficiency in investment theory.

Because uncertainty is ambiguous, Knight, Keynes, and Von Mises unsurprisingly stress different topics in their treatment of how to cope with uncertainty. In contemporary literature, McCloskey and Taleb emphasized on their part new topics, and reflect on the scientific practice which has arisen after, and despite of, the seminal contributions of Knight, Keynes, and Von Mises.

Knight

Knight called an opinion on uncertainty 'judgment' or 'intuition.' He typified the epistemological state of uncertainty, which 'lies' in between risk and irreducible uncertainty, as 'partial knowledge': 'The essence of the situation is action according to opinion, of greater or less foundation and value, neither entire ignorance nor complete and perfect information, but partial knowledge (Knight 2009/1921, 102).' Partial knowledge is what lies under an estimate and includes that the estimate could be wrong. How wrong an estimate is, is uncertain, or at the most, roughly assessable: 'We know that estimates or judgments are 'liable' to err. Sometimes a rough determination of the magnitude of this 'liability' is possible, but more generally it is not (Knight 2009/1921, 116).'

An estimate or judgment does not imply that a probability distribution is actually being made. In fact, the ability to form a judgment based on intuition is what counts in business. In practical situations an estimate seems to be reduced to the expected mean of the probability distribution or a qualitative prediction, accompanied by some confidence level, that is the probability of being right:

> Yet it is true, and the fact can hardly be overemphasized, that a judgment of probability is actually made in such cases. [. . . .]. The 'degree' of certainty or of confidence felt in the conclusion after it is reached cannot be ignored, for it is of the greatest practical significance. The action which follows upon an opinion depends as much upon the amount of confidence in that opinion as it does upon the favorableness of the opinion itself (Knight 2009/1921, 117).

Knight observed that in the phase after the decision, the estimate 'becomes' certain because earlier doubts are being ignored:

> To be sure, after the decision is made he will be likely to sum all up in a certain degree of confidence that a certain outcome will be realized, and in practice may go farther and assume that the outcome itself is a certainty (Knight 2009/1921, 117).

For Knight, risk equalled the measurable, and uncertainty the non-measurable. He distinguished between objective and subjective probabilities along the same lines:

> We can also employ the terms 'objective' and 'subjective' probability to designate the risk and uncertainty respectively, as these expressions are already in general use with a signification akin to that proposed (Knight 2009/1921, 121).

He explained the assumptions and consequences of subjective probabilities at length, though he did not seem to oppose the use of subjective probability as such. Unlike Knight, Keynes and Von Mises did oppose subjective probability explicitly.

Knight related uncertainty, imperfection of knowledge, to economic phenomena and the appropriate behaviour towards them:

> The task [. . .] is to inquire more fully into the meaning of this assumption [of practical omniscience].[. . . .]. On the basis of the insight thus gained, it will be possible to illuminate that large group of economic phenomena which are connected with the imperfection of knowledge (Knight 2009/1921, 101).

If the knowledge available is perfect, economic behaviour consolidates cases. But how to decide upon a single case? Indeed, conduct for an individual instance is the same for risk and uncertainty: '[. . .] when an individual instance only is at issue, there is no difference for conduct between a measurable risk and an unmeasurable uncertainty (Knight 2009/1921, 121).' Knight added, however, that in the case of risk, insurance overcomes the 'uncertainty' of a onetime trial. Insurance results in the same risk and cost as a pool does. So, economic behaviour towards risk, pools internally or externally by insurance. Pooling also handles uncertainty, and results generally in a lower, though not measurable, uncertainty: 'And even the third type, true uncertainties, shows some tendency toward regularity when grouped on the basis of nearly any similarity or common element (Knight 2009/1921, 124).'

Knight characterized probability estimates on uncertain phenomena as rendering 'the greatest logical difficulties of all (Knight 2009/1921, 116).' My view is that Knight meant that uncertainty is more difficult to understand intellectually than risk. The law of indifference explains risk, because specific causes are not determinable. His account of uncertainty seems to imply that causes could be determinable, but that representative cases are lacking. Thus, uncertainty can be handled by a probability distribution, by a statistical relation to some cause(s), or by a judgment. Mathematical statistics apply both to probability distributions and regressive statistical relations. Of course, representative cases and regressive predictive relations can only work *if* they are stationary for some future period.

Keynes

As Markowitz (1959) noted in his seminal work on portfolio theory, Keynes opposed subjective probabilities. Keynes did not believe that the availability of past data solved the problem of subjective probabilities. His approach of logical probability excluded subjective probability: 'It [logical probability] is not, that is to say, subject to human caprice. A proposition is not probable because we think it so (2008/1921, 4, my insertion).' Logical probability relates probability to evidence, not to psychological reasons.

Keynes (1936, 1937) investigated at length the psychological side of subjective probability in the form of expectations, and explained that the present situation dominates expectations if no information about the future is available. He derived how decision makers use the assumptions of stability and correct valuation from the convention that future circumstances resemble the present ones, and that the current price correctly reflects the knowledge of the market:

> In practice we have tacitly agreed, as a rule, to fall back on what is, in truth, a *convention*. The essence of this convention – though it does not, of course, work out quite so simply – lies in assuming that the existing state of affairs will continue indefinitely, except in so far as we have specific reasons to expect a change. [. . . .].
>
> We are assuming, in effect, that the existing market valuation, however arrived at, is uniquely *correct* in relation to our existing knowledge of the facts which will influence the yield of the investment, and that it will only change in proportion to changes in this knowledge; though, philosophically speaking, it cannot be uniquely correct, since our existing knowledge does not provide a sufficient basis for a calculated mathematical expectation (Keynes 1997/1936, 152).

Like Knight, Keynes related subjective probability to confidence in a forecast:

> It [the state of long-term expectation] also depends on the *confidence* with which we make this forecast – on how highly we rate the likelihood of our best forecast turning out quite wrong (Keynes 1997/1936, 148, his italics, my insertion).

Keynes (1936) had a number of suggestions on how to decide under Knightian partial knowledge, or degrees of knowledge in Keynes's (1921) terms. He was sober about applying probability to economic phenomena. But what did his account of subjective probabilities mean for his economics? His view was that economics is a moral science, which deals with introspection, values, motives, expectations, and psychological uncertainties. For Keynes, it was rational in economics to form expectations, and to make decisions by using conventions, stories, rules of thumb, habits, and traditions.

Another way of tackling uncertainty is to find causal evidence in past data to make the uncertainty partly predictable. Yet, Keynes was a known critic of econometrics, as for example witnessed by his discussion with Jan Tinbergen (Keynes 1939). For the reason of scope, we will merely summarize his critique on econometrics with the account of Skidelsky (2009a). His critique was that econometrics wrongfully uses the stability assumption and that its 'free format' modelling expects too much from the data. According to Keynes, one should not use statistics as a default choice: statistics in regressions only make sense for simple and less abstract relations.

Von Mises

Like Keynes, Von Mises opposed the use of the probability calculus for subjective probability. In attacking the culprit of the theory of subjective probability, he refuted the metaphor that case probability, Knightian uncertainty, is a lottery. The metaphor is flawed, because a *tertium comparationis*, a common element between case probability and a lottery, lacks:

> It is usual to search for the underlying *tertium comparationis* [at analysing metaphors]. But even this is not permissible with regard to the metaphor [of case probability] we are dealing with. For the comparison is based on a conception which is in itself faulty in the very frame of the calculus of probability, namely the gambler's fallacy (Von Mises 2012/1949, 114-115, his italics, my insertions).

Von Mises referred to the gambler's fallacy to mark the faulty reasoning. The gambler's fallacy means in short that a decision maker expects a

representation of the probabilities in the short run, assuming that the probability outcome depends on the recent past. For example, a roulette player might expect that the next run will be red, because the last ten runs were black. The *tertium comparationis*, the common element between case probability and a lottery is missing, because it is based on a fallacy: the estimate of Roosevelt winning the elections and winning in a lottery are both one time trials, which cannot be 'corrected' by a large number of series of the same event later on.

Von Mises (1949) stressed that the mere mathematics of probability is a minor issue compared to that of induction for a particular case. Case probability for events in the natural sciences such as medicine, does not predict, because frequency does not predict for unique cases:

> All such predictions about external events [a doctor's chances for full recovery], i.e., events in the field of the natural sciences, are of this character. They are in fact not forecasts about the issue of the case in question, but statements about the frequency of the various possible outcomes. They are based either on statistical information or simply on the rough estimate of the frequency derived from nonstatistical experience (Von Mises 2012/1949, 110, my insertion).

To put it differently, to Von Mises statistics was merely about history, and not about predicting:

> Statistics provides numerical information about historical facts, that is, about events that happened at a definite period of time to definite people in a definite area. It deals with the past and not with the future. Like any other past experience, it can occasionally render important services in planning for the future, but it does not say anything that is directly valid for the future. There is no such thing as statistical laws. (Von Mises 1962, 56).

Moreover, multi-causal phenomena imply many interpretations, and can only be interpreted by some theory. The only method for tackling multi-causal phenomena is that of understanding, *Verstehen*, interpreting, which resembles Knight's partial knowledge

and the accompanying judgment, or Keynes's set of answers from rule of thumb to moral evaluations:

> The fundamental deficiency implied in every quantitative approach to economic problems consists in the neglect of the fact that there are no constant relations between what are called economic dimensions. [. . . .]. Understanding, by trying to grasp what is going on in the minds of the men concerned, can approach the problem of forecasting future conditions. (Von Mises 2012/1949, 118).

Understanding, or *Verstehen,* is to be understood as the counterpart of explaining, *Erklären*, as used in reaction to Comte's positivism. Understanding is about judgment, intentional behaviour, and values (Von Mises 1962).

Both class and case probability have incompleteness of knowledge in common: both cannot predict in a causal, deterministic way, though the outcome of class probability is predictable as a whole. The multi-causality in class probability can be reduced to calculable risk and bought off with a premium. But multi-causality in case probability cannot follow the same procedure and has necessarily to be interpreted.

McCloskey

Concerning inductive inference under uncertainty, McCloskey criticizes, together with Stephen Ziliak (2008), the test of statistical significance in economics and science in general. Ziliak and McCloskey (2008) did not specifically aim their criticism at (empirical) investment theory. Statistical significance tests whether a sample is big enough to confirm a hypothesis, given some likelihood. The likelihood is normally a probability equal or less than 2.5% that a hypothesis is not accepted by mere chance. Yet, statistical significance as an instrument of induction is inappropriate:

> Fit is not the same thing as importance. Statistical significance is not the same thing as scientific finding. R^2, *t*-statistics, *p*-value, *F*-test, and all the

> more sophisticated versions of them in time series and the most advanced statistics are misleading at best (Ziliak and McCloskey 2008, xv).

Ziliak and McCloskey argue against the use of statistical significance, because economics should be about *economic* significance. Statistical significance does not persuade that a hypothesis is correct or meaningful for most economic research. Relevant is that inductions reflect meaningful relations and show the size of the influence under investigation.

Taleb

The function of investment models cannot be that they predict: they are merely a description of the presupposed features of the risk and return of some investment portfolio (Taleb 2007). Concerning statistics, the regular concepts of standard deviation, correlation, and regression, make no sense because the supposed normal probability distribution is invalid. A particular point is his *statistics regress argument*: to establish the type of probability distribution on past data, one has to assume that the probability distribution is of a certain type, which leads to the circularity of data and the type of distribution. My view is that Taleb is obviously against subjective probability. He proposes that the central idea of uncertainty is to focus on the consequences of possible outcomes, but not on the unknown probabilities. Because probability does not work, Taleb's investment approach is to combine very conservative investments with very aggressive ones.

4.9 Implications of Uncertainty for Investment Theory

Because of the lengthy discussion on uncertainty and the probability theory in the preceding paragraphs, we will first summarize the various arguments for uncertainty, and alternative theories under uncertainty: Knight argued that the phenomenon of profit excludes a situation of known risk, and that the organic metaphor of change is more appropriate for economics. Keynes related financial markets explicitly to

uncertainty, and invented an investment theory upon rational expectations under uncertainty. Furthermore, he introduced the role of animal spirits in economic phenomena. Von Mises's argument for uncertainty was first that intent human action features teleological causality, which cannot be predicted, and second that natural sciences do not predict the world as a whole either, so why claim predictability for economics? McCloskey refutes uncertainty using the absence of profitable predictability: if forecasting is easy, economists would get rich by exploiting their knowledge. Taleb's argument for uncertainty is that black swans determine risk and returns of investments; but one cannot predict black swans. Many other arguments could, of course, be brought forward to the case of uncertainty, but the ones presented here suffice to make the case that uncertainty is relevant in investing.

Economic and investing phenomena float in between risk and irreducible uncertainty, and are called 'uncertain.' In Fig. 4.1 Knight's spectrum of risk and uncertainty is elaborated. By definition, the *level of uncertainty* cannot be certain, otherwise it would become calculable risk. Certainty and uncertainty express themselves both in numbers and qualitative judgments. Certainty in the form of Knightian risk is numerical, and a deterministic prediction can be a number or a qualitative judgment. Uncertainty can be numerical or judgmental as well. An uncertain judgment has some implicit or explicit likelihood attached.

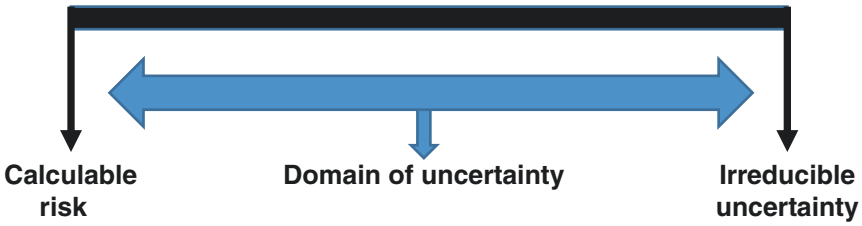

Fig. 4.1 Knight's spectrum of risk and uncertainty (based on Knight 1921)

One cannot tell which method of induction is superior: statistics is about an expectation and its dispersion, an opinion or judgment is about a direction with or without a dispersion. For example, an investment manager can decide on investing based on statistics, or by judging that, say, the economy will do better than expected, which, if correct, could lead to a high return of the stock market. Von Mises, Keynes, and Taleb rejected a subjective probability interpretation: statistics is merely a description of the past. Knight did not reject subjective probability, seemingly because it is common practice. My position is not against the use of subjective probabilities because it is a way of presenting one's expectations. Yet subjective probabilities are an interpretation, not a truth, and are not superior to a qualitative judgement.

Keynes's theory of uncertain expectations contrasts with the contemporary investment theory of the CAPM. His account of financial markets was distinct from other markets, because financial markets possess instant reflexivity. Markets for goods and services take much longer to react to expectations. His alternative investment theory implies that rational expectations do not lead to predictability, but to instability. The CAPM connects rational expectations to efficient markets, market equilibrium, and predictability. Yet, under the condition of uncertainty, Keynes's theory seems more relevant than the CAPM.

In my view Knight's term 'uniqueness' as used in his theory of uncertainty has a twofold connection to uncertainty. The first unique situation is a decision about something new without any resemblance to the past. The second unique situation emerges because of unpredictable change in the former situation. Then, many past instances are available, though not representative. An example of the second form of uniqueness is a financial market, such as the stock market. My book is about the second form of uniqueness: vast amounts of data are available for an important part of the investment decisions, but future returns lack stability. Of course, some 'likeness' with the past can be found, say, for a financial crisis or a recession, which makes an investigation of the past useful. Theory may as well help to find a representative instance: both history and imagination based on theory can be helpful. Though, it should be argued in how far history and imagination are representative and predictive to the case at hand.

A second point of reflection is the meaning of Knight's partial knowledge, or Keynes's degrees of knowledge. In Keynes's terms, uncertainty cannot be expressed as cardinal; the only possible level of distinction is ordinal. Often the ordinality between arguments is unclear. My view is that no intermediate 'risk' state between risk and uncertainty exists, because if the risk of the level of uncertainty were known, it would be put into a probability distribution and become risk in the form of Knight's statistical probability. Again, risk in Knight's notion always means calculable risk. For example, if we know that an investment has an expected return of 6% and a 'risk' of 20%, and that the risk of the 'risk' is 5% points, than the expected return remains 6% and the risk becomes 25%. Yet, if we do not know the risk of the 'risk', we merely have partial knowledge, and thus uncertainty. The distinction between risk and uncertainty is relevant because no statement under uncertainty will have apodictic proof: thus, its arguments need to be judged.

A third reflection on Knight is the effect of diversification under uncertainty. If the future probabilities are known, then randomness is merely a problem of organization. Merely pooling and assessing the cost executes the economics. The cases under risk are supposed to be independent, otherwise pooling does not deliver certainty. But in portfolio theory investments are *dependent*. Dependence implies that a residual uncertainty remains. What is the character of residual uncertainty, does a residual uncertainty resemble an unpooled risk? The question brings to mind the subjectivist's position in the probability theory: for subjectivists, risk and uncertainty mean the same in a one trial decision. Yet, the Ellsberg paradox (1961) shows that in one trial decision, risk and uncertainty still differ. Thus, residual uncertainty is of lesser certain status than unpooled risk.

Another point of evaluation is how McCloskey's critique of statistical significance applies to investment theory? First, it relates directly to the econometric, empirical part of investment theory, which is outside the scope of the book. Second, an echo of the way of thinking in statistical significance pervades financial risk management. In financial risk management, the so-called value at risk, the absolute or relative money value which can be lost with a small theoretical probability, is set at a 95% or 99% probability interval. The value at risk is the minimum loss that can

occur with a probability of 2.5%. The method of value at risk assumes that uncertainty can be quantified. The connection with statistical significance testing is the supposed certainty of the procedure. The point here is that the value at risk obtains an absolute meaning, though under uncertainty no such guarantee can be given.

Besides her point on the theory and practice of statistical significance testing, McCloskey (1990, 1994, 1996a, 1996b, and 1998) has an innovative answer in coping with uncertainty: a rhetorical analysis is helpful in order to better understand the arguments used. Rhetoric has evolved in the realm of uncertainty in decision making and administering justice in Greek antiquity. It is no coincidence that the current chapter is concerned with the *logos*, the rational arguments, of unpredictability. *Logos* is, besides *pathos* and *ethos*, one of the three classical ways to make an appeal to an audience.

Taleb points at the instability of future risks and returns on financial markets with help of the black swan argument. His arguments against the use of regular statistics and the proposal for Mandelbrot's alternative statistics leave portfolio theory and the CAPM disarmed of mathematical statistics.

4.10 A Thought Experiment with Predictability in Investment Theory

The current section presents my thought experiment on the assumption of stochastical predictability in investment theory. The experiment puts the statistical outcomes of Markowitz's investment theory, of the CAPM, and of empirical origin to the test of risk-free arbitrage, which is the other dominant branch of investment theory, represented by for example the option theory. In a model of risk-free arbitrage, a number of transactions in financial, physical, or possibly artificial products create a financial product. Risk-free arbitrage implies, in contrast to the modern portfolio theory, certainty of outcomes. The thought experiment uses the paradigm of risk-free arbitrage of finance to illustrate that the paradigm of predictability is flawed.

As shown in the current chapter, stochastical predictability founds the epistemology of predictability in investment theory. Indeed, statistics and prediction in investment theory look like a tying sale, but they are better to be understood as subjects to be separated. Yet, one might wonder whether stochastical predictability matters, if stocks will achieve a higher expected return than bonds anyway? What are the arguments for stocks to achieve a risk premium above the risk-free rate? Basically, there are two arguments: one economic argument and one empirical argument. The theoretical economic argument is that investors are risk averse because of diminishing marginal utility, and that therefore extra risk needs to be accompanied by an extra reward. Please note that if investors would be risk neutral, the extra reward would not be demanded. In the case of the stock market, the risk is the systematic market risk, which by definition cannot be hedged away, because the market already contains all securities. This economic reasoning is to be agreed on. The point of the thought experiment, however, is to clarify that the level of market risk and return is not stochastically predictable, that is, belonging to the category of Knightian risk.

The other argument in favour of a positive risk premium for stocks stems from empirical data. For example, Dimson et al. (2012) showed that in the period of 1900–2013 American stocks resulted in an annualized real (corrected for inflation) yield of 6.5%, which is 4.5% above the return of bonds. An investment in a portfolio of global stocks would have resulted in the period of 1900–2013 in an annualized real yield of 5.2%, which is 3.3% above the return of global bonds. The question is whether the historical return of stocks is representative for the future. The rationale of rising stocks could be, say, that if the economy grows, profits of stocks as a subset of the economy could grow as well, and if the valuation of the stock remains constant, then prices of stocks should go up. But things can go wrong as well, the economy might not grow, the share of the profits of public companies decreases, or, the valuation goes structurally down because, say, the cult of equities is over. So, the past does not need to resemble the future: therefore the risk premium for stocks is actually uncertain and not-specifiable.

Though, if stochastical predictability were a valid assumption in investment theory, then one should be able to buy investment products,

say, 'investment model' stocks, with fixed parameters of risk and return above the return on risk-free bonds. Financial institutions, such as investment banks, would engineer such products through the technique of risk-free arbitrage. If the parameters of risk and return were fixed in the opinion of the provider of the investment model stocks, the engineering of risk-free arbitrage would be simple:

1. Offer an investment model stock with a guaranteed specified risk (say 20%) and return (say 5%).
2. Invest the cash received in real stocks.
3. Pass the actual return of the real stocks to the buyers of the investment model stock.

The scheme mentioned above can be extended beyond Markowitz's investment theory and the CAPM; the scheme goes for investment strategies based on empirical, valuation, or other grounds as well. But, the advocates of, say, valuation as a source of prediction, or of a model that offers a 60% probability of beating the S&P 500 index, will not offer 'investment theory' stocks based on their strategies with a specifiable risk and return, because the statistics attached do not possess the apodictic quality of a stochastical prediction. Of course, all sorts of bigger or smaller inefficiencies emerge in financial markets, which could be exploited. But the inefficiencies are often temporarily, because players on the market catch on to them.

No one would offer such investment model stocks as postulated in investment theory, simply because the risk and return of stocks are not fixed, so a guarantee on that would be irrational and risky. An investment banker would merely create investment model stocks, if he could arbitrage *without* risk. Then, investment model stocks would become a billion dollar market. In the fictional world of investment model stocks, investment managers could truly claim reliability of risk and return for their clients, because the models for decision making and risk management, both derived from investment theory, would be epistemologically sound. In the following, we will explore what would be the outcomes of investment model stocks offered by risk-free arbitrage within the realm of stochastical predictability.

An Example of Arbitrage

First, let us give an example of the principle of arbitrage. Suppose an American firm needs to pay a bill in Japanese yen in a year, and wants to avoid the currency risk. How could the firm pay the bill in a year *without* engaging in the currency risk? Well, a bank could offer the firm a forward contract at a fixed rate of exchange, which the bank engineers in a number of steps:

1. The bank borrows the dollar amount at the current interest rate in the United States.
2. The bank changes the money borrowed for Japanese yens.
3. The bank puts the amount on a Japanese yen account to receive interest.
4. At the end of the year, the firm delivers the bank the dollar amount, by which the bank pays off the amount borrowed.
5. At the same time, the firm receives the required amount of Japanese yen, which the bank had put on the Japanese yen account.

The procedure explained yields at a fixed rate of exchange for a currency hedge. The interest-rate parity theorem relates the interest rates to the forward price of a currency (Ross et al. 1988):

$$\frac{1+i}{1+i^*} = \frac{F(0,1)}{S(0)}$$

The symbols used mean:

i = the interest rate on a risk-free deposit in the home currency
i^* = the interest rate on a risk-free deposit in the foreign currency
$F(0,1)$ = the current forward price of a foreign currency, 0 denotes the start of the term, 1 denotes the end of the term
$S(0)$ = the spot price of a foreign currency.

Theoretically, the price of the currency forward depends only on the difference between the interest rates of the two currencies. If the price of

the currency forward deviates from the theoretical price, arbitrage aligns the price with that of the interest-rate parity. The argument of interest-rate parity is not merely theoretically true, it works in practice as well. Interest-rate parity is an example of deterministic, in theory, risk-free arbitrage in investment theory. In practice, arbitrage is not risk-free, because capital is needed for some period and risks occur as well, because of for example trading on different markets (Shleifer and Vishny 1997).

The Thought Experiment

Risk-free arbitrage can take a stochastical form as well. How could a financial firm create investment model stocks using risk-free arbitrage? In my thought experiment, the firm can create the risk and return of an investment model stock by drawing from a normal probability distribution. The parameters of the normal distribution are a yearly expected return of, say, 8% and a standard deviation, the risk, of, say, 20%. Microsoft Excel could perform the draws from the normal distribution and deliver the required stochastically predictable risk and return. Suppose that only one investment model stock was marketed, its risk would not be diversifiable and resemble the undiversifiable market risk.

But in risk-free arbitrage a financial firm wishes to arbitrage the risk of drawing the investment returns from a normal distribution when possible. Because of the random nature of the return of an investment model stock, the method of arbitrage would have to be similar to that of a casino or an insurer.

The method of arbitrage is to issue a high number of investment model stocks. Because of the high number of stocks, the issuer attains a calculable and low risk of having to pay more than the expected return. The risk becomes calculable and low, because the drawings of the returns of the investment model stocks are independent, or to put it differently, the correlation coefficient between the investment model stocks is zero. In fact, a large number of issued investment model stocks and the corresponding large number of independent drawings, reduces the issuer's risk of paying more than the promised return close to zero.

To repeat some of the mathematical statistics of diversification from Appendix 2A of Chapter 2: if the correlation coefficient between the

securities is zero, which is the case in the creation of artificial 'investment theory'-stocks, then the risk of the investment model stock, divided by the square root of the number of issued stocks, decides the portfolio risk of the issuer, in the form of a formula:

$$\sigma_p = \frac{\sigma_s}{\sqrt{n}}$$

The symbols used mean:

σ_s = standard deviation of the investment model stock
σ_p = standard deviation of the issuer's portfolio 'p' of investment model stocks
n = number of issued investment model stocks

The formula of portfolio risk demonstrates that a higher n, the number of investment model stocks, lowers σ_p, the risk of the issuer. Figure 4.2 shows the portfolio risk of the issuer as a function of the number of issues, supposing that the risk of the investment model stock is 20%.

In Fig. 4.2, the portfolio risk reduces rapidly as the number of issues enlarges: one investment model stock has a risk of 20%, the portfolio risk of 1000 investment model stocks drops to 0.6%. Thus, a financial firm can hedge a guaranteed, specified level of volatility if the number of issues is large. If, however, the number of issues were relatively small, the financial firm could offer a lower expected return to reduce the sample risk.

Though the issuer of investment model stocks could hedge, protect, the risk, investment model stocks have to deliver a guaranteed return above the risk-free return as well. The issuer has to figure out, how to extract the extra return above the risk-free return of the product by some form of risk-free arbitrage. The issuer receives cash from the buyer of the investment model stock. With the cash, the issuer could buy real stocks, and use the return of the real stocks to pay the return on the investment model stocks. Yet, real stocks are no risk-free hedge for investment model stocks. The cash outflow from the issuer to the buyers of the investment model stocks will be predictable: it will be, to repeat, close to the level of the specified return. But the return of real stocks will be volatile and uncertain, and will

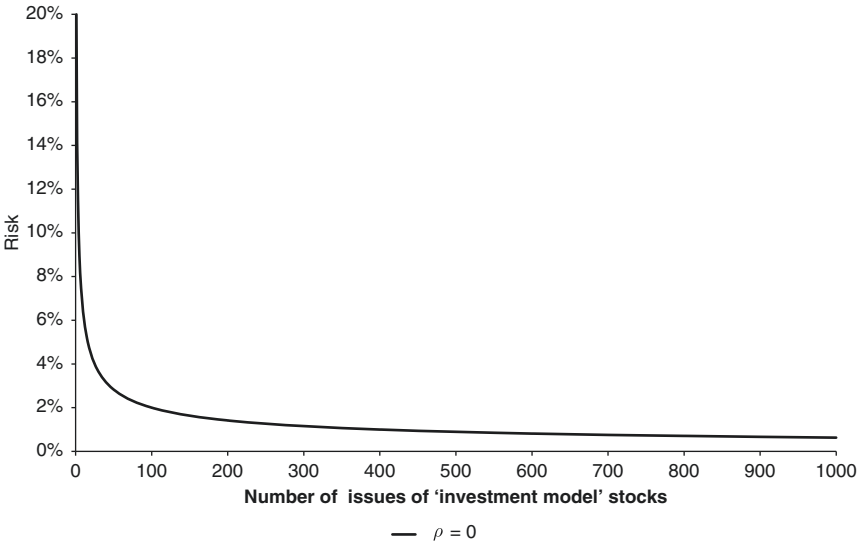

Fig. 4.2 Risk as function of the number of issues of investment model stocks

not match the stable specified return of the investment model stocks: so, real stocks do not hedge investment model stocks risk-free. Moreover, the hedge may turn out worse, because of the Knightian distinction between uncertainty and risk: the returns of real stocks are stochastically unpredictable, uncertain, and the returns of investment model stocks are stochastically predictable, like Knightian risk.

A high yield bond could be an alternative for real stocks to hedge the return of the investment model stock. The issuer could buy a high yield bond, and supposing the coupon of the bond equals the yield, use the coupon to pay the specified return on the investment model stocks. Suppose further that the coupon of the bond equals the specified return, and that the duration of the bond and the investment model stock have the same length, then, the yield of the bond hedges the specified return of the investment model stock. But, uncertainty characterizes a high yield bond: it is incalculable whether the issuer of the bond pays the interests and repays the loan. A high yield bond does not resemble an investment model stock, because the risk and return of the bond belong

to the Knightian notion of uncertainty and not to Knightian risk, the category in which investment model stocks reside.

The point of the thought experiment is that a financial firm *never* can arbitrage, free of risk, an expected return of investment model stocks above the risk-free return. Instead of a real stock, or, a high yield bond, an investment model stock resembles roulette or an insurance activity. An investment model stock resembles mostly roulette, because an investment model stock *issues* a probability distribution like roulette does. An insurer instead *collects* a probability distribution. Casinos and insurers carry out their business on the law of large numbers. How do casinos and insurers make a profit? Insurers charge a fee which includes a profit margin and covers for losses, say, the expected loss of an insurance for car damage. In the chance game of roulette, a player can bet, among other things, on numbers up to 36. Casinos tilt the probability distribution of roulette towards an expected return by introducing a zero in European roulette, or a zero and a double zero in American roulette. If the turn of the wheel results in zero or double zero, the casino wins. In the case of the European roulette with the single zero, the expected return for the casino is$1/37$, or 2.7%, without the zero the roulette would result in a zero sum game because the profits and losses of placing bets combined would be zero. An investment model stock compares to roulette: yet, the expected pay-out to the holders of investment model stocks should be positive because of the specified return above the risk-free rate, instead of negative like for the player of roulette, because of the zero.

The moral is that the provider of stochastical predictable risk should receive an expected return, and the buyer should pay, because Knightian risk results in a zero sum game. No serious financial firm would provide investment model stocks. Should financial firms market investment model stocks, the arbitrage strategy of the buyer would be to borrow at the risk-free rate, buy a diversified portfolio of investment model stocks, and earn the risk premium above the risk-free rate without taking risk, because, again, the different issues of investment theory stocks are statistically independent. In the hypothetical case that the market were to offer merely one investment model stock instead of many issues, then buying the stock would be interesting as well: risk models would work

perfectly, and following the Ellsberg paradox objective risk and return parameters are preferable to subjective ones.

On the claim of economic expertise, McCloskey (1990) responds to the economic and investment advisors: 'If You Are So Smart, Why Ain't You Rich?' To add another American saying about the narrative of statistical expertise to its advocates: 'Put Your Money Where Your Mouth Is!' If statistical expertise on investment theory is correct then its advocates would be willing to provide the investment model stocks to the market. Like McCloskey's test, my test is a fair one too, because to market investment model stocks means to believe in the stochastical predictability of stocks. Yet the advocates of stochastical predictability will wisely reject the test.

In Appendix 4A a mathematical proof formalizes the conclusion of the thought argument that risk-free arbitrage cannot engineer investment theory stocks with a specified risk and a return above the risk-free return.

Option Theory

One might object that option theory has not yet been considered as a solution to the engineering problem of investment theory stocks. Surely options on stocks can create all sorts of pay-offs. Options are available in a great variety of exercise prices and can combine all sorts of exposure to the price of a stock (see Chapter 2 for an explanation of the option theory). But, can options create investment theory stocks?

Despite their flexibility, options cannot create an investment model stock. To explain why, we focus on the put-call parity as an instrument of risk-free arbitrage. The formula of put-call parity (based on Hull 1997) looks like:

$$\begin{aligned} Spotprice(Stock) = {} & Value(Call) - Value(Put) \\ & + Present\ value(Zero\ Coupon\ Bond) \end{aligned}$$

In the formula the call and the put have the same exercise price and the same time to maturity. The zero coupon bond is bought to exactly match the strike

price of the options at the end of the duration. The put-call parity does not need a formula to price the option, or for that matter assumptions about the level of risk or return, though pricing formulas for options need to fit in the call-put parity. Abstracting from the zero coupon bond, the plain intuition behind the parity is that the pay-off of a stock equals the pay-off of a long call, the right to buy the stocks against a strike price, and a short put, the duty to deliver the stocks, against the same strike price, as expressed in Fig. 4.3:

The put-call parity lets a short put and a long call create a normal stock, but no investment theory stock. To create an investment theory stock, the levels of risk and return have to be specific and remain stable. Options are bought against a specified level of risk, but their value depends on the price of the real stock, which has no fixed risk and return level. The dependence on the real value of the stock means that the realized risk is uncertain and that no situation of stochastical predictability is reached. The only way options could arbitrage investment theory stocks in a risk-free way would be if stocks were to have specified levels of risk and return.

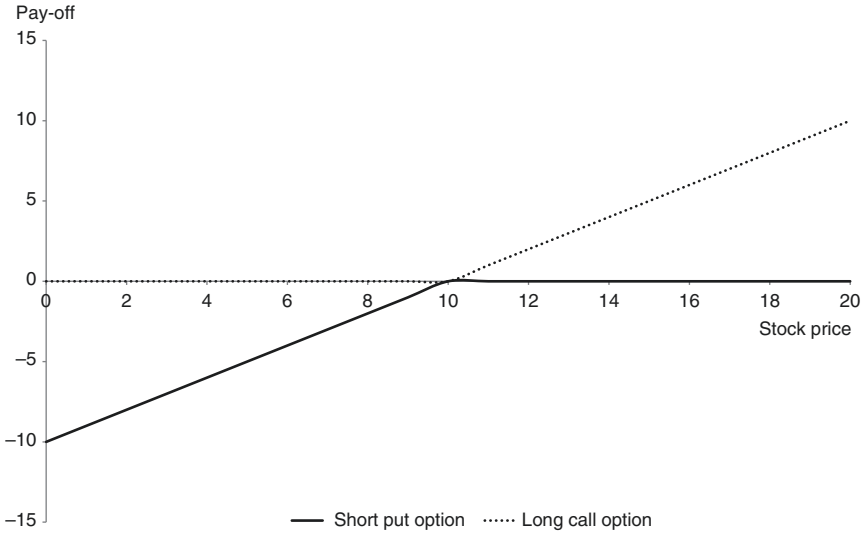

Fig. 4.3 Put-call parity, a long call, and a short put equal the pay-off of a stock

4.11 Closing Remarks about the Thought Experiment

Suppose the reader thinks the reasoning is flawed, and that, after all, risk and return of investments are specifiable. Then, investment model stocks could easily be made because real stocks would provide the hedge. Merely passing through the return would do the job of providing for investment theory stocks. Yet, to know risk and return in advance and to be able to provide investment theory stocks with a fixed, specifiable risk and return, mean the same thing: the fact that financial firms cannot deliver investment model stocks with a specifiable risk and return *means* that risk and return are uncertain.

We hope to have been persuasive in showing that stochastical predictability in investment theory is a false assumption. The thought experiment which shows the impossibility of risk-free arbitrage of investment theory stocks seems fair, because of the analogy with the artificial device of a currency hedge with the interest rate parity. Only the certainty of interest rate parity, gives a bank the incentive to offer the currency hedge. But with investment theory stocks such a certainty does not exist.

'So what? It is obvious!' some might reply. Well, for the ones who are not convinced of unpredictability, the thought experiment could make them doubt. It is essential that the use of statistics does not fool one into the idea of predictability. And for the ones who regard the thought experiment as trivial, it should be time to make a step forward in using and interpreting investment theory. Then, we agree that the function of the models of investment theory is not *prediction*. The investment model enables the investors to 'manage' the future with historical and theoretical insights. So, investment theory can only support decisions. Indeed, if statistics merely supports, it should compete with other theories in handling uncertainty: investment theory would be *a part of* the approach, not *the* approach.

Besides uncertainty, investment theory also results in certainties as represented by the parities. Risk-free arbitrage in the form of interest-rate parity, or put-call parity from the option theory, yield 'accounting' truths: 'Schelling and I are claiming that if you examine important economic

arguments you will find nine times out of ten an accounting identity overlooked by the man in the street or even by the economist in the study (McCloskey 2000, 175).' Arbitrage assumes that 'A is B', which makes a trade theoretically riskless. Yet, risk-free arbitrage is not possible in the case of Markowitz's investment theory, the CAPM, and other currents of empirical investment theory because capital allocation to investment portfolios is about expectations of risk and return. The expectations are never reducible to stochastical predictability. To put it bluntly: logic (A=B) grounds arbitrage, while subjective beliefs about the future ground portfolio theory. So, the models or metaphors of risk-free arbitrage and capital allocation for investments differ. The difference does not mean that nothing can be said about expected returns of investments. On the contrary, in the absence of predictability, theories about expected returns should compete, and deliver stories beyond the narrative of a positive risk premium of stocks above the risk-free rate. It sounds logical that a positive risk premium should compensate the risk, but if risk and return are unpredictable, how would you the premium know in advance? It is, however, the general prediction of rational constructivism that makes one think that risk ought to be rewarded, since that would be fair.

Appendix 4A A Formal Proof of the Thought Experiment

A mathematical proof formalizes the conclusion of the thought experiment that risk-free arbitrage cannot engineer investment theory stocks with a specified risk and a return above the risk-free return. Because the risk and return of an investment theory stock would be similar to the risk and return of a casino with roulettes, we start with the formula of the expected return of the roulettes, and the expected return of the clients of the casino:

$$0 = E(return\ roulettes) + E(return\ clients)$$

Or, rearranged:

$$E(return\ roulettes) = -E(return\ clients)$$

The symbol used means:

$$E(x) = \text{expected return of } x$$

The formula above shows that the parity of the zero-sum game of a casino demands that the positive expected return of the roulettes, is the opposite of the negative expected return of the buyers. Other costs and profits are left out to maintain clarity.

The parity of the zero-sum game of a casino resembles the parity of investment model stocks. The next step is that the formula includes the time value of money, because in the thought argument investment model stocks replace real stocks in a portfolio. Strictly though, investment model stocks and chance games like roulette do not need to be placed in time like real stocks, in order to produce probability distributions, because investment model stocks and roulette are artificial; a computer program produces the artificial outcomes in a split-second. The formula of the expected return of an investment model stock of the issuer and its buyers is:

$$0 = E(return\ issuer) - R_f + E(return\ buyers)$$

Or rearranged:

$$E(return\ buyers) = R_f - E(return\ issuer)$$

The symbol used:

$$R_f = \text{risk-free rate}$$

The formula shows that the $E(return\ buyers)$ is R_f, the risk-free rate when the $E(return\ issuer)$ is assumed to be zero. Any return that the issuer would claim, would lessen the expected return of the buyers. Once again, no other sources of return from real stocks, high yield bonds, or options, deliver a risk-free arbitrage above the risk-free return, or for that matter a sensible hedge with risk to cope with the return obligation of a investment model stock. If the issuer wants a risk-free hedge, he has no choice but to put the money from the buyer on a deposit, in order to give the buyer at least the risk-free return.

Finally, the formalization of the thought experiment will now include the stochastical nature of the investment model stock. The formula of the zero-sum of the probability distributions of investment model stocks of the issuer and its buyers is:

$$0 = N(issuer) - N(R_f) + N(buyers)$$

in which the symbols used mean:

$$N(issuer) = N(\mu, \sigma_{\mathrm{p}}) = N(0, 0) = 0$$
$$N(R_f) = N(R_f, 0) = R_f$$
$$N(buyers) = N(\mu, \sigma_{\mathrm{p}}) = \sum_{i=1}^{n} N(\mu, \sigma_{\mathrm{s}})$$

Symbol used means:

$N(\mu, \sigma)$ = normal probability distribution of expected return μ and standard deviation σ

In rearranged terms, the formula of the zero sum game of investment model stocks becomes:

$$0 = 0 - R_f + \sum_{i=1}^{n} N(\mu, \sigma_s)$$

or,

$$R_f = \sum_{i=1}^{n} N(\mu, \sigma_s)$$

The $N(issuer)$, the normal distribution of the issuer, results, to repeat, in an expected return of zero and a standard deviation of zero, because, σ_{p}, the standard deviation of the issuer's portfolio 'p' of investment model stocks, reduces to zero, at a large number of issues. The $N(R_f)$, the normal distribution of the risk-free rate, has no risk, and reduces to R_f, the risk-free rate. The $N(buyers)$, the normal distribution of the buyers, adds the individual distributions of buyers of the investment model stocks. Please note that the buyers experience randomness, because their risk is σ_s, the risk of the individual investment model stock. To repeat, the randomness of σ_s accumulates to zero in σ_{p}, the risk of the issuer's portfolio. The expected return of the buyer, μ, will equal R_f, the risk-free rate.

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5

The Rhetoric of Investment Theory

5.1 Rhetoric

The Current Rhetoric

The current rhetoric of investment theory is the same as the original rhetoric in the seminal work of Markowitz (1952, 1959). The *logos* of the rhetoric of investment theory was discussed in the preceding chapters. Chapter 4 has investigated the epistemological beliefs of investment theory. Markowitz's arguments for using statistics in investment theory stem from Savage's theory of maximizing utility by using subjective probabilities. The continuations of Markowitz's portfolio theory, CAPM, and the empirical investment theory, are founded on the idea of objective probabilities, or to put it otherwise, the frequency theory of probability. The philosophy of probability justifies the beliefs in investment theory. Yet, merely using the probability theory, does not transform probabilities to Knightian risk (1921). In what follows we will, again, couple 'subjective probability' to Knightian 'uncertainty,' and 'objective probability' to 'risk.' In Knight's account, objective probabilities mean the same as 'stochastically predictable.' Deciding whether

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probability is 'subjective' or 'objective' in the Knightian sense is crucial because it changes what can be legitimately expected of decision making. It appears that Markowitz has put investment theory in the category of risk, instead of in the category of uncertainty where it belongs.

The views on the use of statistics in economics of Knight, Keynes, Von Mises, McCloskey, and Taleb were evaluated in Chapter 4. To repeat the common denominator between their views: stochastical predictability is a rare case for economic phenomena, so uncertainty or Von Misean 'case probability' is relevant for economics. Further, a probability statement under uncertainty has the same epistemological status as a qualitative judgment or a regression on historical data. Under uncertainty, statements on economic phenomena are not cardinally measurable like in stochastical predictability: one can merely compare ordinally the trustworthiness of the statements under uncertainty. Besides the historical and contemporary arguments against using predictability in economics, a thought experiment against predictability has been exposed in Chapter 4: a rational financial firm would never market a synthetic stock with a specified risk and return like the investment theory assumes, because an 'investment theory' stock cannot be hedged risk-free.

The arguments against predictability entail that estimated probabilities are subjective in the Knightian sense, but what does that mean for decision making? As shown in Chapter 4, the gap between the subjective and the true probabilities cannot be bridged; merely making larger allowances for risk would not be enough to create stochastical predictability. Using subjective beliefs in the Knightian sense in practising investment theory gives us no clue to the probability as such that the probability beliefs for the investment decision are right. Moreover, merely using subjective probabilities in investment theory leads to the same decisions as using objective probabilities. So, subjective is used as being objective, which is dangerous because decision making on the basis of subjective probabilities should not be done by statistics alone: under the condition of uncertainty, statistics should merely be used to explicit intuition and to help making judgments.

If science delivers trustworthy outcomes, then science should dominate the input of a decision (Collins and Evans 2007). But what to do when one

cannot trust the scientific outcomes like in investment theory? To mind comes the option of looking for alternative theories. Yet, no scientific theory can overcome the uncertainty of risk and return of investments. Then, should we abandon investment theory? Probably not. The use of expert knowledge remains preferable, because expert knowledge is, despite its flaws, a better alternative than uninformed knowledge as input into a decision (Collins and Evans 2007). To be agreed is that a decision without investment theory is worse than a decision with the theory, though we must propose a new rhetoric for investment theory to lower the importance of statistics, and to promote the use of practical reason, instead of theoretical reason. In the current chapter material from Pistorius (2014) is used.

Plato on Rhetoric

Let us now explain what rhetoric is. The ancient tradition of rhetoric as a discipline started in Greek antiquity. My interest here in ancient rhetoric is practical, and confined to what is relevant to the book. Thus, although rhetoric in the antiquity was mainly concerned with the spoken word, for this book only the rhetorical specialities of writing are relevant. Note also that ancient rhetoric is analysed here for the purpose of contemporary appropriation. Contemporary appropriation entails that anachronisms are not problematic, as they would be in a historical approach. Another difficulty is that competing accounts of the classical discipline of rhetoric differ on how to compose and analyse. We will focus on the common elements amongst the competing accounts.

In Greece in the fourth century BC, the theorization of rhetoric matured. At that time Plato seemingly opposed rhetoric, whilst Aristotle favoured it. Plato's opposition was grounded on the supposed contrast between rhetoric and philosophy: rhetoric is not about rightness, but merely about persuasiveness. His negative opinion pervades the customary account of rhetoric today. But was Plato, as for example Vickers (1988) claims, merely an enemy of rhetoric? In the *Gorgias*, Plato (1925) indeed attacked rhetoric as used in the Athenian democracy because rhetoric capitalizes on the ignorance of its audience, and is not used for deliberation. Thus, he did not consider rhetoric as art, because

genuine art is aimed at our good, such as medicine or gymnastic. He viewed rhetoric as cookery, a mere flattery, aimed at pleasure alone. Cookery made food taste better, but it is not, like medicine, aimed at preserving or bettering someone's health. According to Plato, rhetoric is a device for persuasion to unethical purposes and does not aim at the truth, which can only be found in philosophy. Philosophers, being persons who wish to argue carefully, are inclined to reject rhetoric as characterized by Plato (Griswold 2012). But there is more to rhetoric than what Plato (1925) allowed in the *Gorgias*.

Though Plato (1925) denied in the *Gorgias* that rhetoric is an art, in the *Pheadrus* (1914) he suggested that it could become one. With the sophists he agreed that the purpose of rhetoric is persuasiveness. Persuasion ought to move the soul towards the good, so the rhetorician should have knowledge about the soul in order to persuade. Yet, rhetoric becomes an art if rhetoric and dialectic are *combined*, because rhetoric and dialectic together avert the risk of the improper use of rhetoric. Dialectic is Plato's philosophical method to find truth, which is to be found in the mind, and consists of a discourse of reasoned arguments. By combining rhetoric and philosophy, Plato, albeit apparently the enemy of rhetoric, widened the scope of rhetoric beyond political and juridical discourse. Moreover, rhetoric belonged to the philosophical discourse: it is the art of communicating the truth. For example Harvey Yunis disagrees with the general account of Plato's opinion on rhetoric:

> Any account of Plato's contribution to rhetoric must overcome the traditional view of Plato as the unyielding partisan of philosophy and inveterate opponent of rhetoric in the foundational dispute between the two domains (Yunis in Worthington (ed.) 2010/2007, 75).

Aristotle's Art of Rhetoric

Aristotle arguably did not doubt the merit and status of rhetoric. He invented a complete theory of rhetoric. Aristoteles's *Art of Rhetoric* (2006) is fundamental to studying classical rhetoric (Worthington

2007). He considered *logos*, or rational argument, the most important means of persuasion. For my purposes, a treatment of some basic elements of his theory suffices. His ideas will serve as an illustration of the various parts of the canon of rhetoric.

For making an appeal to an audience, Aristotle (2006) discerned three sources of persuasion: *ethos, pathos*, and *logos*. Ethos is the moral character as presented by the speaker, it aims at being trustworthy. Trust is evoked in the audience through practical wisdom, virtue and goodwill of the speaker. The second source of persuasiveness is pathos: the speaker has to consider the feelings his words will arouse in the listeners. The third and most important source of persuasion is logos, the arguments on the subject which appeal to rationality. Logos makes use of induction and deduction. An inductive argument is given by an example, a deductive one is the *enthymeme*. In economics, a case study can be called an inductive argument, since a case study is an example which can represent other cases as well. The deductive argument of the enthymeme is a *syllogism* in which the premises are probable, or a shortened syllogism, in which parts are absent to make the listener draw the conclusion (Lanham 1991). A syllogism is a logical argument, in which the conclusion is inferred from two premises. In the short enthymeme are to be added the conclusion and a premise to get a full enthymeme. The enthymeme occurs a lot in economic reasoning.

The first element of rhetoric is invention (the Greek and Latin terms are *heuresis* and *invention*, respectively). Invention or discovery is about the finding of the arguments. The main source of invention is the commonplace. Commonplaces (*topoi, loci communes*) are general argumentative patterns, from which specific arguments can be generated for a given conclusion or supposition. An example of a commonplace is: '[. . .] if of two like things the one is possible, so also is the other (Aristotle 2006, § II.xix.2).' The commonplace of 'possibility' reasons by analogy that something which happens in one case can happen in another similar case as well.

The second part of rhetoric, arrangement (*taxis, dispositio*), discerns the order of speech, which is introduction, narration, proofs, and peroration. The introduction (*prooimion, exordium*) is the beginning of

the speech and is meant to capture the listener's attention. The narration (*prothesis, narratio*) is the statement of the case. The proof (*pistis, probatio*) is a confirmation or thought experiment that the narration is true. The peroration (*epilogos, peroratio*) concludes a speech with for example a recapitulation. Aristotle considered the narration and the proof as the most important parts of the arrangement.

The third part of the canon of rhetoric is style (*lexis, elocutio*), which means how to say things well or elegantly. Two characteristics of style are clearness and propriety. Clearness improves comprehension and persuasiveness. Propriety of style has an emotional, an ethical and a proportionate element. An emotional relationship to the subject creates sympathy. Ethos is shown by the use of the language appropriate to the situation. Being proportionate to the subject means for example not to make a small matter look big. Style in Aristotle's theory also includes the fourth element of the canon of delivery (*hupkrisis, actio*) and the fifth canon of memory (*mnēmē, memoria*). Delivery and memory are not relevant for written text, so we will not go into them. Another form of style is the *trope*, which in Greek literally means 'turn.' A trope is a figure like a metaphor, which changes the meaning of words (Lanham 1991).

Rhetoric in the Twentieth Century

In Western history, rhetoric played an important role in education. The re-emergence of the discipline of rhetoric in the twentieth century can be seen as a reaction to logical positivism (Worthington 2007). A number of twentieth-century ideas about rhetoric are illustrated in the work of Chaim Perelman (1958 with Olbrechts-Tyteca) and Stephen Toulmin (1958), and by the development of literary criticism. Perelman coined the term 'The New Rhetoric' (1979). His main work is *The New Rhetoric: A Treatise on Argumentation* (1958). In the 1940s he was attempting to resolve the dilemma of the logic of value judgments. According to logical positivism, value judgments like judicial ones are not scientifically

founded. But he could not agree with the positivist conclusion that value judgments are merely a matter of taste. An outcome of his search for a foundation of value judgments was a rediscovery of Aristotelian rhetoric. Besides Perelman, Toulmin (1958) has been influential in rhetorical theory in the twentieth century. He also turned away from logical positivism. In *The Uses of Argument* (1958) he proposed a new argumentation theory based on actual ways of argument such as legal reasoning. His theory investigated the 'partial argument,' which is close to Aristotle's enthymeme.

Besides in philosophy, rhetorical analysis developed in literary criticism as well. Literary criticism has, like rhetoric, a long tradition:

> A partial list [of literary criticism] in historical order would include rhetorical, philological, Aristotelian, belletristic, hermeneutic, historical, new critical, psychoanalytic, neo-Aristotelian, archetypical, neorhetorical, Marxist, reader-response, deconstructive, linguistic, feminist, and new historicist criticism (McCloskey 1998, 16, my insertion).

Literary criticism investigates metaphors, narratives, and other rhetorical elements that writers use to achieve persuasion.

5.2 The Rhetoric of Economics

McCloskey's discourse analysis of economics in *The Vices of Economists; The Virtues of the Bourgeoisie* (1996) will be used here as a frame of reference for further describing the current rhetoric of investment theory, and for inventing a new rhetoric. *The Vices of Economists* is a rhetorical criticism of the discourse of economics in general. Adopting McCloskey's discourse analysis, investment decisions require two things: an analysis of its rhetoric, and bourgeois virtues for coping with investment decisions. The analysis of rhetoric provides insights into the beliefs, the justifications, and the broader context of investment theory.

First, we will discuss four books that make up her conception of the rhetoric of economics. In the books she analysed the phenomenon of

rhetoric as used in economic texts. In the preface of *The Rhetoric of Economics* (1998) McCloskey referred as key literature to:

1. If You're So Smart: The Narrative of Economic Expertise (1990)
2. Knowledge and Persuasion in Economics (1994)
3. The Vices of Economists: The Virtues of the Bourgeoisie (1996)
4. The Rhetoric of Economics (1998, second edition)

The works seem to constitute the end product of her work on rhetoric. She started publishing on rhetoric with the article *The Rhetoric of Economics* (1983), out of which the book with the same title originated (1985), with a revised second edition in 1998. Both the article-version and the first edition of the book attracted attention of philosophers of economics because of her critical stance towards the modernist methodology. Modernism is called positivism in philosophical terms.

A comprehensive answer to the criticisms of philosophers of economics came in *Knowledge and Persuasion in Economics* (1994), in which she elaborated her views on philosophy and philosophy of science. Too, she discussed the differences between rhetoric and philosophy, and the relation between the two reflective approaches. The book *If You're So Smart* (1990), is of special interest here, because she presents economic forecasting as a narrative of economic expertise.

In *The Vices of Economists* (1996) she remarked that economics has become a game in the sandbox, in which economists play like little boys. But the sandbox is not the real world, despite the seriousness of the boys in their play. The book is a rhetorical criticism of the discourse of economics in general. After picturing three vices of current economics, it suggests a future *bourgeois* moral for the field, that of virtue ethics. It considers prudence not as *the only* virtue, but as *one* of the necessary virtues, such as temperance and justice. She elaborated her ideas on virtue ethics in *The Bourgeois Virtues* (2006). Since *The Vices of Economists* is a rhetorical criticism of the discourse of economics in general, the three vices will now be treated in some depth:

1. **Statistical significance**
   The belief that statistical significance replaces scientific significance in testing a hypothesis follows the ideas of Lawrence R. Klein

(McCloskey 1996). As explained in Chapter 4, statistical significance is not sufficient to accept a scientific result, because it has nothing to do with relevance. Moreover, it leads to irrelevant science. What does matter, is the magnitude of a scientific finding. Because the testing of statistical significance is almost obligatory in science, abolishing it is controversial (Ziliak and McCloskey 2008). Though it does apply to the empirical side of the investment theory, this will not be elaborated here because it is outside the scope. In *The Cult of Statistical Significance* Ziliak and McCloskey (2008) explained the compelling case against the use of statistical significance in science.

2. **Blackboard economics**
   Given an axiomatic set of assumptions in a model, the existence of some economic outcome can by proved by a calculation or inference on the 'blackboard.' Blackboard economics is considered as science and has been promoted by Paul Samuelson. But the 'Samuelsonian vice' has led mainstream economics to become purely theoretical. Of course, McCloskey agrees that 'Theory is good. It is the disciplined imagination of economics (1996, 72).' Mathematics also explicates the mechanism of an economic theory (1998). But the problem is that blackboard economics has been overdone.
3. **Social engineering**
   The most important vice is the belief that the first two vices can be used for economic policy. The question 'why is social engineering as proposed by Jan Tinbergen a vice?' has a simple answer: 'it does not work.' The arguments for the failure of social engineering are not new:

> [...] the Austrian School long ago and the Rational Expectations School during the past quarter century have pointed out that it is ourselves we are trying to engineer. That's the big problem. The reflexivity of economics sets stringent limits on what we can predict and control (McCloskey 1996, 103).

In my opinion the third vice applies arguably to predicting with investment theory. McCloskey's discourse analysis also tried to analyse economics as products of a scientific culture. According to McCloskey, the dominant culture of science is modernism, the official methodology for mainstream

economics based on logical positivism. McCloskey's (1998) view is that economics chose modernist methodology, because the argument of philosophy is one of authority. But her point is that philosophy itself has changed its mind, as expressed for example by Michael Polanyi (1958), Paul Feyerabend (1975), and Richard Rorty (1979). Polanyi (1958) argued that the modernist idea that subjective 'observation' is not scientific, is outdated, which he elaborated in his book *Personal Knowledge*.

Another modernist principle is that science and non-science can be demarcated by methodology. The prescript presupposes the existence of such a methodology. But Feyerabend did not believe in one strict methodology; on the contrary, he recommended anarchy in methodology as an 'excellent medicine for epistemology, and for the philosophy of science (2010/1975, 1).' His point is that methodology depends on the character of the scientific problem and that methodology cannot be fixed.

Rorty discussed a more general point on modernism. He regarded the problems of modernist methodology as coming from the misleading metaphor that the mind is a mirror of nature (1979). The metaphor implies an external reality independent of our mind. But in the pragmatist philosophy such dichotomies as internal and external, or, objective and subjective, are considered as flawed.

Rhetoric and Philosophy of Economics

McCloskey does not believe in the official methodology of modernism for mainstream economics, and has found substantial evidence and support from inside philosophy for her anti-modernist position. Notwithstanding, her alternative of rhetoric of economics has received critical attention from philosophers of economics. The philosophy of economics and the rhetoric of economics have in common that they reflect on economics. Both aim to achieve a better insight into the working of the science of economics. But how do they relate to each other? Can rhetoric be seen as a branch of the philosophy of economics?

According to one of the leading philosophers of economics, Hausman (1981), the philosophy of science broadened its perspective in the 1960s and 1970s from methodologically prescribing how science should work,

to empirically describing how science is actually being done. The broader perspective of philosophy of science has also arisen from the loss of trust in logical positivism. Despite Hausman's (1989) interest in eclectic methodology, he was critical of McCloskey's rhetorical approach:

> But McCloskey offers little solid argument for employing his favored literary tools, and he has a hard time explaining how his proposed successor to economic methodology is supposed to retain any normative role. And the normative role of methodology is unavoidable; whether methodological rules are garnered from imitation, methodological asides, or systematic methodological treatises, there is no doing economics without some standards or norms. Furthermore, if economics is to make any rational claim to guide policy, these standards or norms cannot be arbitrary (Hausman 1989, 123).

The criticisms of McCloskey's approach by Hausman (1989), Hausman and McPherson (1988), and Hollis (1985) provided an opportunity for explicating the difference between the primary beliefs of rhetoric and those of philosophy of science. McCloskey (1994) has replied to the individual criticisms and devoted *Knowledge and Persuasion in Economics* to elaborating her point of view on rhetoric and its relation to philosophy. Hausman and McPherson (1988) missed the normative element in McCloskey's rhetorical approach. They described her standards as those held within a discipline or intellectual standards in general. Anything more would be normative methodology, which McCloskey has rejected. But they disliked the division between general standards and normative methodology, in their words:

> What's left when the formulas and rigid rules are gone is the exercise of informed judgment, guided by broad and evolving principles of assessment, which in turn still rest on implicit or explicit epistemological theories. That's Methodology, too (Hausman and McPherson 1988, 6).

One might conclude that apart from the dispute over the existence of implicit or explicit epistemological theories, Hausman's and McPherson's, and McCloskey's points of view have come rather close. Yet, Collins and Evans (2007) seem to agree with McCloskey's point of

view: in their discussion on the nature of expertise, reflective ability is a generalized skill, a form of expertise applicable to all sorts of sciences and arts, which is different from an epistemological theory.

Martin Hollis (1985), a philosopher of social science, criticized McCloskey's rejection of modernism in the 1983 article-version of *The Rhetoric of Economics*. His criticism was that a rejection of modernism should not imply a rejection of traditional epistemology:

> For instance, no Cartesian or traditional rationalist would accept any of them. So there can be no general presumption that to reject modernism is to abandon the old search after truth by methods grounded in traditional epistemology (Hollis 1983, 2).

The criticism of Hollis amounted to that of Hausman and McPherson (1988): his problem was that the rhetorical approach has no epistemology, in other words, no methodology to determine truth.

But according to McCloskey, epistemology itself, the philosophy of knowing, is the root of the problem (1994). What Hollis meant by epistemology presupposes the existence of an objective form of truth, while she presupposes merely a pragmatic form of truth, like that proposed by Rorty (1979) and his predecessors in pragmatic philosophy. Given her position, it makes sense to distance oneself from strict methodology, just like the anti-methodology standpoint that Feyerabend proposed. Nevertheless, the methodologists of economics see rhetoric as a part of methodology. But McCloskey has no wish to be part of methodology, because the current philosophy of science cannot deliver a standard to which argumentation can be held.

Anti-philosophy and the Moral of Rhetoric

Arjo Klamer has explained the dispute between methodologists and rhetoricians as a matter of different perspectives:

> Since this linguistic turn the books of conventional methodology are gathering dust on my shelves and I had to gather an entire new selection

> of books for my library. [. . . .]. We not only use different concepts, ask different questions, but we also read a different literature and relate to different texts. [. . . .]. The critics turn out not to have read Aristotle, Perelman, Toulmin, Foucault, Booth, Rorty and so many others who have written about rhetoric and discursive practices. It's no wonder, therefore, that we have such a hard time communicating (Klamer 2001, 73).

How did McCloskey compare rhetoric to philosophy? McCloskey saw positivism as a reaction to German idealism. Logical positivism was meant to end speculation on metaphysics. But not talking about metaphysics did not make it disappear. She saw rhetoric as a replacement for the current philosophy: 'We need a new philosophy, or anti-philosophy, to understand economic science as she actually works. The form of anti-philosophy recommended here is the oldest one, "rhetoric" (McCloskey 1994, xiii).' She had no need of a methodology: 'An economic methodology "based" (that hopeful word) in philosophy [. . .] is too thin to work (McCloskey 1994, 86).' Moreover, the accounts of economics within macro-economics are plural: the neoclassical school, the Austrian school, the Institutionalists, and the Marxist have divergent starting points. The starting points are decisive turns within economics and determine the way of looking.

According to McCloskey, German idealism has now returned in a more mature version, as pragmatism or rhetoric. Rhetoric has the advantage that it is interpretative and introspective about metaphors and stories. Idealism in such a way is based on social discourse. In the end, the philosophy of economics is about morality, an intention which a number of philosophers of science share with her. McCloskey urged a *Sprachethik* in which the ethical side of a conversation is stressed: '[. . .] speech morality, the ethics of conversation. [. . .] Don't lie; pay attention; don't sneer; cooperate; don't shout; let other people talk; be open-minded; explain yourself when asked [. . .] (McCloskey 1994, 99).' Modernist science does not fulfil conversational demand, also because morality is seen as mere preference (McCloskey 1994). The discipline of rhetoric, in the spirit of the Roman statesman and author Cato of 'v*ir bonus, dicendi peritus,*' 'a good man, skilled in speaking,' seems a promising alternative to the philosophy of economics.

5.3 Metaphors and Stories

The Rhetorical Tetrad

McCloskey's interpretation of rhetoric combines the tools of classical rhetoric with those of literary criticism. Literary criticism enables one to bridge the gap between literature and science: 'The scientific report is itself a [literary] genre, whose conventions have changed from time to time (1990, 30, my insertion).' Her literary approach is adapted to the specific nature of economic literature: 'Economics may be like poetry in this or that important respect, but plainly it is not the same (McCloskey 1994, 44).' Central to rhetoric is the art of argument that is skilfulness in using reasons to show that something is true or correct. Rhetoric is used by all economists: 'Rhetoric is unavoidable. An economist or historian cannot avoid writing rhetorically since any argument has a rhetoric, a style of argument, taking "argument" to mean "any designs on the reader" (McCloskey 1990, 56).'

She explains her approach of the rhetoric of economics by the rhetorical tetrad, consisting of four elements: fact, logic, story, and metaphor. All these elements help in exploring economics (1994). The key point of the tetrad is that economics must be based on more than fact and logic, on which current economics is centred, because of its modernist background: 'The choice to have high standards of logic, low standards of fact, and no explicit standards of metaphor and story is itself a rhetorical one. It depends on the audience of economic scientists (McCloskey 1990, 23).' Thus, economists lack self-awareness in their use of metaphors and stories. To the concept of storytelling a modernist would respond that a real scientist just *finds* the story, so science is about reality and not 'made up' like fiction. But by just telling the story like it *is* reality, the modernist economist avoids the responsibility of examining his perspective. Denying the existence of a perspective means to deny that people, not the external world, make stories. Economists deny the use of the metaphor in the model as well.

A feature of the rhetorical tetrad is that each of its parts limits the possible excesses of the other parts. Metaphors and stories are the two

ways of answering the question 'why?' Metaphors and stories in economics can criticize each other, and co-exist. An allegory integrates metaphor and story. Following the empiricist tradition, a model and a story are to be checked by the facts. So facts limit a model and a story. Logic also has its role. In the spirit of rationalist tradition, models and stories need to be investigated by logic for their consistency. Yet, a narrow focus on logic and facts can lead to bad science, just like a narrow focus on story and metaphor could.

The metaphor is very relevant in economics because the economic models are to be seen as metaphors. The choice of a metaphor in economics reflects a worldview of a school of economics and is a figure of thought, not merely a figure of language. McCloskey proposed as a definition for a metaphor, that it brings together 'two separate domains into cognitive and emotional relation by using language directly appropriate to the one as a lens for seeing the other (Black, M 1962, *Models and Metaphors*, 236 cited in McCloskey 1990, 12).' Another definition of a metaphor is: 'Changing a word from its literal meaning to one not properly applicable but analogous to it: assertion of identity rather than, as with simile, likeness (Lanham 1991, 100).' Besides using metaphors in the usual sense, the economist uses them in the form of the economic models: 'The market for apartments in New York, says the economist, is "just like" a curve on a blackboard. No one has so far seen a literal demand curve floating in the sky above Manhattan. It's a metaphor (McCloskey 1990, 1).'

Metaphors in the form of models work best in economics for making standard predictions, for example how higher interest rates affect housing prices. A metaphor is not 'true' in the sense that it corresponds with the external world as in the correspondence theory of truth: it is merely useful for a purpose. A problem arises when metaphors are taken literally. Then metaphor becomes identity: instead of one of the possible perspectives, the metaphor becomes the only perspective and absolute.

Besides using metaphors, an economist tells stories: 'Plainly and routinely, 90% of what economists do is such storytelling. Yet even in the other 10%, in the part more obviously dominated by models and metaphors, the economist tells stories (McCloskey 1990, 16).' Indeed,

economists explain their models in the more accessible form of a story or a narrative. To find stories in economics is easy:

> The actions of an economistic folklore are few: entry, exit, price setting, orders within a firm, purchase, sale, valuation, and a few more. [. . . .]. Economists say over and over again, 'action X is just like action Y'[. . .] (McCloskey 1990, 24).

The story is a fiction, constrained by, and underdetermined by facts. Just like metaphors, stories are selective, because they focus on what is important. Storytelling as such is scientific. Storytelling works best at understanding something that already happened (for example, explaining the economic depression of the 1930s), but is used for predictions as well. Economists themselves do not always realise that they are telling stories. Rhetorical criticism sensitizes us to the possibility that a writer, possibly unconsciously, tries to make us look in a particular way. Stories can also be dangerous for the public which takes the economic stories literally.

Metaphors and Stories in Investment Theory

We now apply McCloskey's rhetorical approach to investment theory to discover the main metaphors and stories in Markowitz's theory, the CAPM, theories of uncertainty, and the alternative investment theories of heterodox finance. The main metaphor in Markowitz's investment theory is the claim that investment management *is* mathematical statistics. The application of mathematical statistics assumes calculability and distracts the attention from uncertainty. The metaphor of mathematical statistics makes us see *only* through the perspective of calculability: it makes us think in terms of probability distributions, correlations, criteria for efficiency, and algorithms as the necessary elements. The second metaphor in Markowitz's theory is the machine. The machine metaphor, a well-known form in management theory and indeed in political theory and sociology generally,

can be recognized in the language of, and aspiration to efficiency. 'Efficiency' in Markowitz's theory means that an investment portfolio has a maximum return given a level of risk. The machine metaphor implies that risk and return can be optimized by precise calculations, which can and should determine the composition of the investment portfolio.

Both the metaphors of mathematical statistics and the machine underplay the importance of the *beliefs* on risk and return. Beliefs are viewed as merely input for the theory. Moreover, beliefs cannot be seen as a problem once the jump to mathematical statistics has been made. The machine metaphor focusses on the *process* parts of reaching efficiency, such as the efficiency criteria and the algorithms, and beliefs are treated merely as inputs for the calculating machine.

Markowitz's metaphor of mathematical statistics in story form is that applying mathematical statistics is a sensible and sophisticated thing to do: statistics allow you to engineer your investment decisions like an actuary manages an insurance portfolio. It is superior to a less sophisticated quantitative or qualitative approach. A second story is that the theory finds an efficient trade-off in risk and return by running its algorithms. Before Markowitz there was no 'efficient' frontier of risk and return: investment portfolios are to be directed towards the efficient frontier.

The dominant metaphor in the CAPM is the equilibrium: the market of investments is in balance because of informational efficiency and rational expectations. In equilibrium, risk and return have become predictable. Equilibrium and predictability are exchangeable. The second important metaphor is the informational efficiency. It is again a machine metaphor, but now concerning the processing of information. Because of informational efficiency the market of investments is at any time in balance: new information is immediately being processed into a new equilibrium.

A dominant story that pervades modern investment theory is the idea that running a risk should receive a reward. Thus, stocks should earn a premium, also known as the risk premium, above the risk-free rate, because investors are risk averse. Besides the rational constructivist point of view, historical evidence is used. For example, Jeremy Siegel (1994) analysed that stocks earn a risk premium in the long run over a period of

20 years. To repeat, the rationale of rising stock prices could, say, be that if the economy grows, profits of stocks as a subset of the economy could grow as well, and if the valuation of the stock remains constant, then prices of stocks should go up. But things can go wrong as well, and therefore the past does not need to resemble the future.

Apart from informational efficiency in story form, the dominant story in the CAPM is that an optimal portfolio is no longer at the Markowitz efficient frontier of risk and return, but a combination of the risk free return and the market portfolio. The market portfolio consists of all securities, which are correctly priced, so no advantage can be gained by choosing another portfolio. Another important story is that diversifiable risk does not deserve a reward: only the exposure to the undiversifiable risk is rewarded.

The metaphors and stories of the current investment theory are persuasive because financial economists have been trained to accept the ideas of equilibrium and calculability, which belong to mainstream neoclassical economics. But investment theory, especially the CAPM, is to be seen as an ideal type: informational efficiency in combination with rational expectations seems utopian.

Let us now investigate the metaphors of the opponents of predictability in economics and investment theory. Knight proposed the metaphor of economic phenomena behaving like an organism: the organic includes the aspect of change of economic phenomena. An organism adapts to new, unforeseen circumstances, whilst a mechanism adheres to strict rules. Keynes illustrated the functioning of a financial market using the metaphor of a beauty contest. To win the contest, a participant has to predict which face the *other* contesters will choose. The metaphor of the beauty contest stresses how human interacting works, and opposes the valuation theory, in the sense that valuation is not fundamental but constructed in the beauty contest. A related metaphor of Keynes summarizes how to act under uncertainty and formulates an efficient market theory *without* some form of equilibrium mechanism: Keynes's efficient market theory leads to the conclusion that financial markets are instable. Von Mises stressed that causes are teleological instead of mechanical: teleological does not mean here 'the striving towards a collective equilibrium,' like in the

CAPM, but the striving of many individuals for their goals, which results in unpredictability. McCloskey highlights that predicting in economics is magical. Magic persuades people, because they believe the narrative of expertise. Taleb uses the metaphor of the black swan, which is a rare, very influential, and unpredictable event. The metaphor of the black swan stresses the fallibility of induction on which investment theory founds the probability beliefs of its models.

Alternative investment theories have, of course, metaphors to their aid as well. The ideological criticism of investing equates investing with gambling. By saying investing is gambling the dark side of investing is highlighted, including manipulation and fraud, which can be part of investing. The metaphor of Galbraith, Minsky, Kindleberger, and Shiller is that financial markets are like bubbles which can burst. A bubble consists of nothing but air and can suddenly burst, but as long as it lasts it can fascinate. A bubble is reinforced by lending and self-reflexive social mechanisms, but is not grounded in economic facts, so it bursts, sooner or later. Mandelbrot proposed wild instead of mild randomness as the metaphor for financial markets, and therefore that investment theory needs an alternative statistical theory. The metaphor employed is the fractal, a small geometric form which accumulates to some complex phenomenon, which translates into the Pareto probability distribution that has a long, risky, fat tail. Behavioural finance equates decision making with actual human behaviour instead of the behaviour that economic rationality would demand. The metaphor is that investing is irrational human behaviour. Evolutionary finance employs the metaphor that financial markets are an evolution: financial markets develop out of the interaction of actions of participants and can have surprising outcomes.

In the next chapter, the metaphor of investing as culture is explored, and other metaphors could be interesting as well, such as that investing is a 'power relation' analogous to the agency theory of Jensen and Meckling (1976), which will be discussed in the next chapter in one of the cases of innovative investment practice.

The metaphors of uncertainty economics and alternative investment theory highlight other aspects of investing than the current investment theory does, and reveal its weak spots.

5.4 Virtues

Because the theoretical reason of investment theory results in weak outcomes, the practical reason should dominate in decision making. Practical reason is about introspection, values, and ethics. McCloskey (2006) favours bourgeois virtues as a balanced system of ethics. McCloskey investigated the role of virtues of our capitalist, bourgeois society in the tradition of Adam Smith (1790). In Greece of the antiquity, Aristotle (1908) laid the foundations of virtue ethics in *Nicomachean Ethics*. The seven virtues that McCloskey distinguished, consist of four pagan virtues: courage, temperance, justice, and prudence, and three Christian virtues: faith, hope, and love. A virtue does not tell you what to do, but is about character and is relevant to all kinds of situations: 'A"virtue" is a habit of the heart, a stable disposition, a settled state of character, a durable, educated characteristic of someone to exercise her will to be good (McCloskey 2006, 64).' Virtue ethics contrasts with modernist ethics because virtue ethics is grounded in human nature and tradition, instead of in subjective utility or abstract reasoning (Audi 1995). Subjective utility founds the ethics of economics. In the virtue system of McCloskey, thinking in terms of utility belongs to the virtue of prudence, which is the main virtue of neoclassical economics. By prudence or *phronesis* she means practical wisdom, know-how, or common sense (2006).

But economics should be more than prudence, which also represents ethics in investment theory. Not all virtues seem applicable to investing, for example faith and hope seem less relevant for such a secular activity. Let us illustrate what other virtues can mean for using investment theory. Investing is often done with other people's money. The virtue of temperance is about individual balance: temperance demands self-control and epistemological humbleness of the people who decide on investing or research on investment theory. Temperance means that investment professionals and researchers should not gamble: with leverage it is easy to gamble in investing, but it takes merely a financial crisis to put investment strategies to a stress test, resulting in the destruction of wealth. Justice is about social balance and demands, like the virtue of love, to care for the

owners of the managed investments. The clients often do not have the knowledge on investing that the investment professionals possess: that makes the clients vulnerable. But it cannot be fair that the epistemological uncertainty of investing is transferred to the clients. So, investment managers should be open about the uncertainty, be humble, and take as good care as possible of the client's money.

Following McCloskey's discourse analysis of economics, the new rhetoric for investment theory requires qualitative judgment based on intellectual honesty, insight in its rhetoric, and bourgeois ethics. Because investing takes place under Knightian uncertainty, statistics are supportive rather than dominant in decision making. And alternative investment theories, heterodox finance, as treated in Chapter 3 should be part of the discussion. So, investment theory should become more of a moral science and less an engineering one: it is about judgment, combining virtues with historical and theoretical insights. Of course, no fixed methodology should exist in the domain of the practical reason either, so virtues open interesting possibilities beyond the one-sided solutions of prudence-only or other monolithic modern ethical theories. In the next chapter the culture of investing and innovative cases from practice will be central. The perspective of culture is both a natural extension of rhetoric and uncertainty.

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6

The Culture of Investing

6.1 Culture, Economics, and Finance

The Relevance of Culture

Mainstream economics and finance seem to ignore culture, as we will discuss in the current chapter. The education of economists neither leaves culture out, nor is culture an explicit part of financial education; no wonder, economics and finance are modelled on physics, which indeed does not need culture as a source of explanation. In line with the modelling of economics after physics, the philosophical context of modernism has caused economics and finance to avoid the human part of reality, such as values, ethics, and culture:

> By 'modernism' we mean the claim to practise science as we understood the term in secondary school. Extract from life if you can what is historical, value-laden, judgmental, ethical, cultural, tacit, skilful, smooth, curved – 'all things counter, original, spare, strange'; and what will be left is modernism. It consists of the simpler parts of science and scholarship. Modernism [. . .] has urged us to leave strictly to the side the matters of moral force and human meaning (Klamer and McCloskey 1992, 156).

T. Pistorius, *Heterodox Investment Theory*,
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By relating culture to economics, Klamer has posed a question in the Weberian tradition of distinguishing between procedural and substantive rationality (Klamer 2014). Economics is about procedural rationality, culture is about substantive rationality. Both substantive rationality and culture are centred on values, that is answer to the question 'What is important?' Sociology, anthropology, and philosophy include the perspective of culture. The inclusion of culture in economics could yield a richer economics as well. For example in decision making, economics and finance rely on the calculations of rational choice, though the notion of culture begs for the alternative of phronesis, that is the practical wisdom to do the right thing:

> Economists embrace the idea [of means to an end, measured in utility] because it enables them the modelling of decisions in the form of mathematical equations. The modelling gives the idea the aura of 'science.' The idea of phronesis makes us realize that too much is involved in doing the right thing, that calculation is therefore nigh impossible, and modelling quite hopeless (Klamer 2014, 27, my insertion).

In addition to values, Klamer's cultural approach of economics emphasizes conversation as a way to interpret culture. The point of using conversation to understand investment theory can be illustrated by the role of talk in the stock market:

> The chatter in the stock market (that ideal of a marketplace) is another example of persuasion in the economy. Portfolio managers talk full-time to decide on buying or selling. Stockbrokers talk to clients and to each other. Technical elves spend their days researching the thoughts the brokers ought to have. Journalists spend their careers reporting the talk on Wall Street, elvish or human (McCloskey and Klamer 1995, 194).

McCloskey and Klamer stressed the logic of talk instead of computation, because people make judgments and persuade each other whether a piece of information is knowledge. The importance of talk contrasts with a main theme in investment theory, that of informational efficiency by which financial markets reflect all available information. But as discussed

in Chapter 2, full immediate reflection of information is merely possible for obvious facts, because only then information can be processed mechanically without judgment.

Klamer's View of the Culture of Economics

The fact that economics ignores culture, does of course not mean that economics has no culture. In the current chapter, we work along the lines of Klamer's (2001, 2003, 2006, 2007, 2014) approach of the investigation of the culture of economics, which also fits investment theory because it is a part of economics, also known as financial economics. A difference between Klamer's and the current investigation is that Klamer investigates the culture of academics and we investigate the culture of the investment practice of institutional investors. What is culture? Culture constitutes the partly tacit social behaviour of a group, described by Klamer as:

> [...] culture denotes beliefs, customs, values, emotions, stories, and sentiments that every member of group (Balinese men, Italians, academic economists) have in common and, crucially, by which they distinguish themselves as a group (Klamer 2007, 39–40).

Klamer's cultural approach fits in with McCloskey's rhetorical approach; rhetoric has been Klamer's starting point as well (1988, 1992, 1995 with McCloskey). Within the cultural approach Klamer concentrates on values and conversations. Values, or what is important, typify a culture and can be of a moral, social, and cultural character – though originally, value is an economic notion (Klamer 2003). Value was a topic of debate in classical economics: is value about the exchange for labour (as Marx thought), or about the subjective value for individuals (like the marginalists proposed)? In an effort to combine both theories, Marshall proposed that value arises out of the interplay between supply and demand. In the language of economics values are called preferences, which are exogenous, given. Yet, the reduction of values to mere preferences, and the translation of preferences into utilities, is not what happens when

important decisions are made in real life, because values matter in decision making: 'The consideration of values makes better sense of the process of choosing and acting, at least I will so propose (Klamer 2003, 192).'

Besides values, Klamer uses the metaphor of conversation to understand the culture of economics:

> This book [Speaking of Economics: How to Get in the Conversation] is the result of my finding out what it is that economists do, what makes the science of economics tick. The main point: *think of economics in terms of a conversation, or, better yet, a bunch of conversations* (Klamer 2007, xiii–xiv, his italics and my insertion).

Contrary to the academic ideal of truth, conversation as a metaphor reveals that truth is secondary (Klamer 2007). Conversations are highly disciplined, and for that matter 'Conversations constrain what we are able to say (Klamer 2007, 26).' A feature of a conversation as a metaphor of culture is that it has a core which is stable for a lengthy period. Another feature of a conversation is that it discovers and develops. Conversation resembles Kuhn's (1962) paradigm, though the metaphor of conversation offers a language-oriented perspective, instead of a science-oriented perspective. The notion of conversation has been among others discussed by Rorty (1979). Although a conversation resembles rhetoric, Klamer prefers conversation because it relates to a community:

> [...] I prefer the metaphor of conversation. Seeking conversational commonalities is not a persuasive process but rather an attempt to find the expressions for my ideas to be heard. Conversation stresses the cooperative, the sharing of ideas, the identification with others (Klamer 2007, 25).

Besides oral conversation, conversation mainly consists of individuals dealing with texts, such as articles and books. The past conversations are relevant to a better understanding of the current conversation and reveal

options for a future conversation, as illustrated in Chapter 2 of the current book on the history of finance.

Notions of Culture: Klamer and Hofstede Compared

We will now compare Klamer's view on culture with that of Hofstede et al. (1997), who has compared organizational cultures between countries. More in-depth, culture has according to Klamer three meanings, which we will quote at some length:

1. Culture in the anthropological sense [. . .] connotes the stories, history, expectations, artifacts, symbols, identities and values that a group of people shares and with which they distinguish themselves from other people. In this sense a family, company, city, region, ethnic group, nation, and continent can be said to have a distinct culture. Having a culture implies having the possibility to share the meanings of life with others. [. . . .].
2. When the Germans write *Kultur*, they indicate the second meaning of culture: here culture connotes civilization usually expressed in the accumulated achievements of people in a certain region over a long period of time in the arts, the sciences, technology, politics, and social customs [. . .]. [. . . .].
3. In common parlor culture refers often to just the arts, sometimes including design, architecture and certain crafts [. . .]. [. . . .]. (Klamer 2014, 7–8, his italics).

Klamer's first meaning of culture is relevant for the analysis of economics and investing, and overlaps with Hofstede's notion of culture as a collective phenomenon:

> Culture is always a collective phenomenon [. . .]. Culture consists of the unwritten rules of the social game. It is *the collective programming of the mind that distinguishes the members of one group or category of people from others* (Hofstede et al. 2010/1997, 6, their italics).

Hofstede described national cultures using four categories: values, heroes, rituals, and symbols (Hofstede et al. 1997). Values form the centre of a culture, and symbols its outer layer. Heroes are the role models of a culture. In investment practice, successful investors are role models, such as Warren Buffet and George Soros. In academic finance, heroes are for example Markowitz, Sharpe, Fama, and Merton. Rituals are social activities which a culture regards as essential, such as ceremonial meetings, and discourse, of which the current book provides an analysis. Heroes, rituals, and symbols form the visible practices of a culture. In Hofstede's categorization, Klamer's approach to the culture of economics focusses on values and the conversational part of rituals.

Culture and Uncertainty: Hofstede's View

Hofstede has investigated cultural differences between countries in a research project for IBM. His explanatory model of culture has four dimensions (Hofstede et al. 2010/1997, 31):

1. Power distance
2. Collectivism versus individualism
3. Femininity versus masculinity
4. Uncertainty avoidance.

The way a culture handles uncertainty is a part in Hofstede's explanatory model. He claimed that countries differ in the way uncertainty is experienced and handled. Hofstede's dimensions and findings were debated by for example McSweeney (2002), see also Magala (2004), but his criticisms on the model are out of scope for this book. Yet, Hofstede's notion of uncertainty is relevant: if uncertainty relates to culture, culture could explain why and how investors cope with the uncertainty of investments. For Hofstede, uncertainty is a feeling of anxiety and a part of culture since the dawn of civilization. Civilizations have invented numerous ways to cope with uncertainty: 'Every human society has developed ways to alleviate this anxiety. These ways belong to the domains of technology, law, and religion (Hofstede et al. 2010/1997, 189).' Technology has been

directed against natural uncertainties, law against behavioural uncertainties, and religion against transcendental uncertainties. In investment theory, the technology of statistics treats uncertainty of the future outcomes of financial markets as if returns are a piece of nature 'out there.'

As a matter of culture, uncertainty avoidance begs for predictive ability by some method:

> *Uncertainty avoidance* can therefore be defined as *the extent to which the members of a culture feel threatened by ambiguous or unknown situations*. This feeling is, among other manifestations, expressed through nervous stress and in a need for predictability: a need for written and unwritten rules (Hofstede et al. 2010/1997, 191, their italics).

The psychology of uncertainty avoidance is that the method of handling uncertainty transforms uncertainty into a specified risk, which could imply two things: anxiety changes into a worry which is focussed on the risk, or anxiety disappears. Using a predictive method such as stochastical prediction handles uncertainty by replacing the feeling of uncertainty with a rational, technical method. Thus, risk per se is not the problem of uncertainty: the ambiguity of uncertainty is the reason of anxiety. Ambiguity aversion is also a subject of behavioural finance. Ambiguity aversion demonstrates why people prefer objective over subjective probabilities (Ellsberg 1961).

Culture and Uncertainty: Schön's View

Donald Schön (1970) regarded uncertainty and the quest for certainty, the stable state, as a central notion in human life. Culture creates stability and is a response to uncertainty. He perceived the aim for a stable state in both the secular and the personal domain. In the personal domain, humans tend to regard their identity as fixed when they say 'I am Dutch,' 'I have studied economics,' or 'I am a banker.' The belief in the stable state provides for a need: 'Belief in the stable state is central, because it is a bulwark against the threat of uncertainty (Schön 1970, 1).'

The belief in internal or external stability constructs stability. According to Schön humans try to compensate for uncertainty in one domain with stability in another, say, compensating the instability of being an artist with a structured way of life. When big changes occur in a society three destructive reactions can occur: regression, revolution, and apathy:

> There are a variety of responses to loss of the stable state. Some of the responses are anti-responses, versions of a refusal to recognise it, and they are destructive in character. One of them takes the form of a return. The idea is: let us return to the last stable state, to the way it used to be. [. . . .]. There is a form of revolutionary response whose war-cry is total rejection of the past, but in such a fashion that the past is permitted to creep in by the back door [. . .]. There is a third kind of response, which is mindlessness (Schön 1970, 6).

How about a constructive response to change? A constructive response is to learn how to adapt as a way of managing the change. My view on investing is that both the negative and constructive reactions to the economic and societal changes after the credit crisis of 2008 can be recognized in the behaviour of institutional investors: outright denial of the crisis, or trying to learn and improve behaviour. According to Schön, the solution to cope with uncertainty has to be accepted at both the personal and the institutional level.

6.2 Values, Decision Making, and Phronesis

We will now proceed by explaining how Klamer regards values and conversation as constitutive of decision making. Values and conversation are no part of the decision making in economics. The ethics of economics is reduced to rational decision-making by calculating the maximal utility. The reduction of ethics to rational, utilitarian decision-making was a result of scepticism on ethics. Finance follows the mechanical approach of economics, witness Markowitz (1952, 1959). In decision making, conversation is an alternative for calculation, which then functions merely as the input for discussion. It is from

deliberation between people that most decisions are being made. Why is deliberation necessary? Could we not make a computer program in which we place all the inputs and calculate the outcome? The current book has stressed that the knowledge on the future is partial because of external uncertainty. Though, even if external certainty is a reasonable assumption, like in designing a bridge, the purpose, costs, design, aesthetics, etc., have to be deliberated as well. We could say that *internal* uncertainty characterizes ethical deliberations, which needs to be explored by talking: 'A reason to focus on the talking is the instability of the ethical categories (Klamer 2009, 452).' The cause of instability is that values around which the decisions are made, must be interpreted within their situation.

Knowing a culture means knowing its values, which enhances decision making by deciding which values are appropriate for the situation at hand. A value is not a means, but an end, a goal in itself. In brief, a value answers the question 'What is important?' As a source of values, Klamer (2014) proposes the *oikos*, the home. He uses the oikos as a metaphor for the values that a person, an organization, or a society strives for: oikos is more important than its translation into numerical entities in economics and in the market. In Klamer's words: 'Doing the right thing is realizing our oikos, or whatever else we value (2014, 7).' Because values are part of culture, culture is important in economics too. Klamer proposes to use *phronesis* or practical wisdom as a way of decision making involving values. Phronesis here has a broader meaning than utilitarian prudence in economics, as phronesis is about the goals in life:

> Practical wisdom, or knowledge of the proper ends of life, distinguished by Aristotle from theoretical knowledge and mere means-end reasoning, or craft, and itself a necessary and sufficient condition of virtue (Blackburn 2008).
>
> In Aristotle's ethics it [phronesis] is the complete excellence of the practical intellect, the counterpart of *sophia* in the theoretical sphere, comprising a true conception of the good life and the deliberative excellence necessary to realize that conception in practice via choice [...] (Taylor, CCW in Honderich 2005, their italics, my insertion).

Klamer uses phronesis in the Aristotelean meaning. The difference between the prudence of economics and the phronesis of Aristotle is that prudence of economics is reduced to self-interest, while Aristotle seeks the middle ground between self-interest and altruism.

Besides making decisions, *phronesis* is about the practical wisdom to *realize* values. Realizing values starts with being aware of the values. Klamer's approach brings to mind Karl Weick's (2001) ideas on sense making within organizations under uncertainty. Weick illustrated that sense making is not like breaking the code in a game of Mastermind, but more like designing a map to make the world understandable from the perspective and the purpose of the maker. Yet, decision making in neoclassical economics does resemble a game of mastermind, in which one solution is available by acting rationally. Sense-making in cartography, allows, however, many solutions because it is based on imagination within a social context.

How does Klamer's notion of values relate to McCloskey's approach of virtue ethics? Klamer says that consciousness of the seven virtues for discovering and realizing values is 'most helpful for doing the right thing (Klamer 2014, 26).' Klamer and McCloskey obviously agreed in their criticism of the monistic approach of neoclassical economics, which reduces prudence to calculating utilities. According to Klamer, virtue ethics, as discussed in the Chapter 5, is a part of the deliberation on ethics and relates to values:

> One is that virtue is a value that someone has internalized and enacts. The second is that virtuous action aims at the middle ground between two extremes, and the third is that judging virtuous behaviour requires situational knowledge (Klamer 2009, 453).

Where do McCloskey and Klamer differ? Klamer seems to pursue a Socratic approach to value, an approach to discover what is important. McCloskey's account of virtue ethics (2006) proposed seven virtues which are essential for a fulfilling life. Klamer (2014) seemingly stresses the *oikos*, which may resemble the virtue of love the most, and *phronesis*, practical wisdom, while McCloskey seeks to balance the seven virtues.

Furthermore, Klamer applies *phronesis* to the practice of decision making within families and organizations.

Both McCloskey's virtue approach and Klamer's value approach can compensate for the lack in epistemological strength in the investment theory. McCloskey tried to ensure a balanced approach by reminding us of all the seven virtues; Klamer's approach is a way of making sense for individuals at home or in an organisation, and is embedded in the virtues that McCloskey proposed. Both approaches stimulate conscious thinking on decision making. For the practical purpose of making investment decisions, formulating values within a virtue ethics context is important, though the starting point is insight and honesty about the epistemological weakness of mainstream investment theory. Merely reformulating the implicit dogmas of investment theory into values would be a mistake, and strengthen the received view of investment theory.

6.3 Methodology of the Investigation of the Culture of Investing

An analysis of culture helps to explain the behaviour of investors. The central claim here is that predictability does not apply to investing, raises the question of why investors hold on to their practices of prediction, and what constitutes the practices of investors, seen through the perspective of culture. The following section explains the methodology of the investigation of the culture of investing.

Culture of Dutch Professional Investors

The current chapter aims to describe the culture of investing by investigating the culture of Dutch professional investors. Though investing often becomes part of popular culture during a boom in the stock market, professional investors at Dutch institutions manage the largest part of the investments of private individuals in the Netherlands. At the end of 2014, Dutch pension funds managed 1.209 billion euro, which is 88% of the total invested amount of 1.379 billion euros of Dutch

private individuals and organizations (De Nederlandsche Bank 2014). Some 2.000 investment professionals work at Dutch financial institutions as measured by the combined number of members of the Dutch Association for Investment Professionals and the CFA Society Netherlands ('Vereniging voor Beleggingsanalisten' and 'CFA Society Netherlands'). An investment professional is specialized, he can for example be an asset liability management specialist, a fund manager, an analyst for segments within equities, bonds, credits or private equity, a strategist, a risk manager, or a performance analyst. In spite of the specializations of investment professionals, the chapter aims to identify what the investors share in their culture, instead of investigating the differences between the specializations.

In the practice of investment management, prediction and stochastical prediction are variations on a theme. A stochastical prediction is a product of scientific refinement, which is simplified into two dimensions in Markowitz's portfolio theory and the CAPM, or into one dimension, such as a quantitative strategy that tries to benefit from an anomaly of the efficient market hypothesis. A one-dimensional prediction can also be grounded on less complicated statistics such as long-term data, a theory of valuation, technical analysis, expectations of future economic growth, investment themes, or the central bank policy.

Ethnography Includes Personal Observations

The method of ethnography is an appropriate way to perform an investigation into the culture of a community:

> Ethnography is the art and science of describing a group or culture. The description may be of a small tribal group in some exotic land or of a classroom in middle-class suburbia. The ethnographer writes about the routine, daily lives of people. The more predictable patterns of human thought and behavior are the focus of inquiry (Fetterman 2015, 184).

Ethnography is a form of qualitative research and implies that the researcher is a part of the community to be observed, and also that he

conducts interviews and studies documents (Bryman and Bell 2003). For example, Hammersley and Atkinson (1983) take a similar view of ethnography. In the investigation we adopt Klamer's framework to focus on values and conversations. The ethnographic method is needed because the values of investors are hidden and have to be interpreted, and the conversations of investors have to be witnessed to be typified.

The ethnographic method is grounded on the insider's view, the personal experience, which makes sense since: '[. . .] climbing unknown mountains is safer with native guides [. . .] (Magala 2004, 8).' My experience as an investment professional in the Netherlands will be a source of investigation. In my professional life I have for the last 20 years been working in investment management as an investment advisor, analyst, and researcher. I performed my research activities for a large part at the Dutch fund manager Robeco. For the last 10 years, I have been working at Dutch pension funds as an investment and risk manager. In this role, I have become very familiar with the way Dutch investment professionals behave and argue. Using my experience can at the same time provoke the possible objection of personal bias. The investigation into the culture of Dutch investment professionals uses, however, a variety of sources that is interviews, literature, and the material in the book, which are assumed to balance the analysis.

Interviews

Besides participative observation, interviews are a source of ethnographic investigation. I conducted a number of interviews with professional investors in the Netherlands which serve as background material for the investigation into culture. In ethnographic research finding 'key actors' is essential in order to gain insight into the culture of a group:

> Some people are more articulate and culturally sensitive than others. These individuals make excellent key actors or informants. [. . . .]. Key actors require careful selection. They are rarely perfect representatives of the group. However, they are usually members of the mainstream – otherwise, they would not have access to up-to-date cultural information.

> Key actors may be cultural brokers, straddling two cultures. This position may give them a special vantage point and objectivity about their culture (Fetterman 2015, 187).

The interviewees chosen can be regarded as key actors in the Dutch world of institutional investors. They are experts on innovative approaches in investing, and try to cope with the problems of stochastical prediction or the culture of investing in general. The choice for focussing the interviews on experts on innovative approaches has the advantage of gaining a contrasting expert view on investing, and thereby on its culture. At the same time, it is also relevant for the book to find how the investment practice handles uncertainty in other ways than prescribed by investment theory and by other traditional investment practices.

Concerning the interviews, a qualitative, semi-structured approach has been taken. Its intention is to get 'rich' answers (Bryman and Bell 2003). Rich answers are useful because values and culture are hidden. To validate the interviews, the resulting interview text has been reviewed by the interviewee. The interview questions were:

1. How would you describe your investment approach, and which elements play an important role in it?
2. What is the difference between your approach and the standard investment approach based on modern investment theory used by Dutch institutional investors?
3. How did you come to your investment approach?
4. Which parts of the non-mainstream investment theory are neglected in investment practices?
5. How important is statistics for your approach, and what role do statistics play?
6. To what extent does your approach predict investment returns?
7. What are your experiences with your approach in the institutional practice?
8. How could the existing culture of investing be changed in your opinion?

9. To what values or virtues should investors pay more attention in their investment decisions in the future?

A particular study of internal documents could also have been a part of the ethnographic investigation. I have not explicitly used the source of internal documents, because such documents are undisclosed. Though, as an insider I am very familiar with such internal documents, hence they function as background knowledge.

Literature on the Culture of Investing

The investigation into the culture of investing is, however, not necessarily restricted to the ethnographic method of participation. We will for example also refer to literature on investing to enrichen the notion of the culture of investing. The literature of De Goede (2005), Preda (2006), Galbraith (1954), and Shiller (2000) is well suited for the culture of investing. The purpose of discussing their books is to typify the culture of investing, and discover the values and conversations of investors. The works of De Goede (2005) and Preda (2006) investigate the start of the current investment theory and its contrast with the earlier notion of investing as gambling. De Goede en Preda were also treated in Chapters 2 and 3. Galbraith (1954) wrote a telling book on the stock market crash of 1929 and its aftermath. Shiller (2000) has investigated bubbles on financial markets and their (cultural) causes. The other chapters of the book are, of course, a relevant source as well. To my knowledge, there is no literature on the culture of Dutch professional investors at pension funds.

Because we focus on the culture of Dutch professional investors at pension funds, we will not discuss the literature that discusses the culture of investment banking that is the culture that is associated with the culture of 'Wall Street.' Though both Dutch professional investors at pension funds and investment bankers deal with financial markets, the culture of Wall Street is in my opinion not representative for Dutch professional investors: a pension fund and a commercial American or

global investment bank act in different environments. The reader interested in the culture of Wall Street is referred to Michael Lewis (1989, 2010), Gillian Tett (2009), or Karin Ho (2009).

Pitfalls of an Investigation into Culture

In a section on the methodology of investigating the culture of a group, the notion of culture as such needs to be discussed as well. In the following, the notion of culture will be discussed along the lines of McSweeney's criticism (2002) of Hofstede's et al. (1997) cross-cultural approach. Though McSweeney's criticism is directed against Hofstede's methodology of cross-cultural research, it can be helpful for the current investigation as his criticism has a number of generalizable elements. McSweeney's (2002) criticisms, complemented with views of Magala (2005) and Morgan (2006), and including my response, are summarized in the following.

Other factors than culture can explain actions (McSweeney 2002, 109). Instead of culture, other explaining factors of the behaviour of investors could be the need to make a living, the commercial or bureaucratic ends of an organization, power relations, constitutional arrangements, or peer group pressure.

My response: culture is to be considered as a metaphor, a constitutive perspective of looking at phenomena (Morgan 1986). Though Morgan focussed on the culture of organizations, instead of a professional group such as investors, his ideas are helpful in understanding culture as a means of investigation. Morgan (1986) identified as strong points of the metaphor of culture that it focusses on symbols, identifies shared values and beliefs, and promotes the notion of social construction. The danger of using the metaphor of culture might be that 'everything' is explained by culture. Yet, the point of using a metaphor here is that it is appropriate, not that it could prevent other ways of seeing. The limitations of the metaphor of culture will be balanced here by the outcomes of the other approaches applied, such as the rhetoric and the history of investment theory, the philosophy of

statistics, the economics of uncertainty, and, the mainstream and alternative theories of investing.

Assuming one uniform culture would disregard the diversity within the culture (McSweeney 2002, 95–96).

My response: Dutch professional investors are a rather heterogeneous group, and the outcome of the investigation does not deny diversity within the culture. The cultural picture of investing will, of course, always remain a generalization. Yet, the point of the investigation is to deliver a persuasive picture of the dominant culture of investing.

Culture is an elusive subject to grasp (McSweeney 2002, 108). McSweeney's advice is to be careful to take the outcomes of an investigation as being *the* culture.

My response: a concept such as a culture can be interpreted in many ways; the interpretation of the concept of culture does not differ from that of concepts such as freedom, rationality, or truth. So, *the* culture does indeed not exist. Klamer provides a clear approach to the culture of economics by focussing on values and conversations, which he finds relevant to economics: he does not seem to claim that values and conversations describe the entire culture and differs in that respect from Hofstede's approach.

Beliefs are not stable, but depend on the situation: so culture interacts with the changes in the environment, it is therefore dynamic (Magala 2005, 9).

My response: in the literature review the start of the current culture of investing and the culture of investors at the time of the crash of 1929 will be treated. One can wonder whether the culture of professional investors could easily become unstable after surviving the numerous financial and other crises. The culture of investing and its destiny seem to root in the continuance of our liberal, free market society.

6.4 Personal Observations

In line with the tradition of participatory research in ethnography, my observations on investment management will be used to construct a picture of the culture of investing. The picture formed gradually as it

took time to gain insight into the epistemology of the investment theory and practice. In 1991, I obtained an MSc in finance (in Dutch: drs.), and in 1999, I finished the postgraduate VBA-education, the Dutch CFA-equivalent for becoming an investment and financial analyst. In my professional life I have been for the last 20 years working in investment management as an investment advisor, analyst, and researcher. I performed my research activities for a large part at the Dutch fund manager Robeco. For the last 10 years, I have been working at Dutch pension funds as an investment and risk manager.

My research interest in investment theory has been in the mathematical–statistical analysis of investment problems which find its roots in my master thesis on alternative risk measures in portfolio theory. Besides my interest in finance, I am also attracted to the arts. In 2010, I completed a bachelor in philosophy. My book combines my interest in finance and philosophy. Besides having been a researcher with a mathematical–statistical bent and an interest in philosophy, I worked as an investment strategist and equity analyst, and have been advising on investing. Working in the practice of investment management and having analysed investment theory for practice, has taught me about investment theory, investment management, and the culture of investing.

My first experience in the practice of investing was as an investment advisor for private individuals at the ING Bank. At that time in the second half of the 1990s, share prices rose sharply: I was advising in the middle of a bull market. To be an investment advisor, one had to be in command of the arguments for buying stocks in general (the positive returns in the past, the optimistic outlook) and for buying specific stocks (what to buy and why), understand the investment instruments such as bonds and options, and importantly, follow the news and interpret the stock market. Being an investment advisor was all about information, interpretation, talk, and persuasion. Besides the bank's ideas on investing, the diversity of clients such as entrepreneurs, professors, and public accountants, taught me different pictures of investing. The thoughts of clients on investing ranged from: investing is mere speculation, the market is autonomous: the irrationality argument, investment advisors have better knowledge because they had time to study the market: the information argument, investing is about timing, about being smarter

than others: the timing argument, investing is about a rational top-down allocation: the rational construction argument, and a patient long-term approach to investing leads to the best results: the long-term argument.

In the 1990s, after a long period of price increases, most investors did not believe that stock prices could fall heavily. An older investment advisor warned me then that investment advising was a cyclical business: he had experienced the bear market of the 70s with the oil crisis and high inflation. Despite knowing about the episode, I could not imagine a bear stock market in the future. If the stock prices fell, it was an opportunity to buy, to buy on the dips. Some investors were caught in the folly of the stock market. I had lengthy discussions whether buying call options with a long horizon was a better idea than buying the underlying stocks. Indeed, on the premise of rising stock prices, leverage pays off. Buying call options with a long horizon did, of course, not turn out to be a good idea in the longer run. As an investment advisor, I have gained experience with the practice of selecting stocks for a portfolio. My experience was that the strategies based on value, growth, themes, sectors or whatever often turn out differently than expected, for example other shares performed better (such as IT stocks in those days), the portfolio contained the wrong stocks within the sectors, or the nature of a stock or whole sector changed.

In 1997, I became an equity analyst. I was convinced that being an analyst I could better predict stock prices, because I would get a better understanding of the companies involved. After a number of analyses of stocks, however, it appeared to me that more knowledge on a company did not lead to superior ideas on the future performance of a stock. The translation from analysis to advice was often done by rules of thumb, for example by comparing price-earnings ratios to expected growth rates, which could be made without the analysis as well. In order to work as an analyst, you had to believe in the idea that the analysis had value, or at least you had to enjoy studying companies.

In 1999, I continued my career as an investment analyst at the Dutch fund manager Robeco. As an investment analyst, I had the opportunity to explore the mathematical–statistical part of investment theory, and apply it to practice. I had thought about questions such as: 'How does time relate to risk in investing?,' 'Are options useful in asset allocation?,'

'How is risk perceived?,' 'How to measure risk?,' 'Does diversification pay off?,' and 'How to establish an expectation for future returns?' I experienced that the mathematical–statistical approach delivers insight on the mechanisms it studies, which has value as a way of interpretation, of understanding. I have also learnt that the investment industry upholds a number of myths that seem to be believed by most investment professionals. I mention a number of them in the following.

A Long Investment Horizon Diminishes Risk
Yet, investment risks are not smaller but larger with a long horizon, unlike what is often thought. As explained in Chapter 2, risks add up on a longer horizon: the notion of more risk opposes the belief of investors that getting results from investing is merely a matter of time.

The Diversification of Investments is the Key to Reducing Risk
But the effects of diversification within and across asset classes are a myth: in times of crisis, it will not work because the correlations between assets and asset classes converge to one. Moreover, the rationale behind low correlation coefficients is often not based on economic rationale.

In the Long Term an Investment Portfolio will Achieve Its Expected Return
If the expected risk and return *could* be estimated, then it is unlikely that the expected return on equity would be achieved in the long term. Expected returns are almost never met simply which can simply be explained by the theory of statistics. Suppose we know that the expected return on equities is 10%, then the probability is 50% (at each horizon) that the return on equities is 10% or more. However, a yield of less than 10% also has a probability of 50%.

In the beginning of the 2000s, the bubble in the stock market started to burst. For the first time, I started to doubt that investing in stocks would always lead to a superior return above bonds. Since the bursting of the internet bubble and the three negative stock market years of 2001–2003, I finally stopped believing that stocks would always yield more than bonds. The belief that stocks yield more than bonds,

appeared to be an unconscious assumption of the investment world and its theory. I realized that the equity premium above risk-free bonds was uncertain, and possibly not even positive. Obviously, personal experience changes beliefs.

At that time it also seemed to me that investing in a broadly diversified investment fund was a better idea than investing in a particular portfolio. But I no longer believed in an active policy of the fund manager of the fund. No doubt, fund managers themselves believe that they can outperform the market, of course, if you do not believe that, you cannot be part of the culture of investing. I remember that a fund manager was under pressure, because one of the flagship funds under his management, underperformed for a number of years. The fund manager asked, in order to cope with the criticism in the weekly meeting of fund managers and research analysts: 'Who does not believe in outperformance?' Of the 100 people or so in the meeting room nobody raised his hand, nor did I. The fund manager thus concluded: 'Fine, so that issue is settled.' If we all believed in outperformance, than the flagship fund would eventually be all right, if merely given some time. I could have raised my hand in that meeting, but in the culture of investing, at an active manager, that would have been unwise. You have to believe in outperformance to be part of the culture of investing at an active fund manager.

I have also been an investment strategist at the fund manager, while continuing to do analytical work. Maybe, the perspective of looking at the financial markets as a whole including the economy, and trying to say meaningful things about it, could improve my insight into the financial markets. As an investment strategist, getting an idea of the direction the economy was taking, was the key thing: it was all about the business cycle, recessions, and the central bank decisions concerning interest rates. But being an strategist also meant that one could orientate broadly and eclectically, for example consider Minsky's model of boom and bust, societal trends, innovation, politics, and models composed of indicators on valuation, technical analysis, momentum and the like. Yet, despite that it was interesting to study economic phenomena, it did again not take long for me to conclude

that the development of the economy is not predictable, just like the financial markets are not predictable.

Since 2005, I worked as an advisor to the boards of pension funds dealing with investment and risk decisions. I have, for example, participated in more than 100 meetings of investment committees in which professional investors and trustee participated. In such meetings investment policy is discussed, varying from asset liability management studies which support the long-term asset allocation decisions to short-term tactical decision making, with discussion on what the economy, the stock market, or the interest rate were going to do. My observation is that the culture of investing of pension funds in the Netherlands is not that different from the investment culture of a commercial fund manager. The biggest difference is that commercial reasons can influence the behaviour of investors at a fund manager: it can push people to be more optimistic on investing. Another observation is that the changing of the investment climate after the crisis of 2008 did not really change the culture of investing.

To summarize my ideas on the beliefs of the institutional investment community in the Netherlands:

1. Optimism that stocks will outperform bonds. The optimism continues in a bear market
2. More general: the economy and the financial market will return to an equilibrium
3. It is possible to outperform a market index, but it takes expert knowledge
4. It is possible to predict the market, but it takes expert knowledge.

Due to personal character traits, some professionals in the investment world will leverage the beliefs. When asked individually, investment professionals will probably take interest in my views, but for reasons of culture, conformity, income, status, and position they cannot express their doubts in public as it places them outside the community.

6.5 Literature on the Culture of Investing

The purpose of discussing literature is to typify the culture of investing, and discover the values and conversations of investors. The works of De Goede (2005) and Preda (2006) investigated the inception of the current investment theory. Galbraith (1954) wrote on the stock market crash of 1929 and its aftermath. Shiller (2000) investigated bubbles on financial markets and their cultural causes.

The perspective that financial markets resemble gambling is old, witnessed by the De la Vega's (1688) eyewitness report of the Amsterdam Exchange in the seventeenth century. Yet nowadays, investing is not perceived as gambling because it has a rationale, arguments to believe that it is worthwhile. Finance is now seen as a respectable scientific and societal subject, instead of as gambling, and at times associated with fraud and manipulation. The change of perception in finance from gambling to a rational activity took time and was brought about by the emergence of the financial markets, of which the actors needed respectability (De Goede 2005). De Goede underpins that the distinction of finance and gambling is merely political, ideological, instead of based on the nature of financial markets: 'Like statistics, modern (financial) rationality is not wholly secular and disinterested, but is premised upon faith in a divine or cosmological order (De Goede 2005, 114).' She identified a transcendental justification of investing, which is based on faith, on optimism that capital invested in the stock market always will accumulate. Interestingly enough, she also regarded statistics as a transcendental faith.

Preda (2006) has described the process of the transformation of the notion of investing in detail. In France in the 1860s investing in stocks was associated with gambling, but how could investing in stocks be legitimized? The legitimization of investing in stocks was done by *vernacular* science. The vernacular science of financial investments attempted to dispose the unethical connotation of investing by turning it into a rational and partly scientific object, in which information becomes the most important aspect.

Vernacular science used among other things the analogy of financial markets with physics and engineering, and adapted the idea of rational behaviour as the guideline for stock investors. Rational behaviour in the form of self-control and the study of information was promoted as the key to successful investing. A part of vernacular science resulted in the efficient market theory because it included probabilistic and abstract reasoning. The perspective that financial markets can be managed by a scientific approach is enforced since 'modern' finance emerged in the 1960s.

Galbraith's *The Great Crash, 1929* (1954) offered insight into the culture of investing in the twentieth century. The magnitude of the stock market crash of 1929 compares with the consequences on the financial markets of the credit crisis of 2008. In the opinion of Galbraith neither regulation nor ethics will end the boom and bust cycle; he advocated to keep the history of the cycle of boom and bust alive by retelling the story of how investors came to believe in the illusion that the stock market is a utopia in which stock prices continue to rise:

> For protecting people from the cupidity of others and their own, history is highly utilitarian. It sustains memory and memory serves the same purpose as the S.E.C. and, on the record, is far more effective (Galbraith 1992/1954, 11).

The metaphor that financial markets are bubbles, highlights the danger of the financial markets. Socially constructed optimism regularly pervades the culture of investing. Some phenomenon causes, though not justifies, the optimism: '[. . .] speculation does not depend entirely on the capacity for self-delusion (Galbraith 1992/1954, 33).' In a boom time, the culture of investing becomes a part of the popular culture. A condition for a boom is that investors have trust: 'Such a feeling of trust is essential for a boom. When people are cautious, questioning, misanthropic, suspicious, or mean, they are immune to speculative enthusiasms (Galbraith 1992/1954, 188).' Besides trust, a boom needs prosperity: ample resources have to be available to be invested.

The optimism of investors in a boom, makes being negative on the outlook of the stock market a taboo. Galbraith experienced the taboo personally: he received various threats of physical violence after he testified in 1955 at a congressional hearing that the stock market crash of 1929 could repeat itself, at which the stock market reacted negatively. The threats received are an obvious reaction to breaking a taboo because the declining stock market threatened investors' optimism. The culture of investing combines personal interest and pressure of the group, and rejects critics:

> Clearly, given the nature of the euphoric mood and the vested interest therein, the critic must wait until after the crash for any approval, not to say applause.

> To summarize: The euphoric episode is protected and sustained by the will of those who are involved, in order to justify the circumstances that are making them rich. And it is equally protected by the will to ignore, exorcise or condemn those who express doubts (Galbraith, *A Short History of Financial Euphoria*, in *The Essential Galbraith* 2001, 254).

People just want to believe they can get rich. And some investors do get rich, if they manage to sell their stocks before the market collapses.

In the culture of investing, its optimism cannot afford doubts. Therefore, when financial markets crash, a forecaster is usually not held accountable for his earlier optimism. An exception was, as told in Chapter 2, Irving Fisher, who is even nowadays remembered for his unfortunate prediction in October 1929 before the crash that 'stock prices have reached what looks like a permanent high plateau (Dimand 2007, 45).' As a matter of culture, the sayings of experts are part of the ritual of investing.

Shiller (2000) is an opponent of the efficient market theory and elaborated on culture in *Irrational Exuberance*. The public generally expects stocks to deliver a positive return in the long run, an expectation based on the views of experts and other people:

> It is still very much the conventional wisdom today that for investors whose horizons are years long, the stock market cannot disappoint. People

> modify their sense of this conventional wisdom only slowly as they hear expert opinion from time to time, hear others say 'they say that . . . ,' and hear others express approval or disapproval of these opinions (Shiller 2001/2000, xiv).

The optimism of investment experts that the market goes up in the long run, is based on background facts, which are not disputed. The interesting thing is that after a crash the optimism remains. The remaining optimism is typically a cultural phenomenon of investing, a value that guides investors as they perform their cultural program.

The media offers support for optimism on the stock market, typically by a conversation in which the interviewer asks critical questions and is reassured by the interviewee:

> Interviewers and investment professionals sometimes seem to play a sort of rhetorical game on television that plays out pretty predictable to be supportive of the market. The interviewer asks dark questions about whether the market might conceivably do very badly, blunt questions posed as if to get an answer with the plain, unvarnished truth. The interviewee answers in an assuring, confident, professional manner about the great longer-run outlook for the market, about the importance of not being unsettled by short-run fluctuations, and about the benefits of holding firm to a long-run investment strategy. The interviewer establishes his or her news-media credibility as pressing hard for the truth, but given the typical choice of interviewee, the interview closes on a suitable upbeat note (Shiller 2001/2000, xv).

The point of the long quotation from Shiller is that, in my view, it could be a conversation between a client and an investment expert or advisor as well, and could be typical of the culture of investors; the client would be less critical than the interviewer but nevertheless worried, and is being reassured.

Shiller discussed that the media play a decisive role in the culture of investing. Though they look like objective observers, they spread the ideas about the markets. Media compete about the attention of the public and want to keep that attention. How can they do that? The news has to be interesting and preferably a continuing story. The stock market is a

source of continuing information, just like sport. Thus, the media need the stock market to capture the attention of the public, which cannot get enough of news on the stock market during the boom days and when financial disaster strikes. Markets are, however, not moved by the news as you would expect them to be. Shiller explored the crash of 1987 as a case study and found that no significant news could be discovered as the cause of the crash. News is brought because the public wants explanations. The media also help promote the optimism of the stock market, because that is the story that the public wants to hear.

Another point of culture of stock markets is that in good times a belief exists that a new era has come, which elevates growth forecasts to a higher level, and underpins rising stock market levels and valuations such as price to earnings.

6.6 Innovative Case 1 The Management of Investment Risk

The culture of investing is heterogeneous, also because innovation takes place in investment practice. The innovations of interest here is how practice constructively handles the uncertainty of investing. The current paragraphs will treat the ideas and practices of three investment professionals in the institutional part of the Dutch financial sector dealing mainly with pension funds. Each of the interviewees has an innovative way of dealing with the problems of the epistemology of investment theory, that is the stochastical unpredictability of future returns, and the culture which holds on to the current practices of investing. The interviews served as background material for the investigation into culture.

Introduction Theo Kocken

Theo Kocken is Professor of Risk Management for Institutional Investors at the VU University Amsterdam. After working as a risk manager at ING and Rabobank, he became in 2000 a founder and

CEO of Cardano, a Dutch company which performs risk management services for the financial sector such as pension funds. In 2007 an asset and risk management branch of Cardano in the United Kingdom was launched. Currently Cardano employs some 150 people (Cardano 2015). Cardano's risk management approach aims to avoid excessive risk taking. What 'excessive' means, depends, of course, on the theory of risk that Cardano applies. Besides servicing risk management for pension funds, the firm advises for example on the design of pension fund schemes and the distribution of risk between generations. The following text is based on my interview with Kocken, conducted on 9 February 2015, and is completed with additional information from the literature and other sources.

Risk Management

When Kocken was 30 years old and head of market risk at ING, a large Dutch financial institution, he experienced the sudden collapse of financial markets in South America and the reality that past statistics cannot predict such cases. The experience brought him to reflect on the usefulness of Markowitz's portfolio theory and of statistics for the risk management of financial markets. A story that he has frequently told at seminars on risk management illustrates why Value at Risk-models (VaR) are still being used despite their flaws. A VaR-model is based on portfolio theory and measures the maximum absolute or relative risk within two or three standard deviations of the current value of an investment. Financial institutions worldwide practice the method of VaR. As risk manager he calculated the VaR of a certain portfolio on a 99% confidence interval for a 10-day horizon, which was mandatory for the De Nederlandsche Bank (the Dutch central bank, for short DNB). For ING, however, he conducted a stress test for the same portfolio with a significantly higher outcome than the VaR for DNB. Yet, DNB did not use the higher level of possible loss as proposed by Kocken, not because they did not understand or disagreed with his interpretation of the risks, but because they had to conform to the supervisory rules. The

conversations with DNB on how to estimate risk were an eye-opener for him; intelligent professionals seem to have to neglect common sense because usual practices dominate.

Kocken (1997) has formulated an alternative, innovative approach of risk management in his book on risk management for financial institutions. The book treats, among other things, subjects such as value at risk and the risks of options. Yet, one chapter of the book (Chapter 7), on stress testing and the measurement of event risk, differs from the usual view of risk management centred on the VaR-approach. The reason for including stress tests in his book is that VaR underestimates risk. Kocken calls the phenomenon 'the Value at Risk paradox': the VaR-model does not function when it is needed most, that is in times of crisis when risks materialize. The stock market crash of 1987 demonstrated risks in the form of standard deviations of 10 times and more, which the VaR-model merely expected to happen once in the period from the big bang until now. One of the reasons that VaR-models fail in times of a financial crisis is the assumption that returns are normally distributed. Though VaR-modellers have tried to incorporate non-normality, in practice the VaR-models remain too optimistic.

So, why does his stress test demonstrate a higher possible loss then the VaR-model? The higher loss originates in rare events, which are no part of past data on which the VaR-models are based. For example, Brady Bonds (restructured bank loans of mainly South American countries) can behave normally for 20 years, but then suddenly collapse by 80%. The collapse of the Argentinian peso is another example in which past statistics are meaningless, because if the Argentinian peso is decoupled from the American dollar, past statistics based on a coupling of the two currencies are no longer representative. Kocken thought a decrease of 50–60% possible in the cases mentioned. Interestingly, professionals in the financial world have often claimed that stress testing is not scientific, because it is based on economic judgment, and not on statistics. The received view of risk management practitioners expresses the ideas of modernistic science, which have been discussed at length in the current book. Kocken's approach of stress testing involves a casuistic approach based among other things on macroeconomic and political research, and demands experienced and creative risk managers.

Besides that the tail risks in financial markets are bigger than expected by the users of the conventional investment theory, diversification does not function either in financial markets crisis. Diversification does not function because correlations tend to move towards their maximum of 1 in a crisis, which means that no diversification benefit is left. The accepted theory, however, is Markowitz's theory of diversification, which has proven to be naïve if merely backed by past statistics instead of an economic rationale. An example of diversification with an economic rationale is *TCX* (the currency exchange fund), which is supported by Cardano Development (a branch of Cardano). The fund provides loans in local currency to entrepreneurs in countries in West Africa, East Africa, Central Asia, and South America. The fund hedges the local currency risks by diversifying 50 currencies, which are statistically independent because the dynamics of the countries involved differ. Such an economic rationale for diversification does not exist for stocks and bonds of the United States and Europe, because in a crisis American and European markets move in the same direction.

An Economic Explanation of the Failing of Portfolio Theory

Concerning economics, Kocken (2012) advocates the theory of Minsky which is also of importance for risk management. Minsky's theory (1982) sketched the causes of economic instability that led to a worldwide depression. Minsky stressed that the economy and financial markets do not tend to an equilibrium as neo-classical economics and finance propose, but that the economy and financial markets are inherently instable:

> Minsky realised that our economy was anything but a system where external shocks from outside our assumedly stable economy are processed by the economy until equilibrium is re-established. In fact, the world works exactly the other way round. Big unexpected external shocks may be troublesome, but they are not the reason behind real deep depressions. The major destabilising moves are created internally, from within the

> economy. A process that keeps repeating itself, hence the name endogenous instability. It is those endogenously created moves that lead to depressions (Kocken 2012, 7).

The instability is created by superfluous lending which fuels optimism, and will eventually lead to an endogenous crisis. See also Chapter 3 of the book in which the bubble theory is explained. The policy applied by the central banks to act on recessions by lowering the interest rate, postpones and thereby aggravates the crisis.

Kocken relates the optimism of investors to the behavioural bias of the affect heuristic:

> This is partially due to overconfidence but is also supported by the 'affect heuristic,' as researched by Paul Slovic: when people have a good feeling about the returns of the markets, their perception of the risks in the markets is lower.
>
> This is exactly what we saw during many crises in the past: the more risk accumulated (exploding stock and house prices etc.), the lower the volatility in the markets (Rosenberg and Kocken 2013, 31).

A Behavioural Explanation of the Failing of Portfolio Theory

Kocken has found behavioural finance illuminating as a source of explanation why professionals continue to use models based on portfolio theory; endogenous instability can be explained by behavioural finance as well. In his inaugural lecture (2012) as a Professor of Risk Management for Institutional Investors at the VU University Amsterdam, he combined Minsky's theory of economic instability (1982) with the insights of behavioural finance, which are directed at individual behaviour.

A number of behavioural biases are central to explaining why investment and risk professionals carry on with the models of portfolio theory. The first one is ambiguity aversion as described by Ellsberg (1961): people dislike uncertainty and prefer a presentation which is more elaborate (also see

Chapter 4 of the book, in which Ellsberg's views are discussed). Risk professionals arguably understand the criticism, but taking the criticism seriously would force risk professionals into ambiguity. Hence, their reluctance to abandon the models which are their main support against uncertainty.

The second behavioural bias is the so-called attribute substitution in which a problem is simplified by reducing the problem to a simpler problem, for example in representing the economy by a neo-classical equilibrium model or financial markets risk by a VaR-model:

> [. . .] our brain has the latent tendency to substitute complex problems with less complex problems. And these less complex, though often mathematically rigorous problems are then resolved as a substitute solution for the complex problems. That is called attribute substitution (Kocken 2012, 18).

The third bias relevant to risk management is overconfidence, which paradoxically has the tendency to rise if the level of uncertainty is higher. Overconfidence could also explain the inability to learn from financial crisis. Despite the economic depression in the 1930s, economics embraced the Cartesian mathematical approach in the 1950s which does not include the phenomena of depression and its causes. Yet, the point is that mathematics does not support predicting in economics and finance. Models for the calculation of option prices do not predict: a low implied volatility as distilled by an option valuation model does not mean that the volatility of the underlying asset will remain low. Nevertheless, mathematics is useful for the valuation of options on financial markets or embedded options in pension schemes, because uncertainty can be articulated by the mathematics of option theory. A further treatment here of embedded options would be out of scope, an example of an investigation of embedded options and its redistributive effects on pension funds can be found in Kocken (2006).

The fourth relevant bias is the confirmation bias: the confirmation bias is the tendency to filter information towards a confirmation of our point of view. It helps to explain why people do not always seem to learn from new information: they ignore the new information because it does not match earlier adopted ideas.

How to Invest

The assumptions of the models of Markowitz and Sharpe that probability distributions and correlations are known and therefore predict, are flawed. The consequence is that investors following the portfolio theory will become disappointed, because the portfolio theory embeds optimistic assumptions. Thus, investing in a more robust way has to be done in another way: 'And if we concede we don't know the distributions exactly, then we should steer in a very different way to lead to more robust solutions (Rosenberg and Kocken 2013, 29).'

Assuming a pension fund has a clear ambition for the realization of the pensions, for example an aspiration level of the indexation, then, making investment portfolios robust, starts with investigating what negative consequences are unacceptable. In practice, the question for pension funds of what level of funding ratio, or level of indexation, is unacceptable, appears difficult to answer. But, if a pension fund does not answer the question what level of funding ratio is unacceptable, chances are that the fund has taken insufficient risk measures to prevent the funding ratio ending up below such a disaster level. Once a disaster level has been formulated, the arrangement of the investment portfolio has to prevent that the disaster level will be met. To the purpose of risk management, five stress scenarios are projected on the portfolios. The projection is both top-down and bottom-up. The bottom-up projection is relevant because the actual implemented portfolios of the investment managers may react differently to the stress scenarios than the top-down portfolio strategy had assumed. The purpose of the stress scenarios is to assure that the pension fund can survive the worst of the five scenarios.

The Use of Options

What is the role of derivatives in the strategy of Cardano? Derivates can be applied for managing the interest and inflation risk of pension funds, but also for investments in stocks. Pension funds in the Netherlands have usually a large amount of stocks in their portfolio.

Because of peer group pressure in the form of reputation risk, Dutch pension funds may find it hard to significantly lower the amount invested in stocks. The investment approach favoured by Cardano, is performed by the Cardano UK branch: Cardano UK composes a portfolio with many small bets, with a small amount of stocks, and aims at a modest investment performance. If an investment approach with small bets is not possible, buying put options offers another possibility to reduce risk. Such downside protection with put options in order to protect a minimum value of stocks has a cost, but does offer real risk reduction which fundamentally differs from the assumed risk reduction in portfolio theory.

The cost of buying put options can be reduced by combining put options with writing call options on the stocks involved. A written call option means that the writer, that is the pension fund, receives a premium in exchange for the future delivery of the stocks or its financial equivalent at a certain price level. By writing call options the return of the stocks is maximized. Combining put options with written call options, also known as a collar, provides risk reduction if stocks have to be held in the investment portfolio (Van Capelleveen, Kat and Kocken 2004).

An example of a case in which Cardano was involved was the protection of the funding ratio of the Pension Fund of the Rabobank (Walschots and Capelleveen 2008). The Rabobank Pension Fund acquired a hybrid protection, combining the coverage of interest rate risk (which stems from the long term obligations of the pension fund to pay pensions to the participants) and equity risk. In technical terms, the pension fund engaged in an equity-linked swaption collars, which combine a collar on both the interest rate and stocks. It would be out of scope to explain the technical details of the approach, for that see Walschots and Van Capelleveen (2008). The construction was applied in 2007, and proved to be valuable in 2008 at the time of the credit crisis. The case of the Rabobank Pension Fund is rather unique, it takes courage and expert knowledge to execute such a protection strategy.

What Should Be Done About the Current State of Finance?

Having explained the problems with finance, a key question is how the theory and practice of finance can be changed. Kocken notes that Taleb, a well-known critic of prediction in investing, is widely read and admired in the investment world, but that his ideas are not put to practice. Why not? Apparently, investment professionals are not cynical or critical enough, and are not able to think out-of-the-box.

An important step in changing finance is that investment and risk professionals must realize that their field and its praxis are flawed. But current training ensures a continuation of the faith in current finance. Therefore, Kocken has launched a master of science in risk management for financial institutions at the VU University Amsterdam. The master differs from the usual quantitative approach of risk management and is intended for experienced professionals who have started to question the quantitative approach. The master in risk management has a multi-disciplinary approach in which, besides assessing the regular risk models, also covers subjects such as psychology, philosophy, history of financial markets, decision making, and group dynamics.

Besides his educational effort, Kocken engages in reaching a wider audience for the failing of economics and finance. For that purpose, he made the documentary *Boom Bust Boom* with Terry Jones, who was part of Monty Python, on human behaviour which is absent in the neoclassical economic models. In an article on the documentary in *Ad Valvas*, he explained to the students of the Amsterdam University VU that 'economists live in a fantasy world (Schilp 2015, 1, my translation).' Including human behaviour in economics as Kocken proposes, acknowledges that people imitate each other when they make decisions, which creates bubbles and instability. The documentary is aimed at economists, policymakers, and the public. Kocken is now supporting student organization Rethinking Economics that demands a more pluralist education. Jointly they started the foundation ECONOMY that released the website www.ecnmy.org that aims to explain economic news in jargon-free laymen terms, engage and teach the general

public in economics but also offering different views on the underlying causes of economic events instead of one single view of 'this is how it works.'

Entrepreneurship in the financial services could change practice as well. The risk management services of Cardano have been a success: Cardano provides services to pension funds of which the assets amount to 150 billion euro (Cardano 2015), though in terms of market share, Cardano is not dominant.

Another solution concerns the development of ideas employed in economics and finance. Kocken suggests that economics and finance should engage more in investigating the complexity of the economy and financial markets with a bottom-up approach. A bottom-up approach replaces the equilibrium analogy of physics by that of evolution of biology, like the one adopted by the Santa Fe Institute.

6.7 Innovative Case 2 Shell's Scenarios-approach

Introduction Peter Heijmans

Peter Heijmans is the Head of Strategy at Shell Asset Management Company (SAMCo). SAMCo has some 60 billion euros of assets under management for defined benefit pension funds of Shell worldwide such as for the Netherlands, Great Britain, the United States, Austria, and Germany. Shell, or more formally Royal Dutch Shell plc, is active worldwide in energy and petrochemicals, and employs 90,000 people in 70 countries. Heijmans is trained as a macroeconomist and worked for four-and-a-half years at the Shell Strategy & Planning department, in the Scenarios team, and prior to that as an economist in the United States and for the Dutch government. The Strategy & Scenarios team devises scenarios on the business environment of Shell and is concerned with subjects such as the oil prices, the energy demand, the global energy system, and the global economy.

Since August 2013 Heijmans is the Head of Investment Strategy at SAMCo. As the head of strategy, Heijmans can use his experience with scenarios for the investment management of the pension funds of Shell.

The following text is based on an interview with Heijmans on 20 February 2015, and completed with additional information from articles and other sources.

Scenarios Instead of Statistics

Shell is a pioneer in scenario-thinking and has been working with scenarios since the 1970s. The attraction of scenarios is that they stress discontinuity, instead of the usual mechanistic claim of continuity provided by forecasting (Wilkinson and Kupers 2013). The company works with scenarios because scenarios, unlike statistics, enable us to cope with uncertainty. Indeed:

> Any form of mechanical extrapolation/modelling/probability analysis is '**an enemy to thinking.**'
>
> Probabilities assume the presumption of predictive accuracy. Scenarios are most powerful when they stimulate flexible and innovative thinking (Heijmans 2014, 10, his emphasis).

For Shell the scenario-approach prevents the usual behaviour of people when confronted with uncertainty: people usually dislike uncertainty and therefore ignore uncertainty (Shell 2008). Scenarios consider the worrying parts of uncertainty, are story-like, and open new conversations:

> Decision makers can use scenarios to think about the uncertain aspects of the future that most worry them – or to discover the aspects about which they should be concerned – and to explore the ways in which these might unfold. [. . . .].
>
> Scenarios are based on intuition, but crafted as analytical structures. They are written as stories that make potential futures seem vivid and compelling. [. . . .].

> Scenarios are intended to form a basis for strategic conversation – they are a method for considering potential implications of and possible responses to different events (Shell 2008, 8).

Shell has been working with scenario's because the route from discovery to exploration of and distribution of energy cover long horizons, and investment in projects are capital intensive and irreversible (Heijmans 2014, 5). Depending on the subject the horizon of a scenario can stretch to 20 years for global themes such as mobility and cities, and more than 50 years for issues such as energy systems. With such characteristics, the traditional way of forecasting nudges people into a direction that seems appropriate because of our education, training, and current dominant ideas. Yet, experience shows that the future probably differs from such extrapolations, moreover such a focus tends to hinder other ways of seeing. A detailed description of the current and past scenarios of Shell (see www.shell.com /scenarios) would be out of scope for the book.

Investing in General

How does Heijmans look at the role of investing for pension funds? Investing is not a purpose in itself, but should be aimed at enabling SAMCo's clients to fulfill their nominal liabilities and the ambition to grant indexation. SAMCo's clients have a long term investment horizon. Return is a reward to risk, which needs to be taken, but in a careful and sustainable way. Diversification improves the trade-off between risk and return. Active asset management can add value.

Most pension funds at Shell have determined journey-plans for de-risking, mostly defined in terms of the funding ratio. De-risking in this context is defined as reducing the investment and balance sheet risk of the pension funds, with the objective of reducing the likelihood of a drop in the funding ratio in the future, and hence reducing the likelihood of the need for increased sponsor contributions. The goal is to reach a certain funding ratio threshold, at which the surplus of the fund is large enough to pay pension benefits including indexation for

inflation. Once in 'happy land' the investments can be de-risked, because risk taking is not necessary anymore to reach the goal.

Scenario Thinking Applied to Investing

Working with scenarios differs from working with models because scenarios are meant to explore and models are meant to analyse. Models for investing are based on historical data. But in the future, discontinuities will appear and that makes the stochastic future different than assumed by the model. The credit crisis of 2008 illustrates the effect of discontinuity for Shell's Dutch pension fund: the Asset Liability Management study (ALM-study) for the pension fund, conducted just before the crisis in 2008, resulted in a risk of less than 0,1% that the funding ratio could halve. Yet it did: the funding ratio of the pension fund declined from 180 to 80% (Stichting Shell Pensioenfonds 2015). So experience demonstrates that it is dangerous to found the investment policy on ALM.

An ALM-study has other qualities though, as it enables us to identify the interests and risks for the various stakeholders, such as the sponsor and the participants, of the pension fund. For example, if the pension fund lowers the weight of stocks in the portfolio, then the probability that the sponsor has to pay additional premium declines, but at the same time a higher level of premium is necessary because the expected return of the portfolio diminishes because of the lower weight of stocks. And as a result, the average indexation, that is the compensation for inflation, for the participants will probably decline, but also become less risky. Thus, ALM allows us to compare various investment and other pension fund policies in a stochastical way. One should however be careful to take ALM-results as absolute results: the results compare relatively. Heijmans does not take the outcome of the ALM-study that the average funding ratios eventually always will rise literally, because the rise stems from the fixed equity risk premium which is normally an input for ALM. So, judgment of senior investment professionals is needed to interpret the results, and to consider other scenarios as well.

The scenario approach of Shell has had a first try-out for the investment management of the pension funds of Shell. The subject of the workshop for investment management with the Shell Scenario team was the outlook for inflation, which at the same time determines the interest rate, often the biggest risk for the funding ratio of a pension fund, because the pension obligations are sensitive to changes in the interest rate.

How to Make Scenarios

Shell has a lot of experience with making scenarios. How does making a scenario work in practice? A multidisciplinary expertise is essential to overcome the problem of having an incomplete view of reality (Heijmans 2014). For the workshop a certain type of people are needed. For example, if only people who are accustomed to ALM studies participate then the workshop does not result in interesting scenarios because the answers will probably be traditional. To make a workshop a success, a diversity of backgrounds is needed, because different kinds of thinking are needed, for example the thinking of political scientists or philosophers when the outlook for inflation is discussed. So external people from outside of SAMCo are being sought, preferably from other countries. To work with scenarios, senior people are needed and the participants have to be prepared, because people often feel comfortable with their acquired views.

Some 10–15 people take part in a workshop in which the scenarios are built is based on conversation. The workshop may appear a somewhat chaotic process. Various experts will present their view to an audience of Shell employees. Then discussion follows and the facilitator of the workshop collects and categorizes statements. During the workshop relationships between the statements are laid. Heijmans explains that a workshop on the same topic could yield other, not necessarily better or worse results as well, the results possess an element of serendipity. Though what results from the process is out-of-the-box, non-traditional, and from different perspectives than the traditional model-based approach.

The scenario team prepares the workshop by identifying the important trends, for example for inflation, demographic trends are an input. In the identification of trends, the so-called critical uncertainties, the most

important uncertainties about say regulations, politics, or oil prices have to be discovered. In the workshop the experts are asked to present their view on how the critical uncertainties could develop. One caveat would be to merely present the extreme scenarios. But, to stress extreme scenarios does not work because it leads to confusion instead of results from the workshop.

To illustrate the outcomes of the recent scenario exploration for the businesses of Shell, the scenarios 'Mountains,' in which government policies dominate, and 'Oceans,' in which the markets dominate, are presented here:

- **Mountains**
  The first scenario, labelled 'mountains,' sees a strong role for government and the introduction of firm and far-reaching policy measures. These help to develop more compact cities and transform the global transport network. New policies unlock plentiful natural gas resources – making it the largest global energy source by the 2030s – and accelerate carbon capture and storage technology, supporting a cleaner energy system.

- **Oceans**
  The second scenario, which we call 'oceans,' describes a more prosperous and volatile world. Energy demand surges, due to strong economic growth. Power is more widely distributed and governments take longer to agree major decisions. Market forces rather than policies shape the energy system: oil and coal remain part of the energy mix but renewable energy also grows. By the 2070s solar becomes the world's largest energy source (Shell 2014).

6.8 Innovative Case 3 Investment Beliefs

Introduction Alfred Slager

Alfred Slager is Professor of Pension Fund Management at the TIAS School for Business and Society in the Netherlands. He has been

working in investment management as a portfolio manager at Fortis Investments, policy advisor at PGGM, the Dutch Pension Fund for the Care and Welfare sector, and as the Chief Investment Officer of the Pension Fund of Stork. Currently he is a trustee of the board for SPH, the pension fund of general practitioners in the Netherlands. The following text is based on an interview with Slager, and is completed with additional information from the literature. The interview with Slager was conducted on 17 March 2015.

What Are Investment Beliefs?

Slager has pioneered, together with Kees Koedijk (2007, 2011) in the field of investment beliefs. The board of a pension fund or an investment manager has implicit or explicit beliefs, in other words ideas or convictions on investing. Investment beliefs consist of three parts: beliefs about the capital markets, the organization of the investments, and the society (Slager and Koedijk 2007). The reason that investors should examine their investment beliefs is because finance lacks the epistemological 'certainty' of physics, and, though data on financial markets is available in great quantities, models of financial markets mostly lack predictive power. The lack of an effective epistemology makes investment beliefs dominant for the investment policy executed in practice. Investment beliefs are, however, often tacit, and need to be clear to improve the performance of investing:

> Investment beliefs improve stakeholder governance by reducing possible conflicts of interest, and charge the innovative adaptability of an organization by setting guidelines for best practice. Managers need to formulate their own investment beliefs: a clear view on how they perceive the way capital markets work, and how their organizations can add value and strive for excellence (Slager and Koedijk 2007, 77).

Another reason for the importance of articulating investment beliefs, is that changing beliefs is easier if the beliefs are known. This knowledge is instrumental for effective reflection on the results, and the (potential)

need to adapt in changing financial markets. Beliefs have to be measured if possible: ex-ante as evidence to support a belief, and ex-post to sustain to a belief or to change it.

The approach of formulating investment beliefs originated in the practice of investment management. Slager experienced that applying investment theory is not self-evident in practice, for example the optimization procedure for risk and return as proposed by Markowitz is not an effective tool because the data input can lead to senseless portfolios. Another example is that the results of active management, the pursuit to outperform a benchmark, are doubtful. In general, investment theory needs interpretation to be put to use fruitfully in practice. The interpretation of investment theory is also a part of the investment beliefs.

Dutch pension funds have shown interest in working with investments beliefs. Slager has advised some 30 Dutch pension funds in articulating their investment beliefs, some more in-depth than others. For a thorough review, boards of pension funds need to invest time to discuss their investment beliefs, because, again, the beliefs often are implicit. Of the 30 pension funds, two-thirds ended up in successfully describing their investment beliefs, the other third did not fully pursue the process of investigating their beliefs.

Beliefs About Capital Markets

The beliefs about capital markets can be clustered into four themes: risk premiums, diversification, market inefficiencies, and investment horizon (Koedijk and Slager 2011). The themes will not be treated in depth here because they have been treated at length in the book. The existence of a risk premium of stocks and other investments is a basic belief for investors. According to Slager, not to believe in the risk premium would be to disbelieve in the future success of capitalism, which has achieved economic growth by achieving a higher return than risk free investments by taking risk. Market efficiencies are beliefs about beating the market index, a subject which has been treated in the book in Chapter 2. Koedijk and Slager (2011) advise boards of pension funds to be careful about active investment strategies because there is no clear

proof that such strategies deliver persistent excess returns after costs are deduced. Koedijk and Slager stress that diversification may not work in a time of crisis on the financial markets, and advise to look at the economic ratio of new asset categories if they are meant for diversification. The subject of diversification has been treated in the book in Chapter 2. The fourth aspect of the investment horizon is the flawed notion that a longer horizon diminishes investment risk. The investment horizon and its pitfalls have also been a subject of Chapter 2. Koedijk and Slager apply an evidence-based approach here; it is not their individual investment opinion that guides these proposals, but rather the state of empirical research, seen through the lens of a decision maker in a pension fund.

Beliefs About the Organization of Investments

The organizational beliefs on investments matter for governance. Concerning the beliefs on governance, the principal-agent problem in investment management is often overlooked. The agents, the asset managers, have other interests other than the principal, the board of the pension fund, and ultimately the participants. The asset managers pursue their ideas as investors. The principal, the board of the pension fund generally lack detailed or expert insight into investment management, also because it takes a number of years to become aware and to understand what investing is about, and by then board members may have left or changed roles. Key is that the governance investment beliefs are formulated according to the interests of the participants. Slager and Koedijk (2007) refer for the theory of governmental beliefs to the agency theory of Jensen and Meckling (1976). Awareness of agency problems should lead to minimizing agency costs, which consist of the monitoring costs of the principal, the bonding cost that the agent makes to demonstrate that he works in the interest of the principal, and the residual loss, which is the cost that remains because of the imperfection of monitoring the principal.

The societal beliefs concern values such as the environment and human rights which are to be considered by Dutch pension funds in

their investment policy. An oversight of the practices of responsible investing in the Netherlands can be found in Koedijk and Slager (2011).

What Should Be Done About the Current State of Finance?

A key question is how the theory and practice of finance can be changed. Besides engaging agency theory in practice as discussed, the practical side of behavioural finance can be put to use in investment practice. Slager refers to Gigerenzer (1999 with Todd 2000) as an author on behavioural finance who has practical relevance (see also Chapter 3 of the book in which the ideas of Gigerenzer are treated).

Another theme which is underexposed in finance and economics is that economics is also political economics. Economics is not merely a technical subject, but also deals with values such as fairness and the distribution of wealth. Analogous to economics, finance is not seen as a political subject, but nevertheless has ethical value aspects: money is not neutral and influences people as it potentially can make them greedy, negatively affecting the alignment between principal and agent. This phenomenon is generally attributed to the financial sector at large. However, this occurs at all levels; within boards, between boards and their executive offices, as well as between the pension fund and asset manager. Here too, the formulation of beliefs (and the organizational embedding) provides a self-disciplining mechanism to potentially counter these effects. The depoliticization of finance has been a subject in the book in the current chapter.

Despite the fact that Slager would like to see that more attention to ethics would change behaviour of the organizations and professionals involved in investing, he does not expect that ethics is the solution to improve the current state of finance. However, he posits that the sector should not be afraid to make fiduciary and ethical norms more explicit than is the case today. Rather, the focus in the Netherlands is on making the pension contract explicit, but this does not induce change. As an example of making norms explicit he refers to the effects of the ERISA laws of the United States. ERISA is the abbreviation of 'Employee

Retirement Income Security Act' of 1974) and is meant to protect participants of pension scheme by setting standards of, and disclosure for, conduct of pension funds in the United States. ERISA for example constantly urges investors to explain why investments are made in the interest of the participants, and sharpens trustee's minds on what really matters in the principal-agent dilemma's that they might face.

To change the practice of finance, Slager does not strongly believe that changing the finance education would change the practice. First, it would be difficult to fundamentally change the finance education because the received view of finance dominates strongly and would basically require a whole new generation of tutors, textbooks and method of teaching. Secondly, there is the alluring career perspective to consider. Students of finance simply find active management more appealing than passive investment as advocated by the theory of efficient markets. Ending on a more positive note, placing more focus on the institutional and ethical context of investment discussion will help change the mindset, yet slowly. Also a form of belief, in Slager's view.

6.9 Values, Conversations, Their Justification, and Innovation

The Values of Investors

Klamer regards values as an important aspect of culture. The values of a culture are not evident and therefore have to be interpreted. Emerging from my personal observations, the interviews, the literature, and the book, in my view, the prime shared values of investors are wealth, optimism, and rationalism.

Wealth

The investment of capital in the financial markets aims to earn money for future income or consumption, or to preserve capital. An intriguing

point about the culture of investing is that wealth, money, cannot actually be an end in itself, because money is always instrumental to achieving something else (Klamer 2014). Values are about what is important in life, the 'things' we strive for. Klamer uses the *oikos*, the home, as an example of a value which will probably be important to most of us. So, we have to understand the values of the people for whom is invested. Indeed, institutional investors must be interested in the values of their clients, also because investing is an instrument with uncertain outcomes. Accepting the uncertain outcomes of investing as an instrument is a leap of faith.

Optimism

The public expects stocks to deliver a positive return above bonds in the long run. The optimism in the culture of investing roots in our liberal, free-market society. The free-market system has realized a remarkable high economic growth (McCloskey 2010). Economic growth and profits are related: in general higher economic growth means higher profits. And, higher profits mean in general higher stock prices. In Chapter 5 is argued that the transfer mechanism of economic growth (not a sure thing either) to stock prices is more complicated and uncertain than explained here.

The level of optimism on the stock market varies. In a boom time the optimism is at its highest level and shared by professional investors and the investing public alike: investing then becomes part of popular culture. The optimism of investors in a boom, makes being negative about the outlook of the stock market a taboo, because people are too eager to become rich. Probably therefore, no forecaster is easily held accountable for his optimism. We probably cannot recall investors in the Netherlands who lost their job after the credit crisis of 2008, because they were accused of too much optimism. An exception of a person held accountable was, as told in Chapter 2, Irving Fisher, who is even nowadays remembered for his unfortunate optimistic prediction in October 1929 before the crash. As a matter of culture, the optimistic sayings of experts are part of

the ritual of investing. In times of bust, professional investors will maintain their optimism. Professional investors who doubt the optimism will have a hard time functioning in the culture of investing and probably will pursue another career. So, self-selection of professional investors ensures a continuing optimism.

My observation has been that the optimism about investing is both present in commercial and non-commercial institutions. A commercial setting can however stimulate investors to be more optimistic because doubt does not persuade clients. Also personal character traits will encourage some professional investors, though not the majority, to leverage their beliefs.

Rationalism

Handling uncertainty, a feeling of anxiety, has since long been a universal part of culture (Hofstede et al. 1997). Using a predictive method handles uncertainty by replacing a feeling of uncertainty with a rationalistic method. Since the 1860s, vernacular science has modelled investing on engineering, and has promoted rational behaviour as the role model for investors (Preda 2006). Rational behaviour consists of self-control and the study of information. Vernacular science results in the efficient market theory and the use of the statistical approach as explained at length in Chapter 2. The analysis of the rhetoric of investment theory has also demonstrated that modernism is a form of rationalism that has heavily influenced current investment theory and practice. Predictionism is a form of modernism and expresses itself in investment theory in the form of teleological equilibrium thinking, valuation theory, and stochastical predictability.

The Conversations of Investors

Besides values, Klamer has proposed to investigate conversations as an utterance of culture. In my view, the archetypical conversations of investors, again emerging from my personal observations, the interviews, the

literature, and the book, are about 'The market and the economy,' 'Talk by the model,' 'Money must be put to work,' and 'Doubt and reassurance.' The archetypical conversations can, of course, be combined.

The Market and the Economy

As an investor you have to be informed of the news, so the media, views of brokers, and the development on the markets are important. Investors talk a lot about developments on the markets and the economy, and interpret the development in order to be able to make decisions. Though the media look like objective observers, they spread the ideas about the markets. Brokers do effectively the same thing as media.

Talk by the Model

As often in complex phenomena, a rationalisation is needed to get in control. It is the same for financial markets. For example quantitative models based on investment theory supply information, input, to the conversations and decisions of investors. The models make a conversation possible about risk and return of investments, or the selection of stocks. Models also legitimise investment decisions, for example: 'If we enlarge our stake in stocks with 10% our risk return profile will benefit.'

Money Must Be Put to Work

An argument often heard in conversations about investing is that money on a savings account should be replaced by investments, because money should, instead of doing nothing, be activated in the financial market. De Goede (2005) also discussed this theme. The same kind of discussions take for example place about bonds versus stocks or other securities. The discussions about putting money to work tend to be on taking more risk, and are often based on optimism.

Doubt and Reassurance

A discourse such as the one on investing has to be repeated frequently. The cycle of doubt and reassurance fits in the discourse as Shiller (2000) demonstrated with his analysis of interviewers of the media and investment professionals. The interviewer asks critical questions about the financial markets, and the investment professionals reassure the interviewer. The interview ends with a supportive view of the market. The same kind of conversations about the markets, specific investments, or investment strategies take place between a client and an investment expert or advisor. Obviously, the conversation of doubt and reassurance is needed because of the uncertainty of investing.

The Justification of the Culture of Investing

How to relate Klamer's investigation of the culture of economics to that of the culture of investing? The culture of economics is about getting attention. Instead of on attention, the culture of investing concentrates on wealth. Conceptually, the legitimization of a conversation can consist of three parts: a transcendental justification (religion or truth), a social justification (the meaning for society), and a personal justification (such as the need to make a living) (Klamer 2007). Getting attention in economics is a social justification. To consider truth as the only effective contribution, would reflect the philosophical realist position: in short, the realist position expects a theory to conform to the external world, and so to be true in the notion of truth as correspondence to the external world. But effective contributions can also be established if they are meaningful or interesting, for example because a contribution aids to understanding. A contribution can also be pragmatic, for example by giving guidelines on what to do. Yet, in the end, the contribution of a conversation has to be *effective*. The conversation must be able to sensibly answer the 'So what?' question.

For investing, the 'So what?' question is whether the investments lead to more wealth. McCloskey puts the forecasting abilities of investor to the test by asking the 'So what?' question in the form of the American question: 'If You're So Smart Why Ain't You Rich? (1990).' The answer

to the question is one of common sense: investors earn a living by 'selling' their predictions, but cannot really predict. The social justification of investing is to make money by investing to provide future income or wealth to the owners. The personal justification for investors is that they make a living out of making money for their clients, and probably that they like or need their job. Investing has a transcendental justification as well, investing is nowadays a matter of unquestioned faith (De Goede 2005). Like economics, finance is depoliticized and viewed as a technical subject, not a moral subject.

What about truth as a justification for investing? Investors need theories to help them act, but are the theories really true, or are they to be viewed as practical guides? In Chapter 5 the scientific context of modernism was treated. Modernism has moulded investment theory into a stochastical predictive framework. Modernism is a part of the background culture of investment theory and is a possible explanation for the depoliticization of finance. The denial of the normative aspect in modernist science intends to keep science confined to the truth. In finance, a statistical formulation leads to the idea that the applied theory of statistics is meaningful. But an improper theory of statistics fools one into the feeling of certainty, and does not explain nor predict financial markets. Of course, efficient markets as such are an interesting notion of modern finance, just like diversification and value: theories have a worth in themselves, but does that make them a good guide for practice? In practice, the ideas of finance together with other ideas serve as a practical guide, like engineering serves to build a bridge. But investing is not like engineering, because the analogy of economics as mechanical physics does not hold (Knight 1921).

Evaluation of Innovative Practices

An interesting outcome of investigating practice is that practice combines various theoretical and practical viewpoints as a matter of phronesis, as foreseen by Klamer. Kocken uses his insight gained as a risk manager that VaR-models based on portfolio theory do not function, to implement stress testing as the alternative. Stress testing is not based on

statistics. Furthermore, he combines the insight of Minsky's instability hypothesis, a non-mainstream macro-economic theory, as an argument for better risk management by stress testing. To understand why risk and investment professionals stick to the current investment theory, he applies insights from behavioural finance. He also advocates the bottom-up approach of evolutionary finance. Concerning investment theory, he advocates the use of option theory. Options make sure that downside risk is covered.

Slager combines insights from the practice of investing with management and agency theory. He asks a Socratic question when he asks investors what beliefs they have about investing, and takes uncertainty as a starting point. Next, he emphasizes that organizational aspects are important in investing, that management matters. He also underpins the agency problem for pension funds, which in essence reflects the metaphor of investing as power relations between the participants, the board of the pension fund, and the investment managers.

The Shell scenarios approach applied to investing by Heijmans, is of a non-stochastical character. Mechanical statistical forecasting has not been effective in the past for Shell business and is regarded as an enemy to thinking. In essence, the scenario approach is about the social construction of a potential future, founded on uncertainty, conversation, and practical wisdom. The scenario approach has emerged from management practice, the management of uncertainty.

Kocken and Heijmans share the conviction that scenario thinking is a better alternative for investing than applying statistical models. But both acknowledge that statistical models have a specific benefit as well. In my words, statistical models for investing reveal how stakeholders of a pension fund or parties in an option contract divide risk and return: in essence, the models try to quantify statistically the equity, the fairness of the distribution of risk and return between parties involved. The quantification serves to make the fairness between stakeholders or parties visible, and is not meant, nor should be understood, as a specific prediction. Yet, the model is useful, because it provides an insight which would otherwise not have been available.

Many ideas and practices exist to change the theory and practice of finance. Besides entrepreneurship in the financial services, changing

education is important to Kocken. Therefore he has launched a master of science in risk management with a multidisciplinary approach. He also tries to reach a wider audience for the failing of economics and finance with the documentary *Boom Bust Boom*. Furthermore he supports student organizations that demand more pluralist education in economics. Concerning science, he suggests that economics and finance should investigate the complexity of economic and financial markets phenomena with a bottom-up approach. Slager suggest that, besides agency theory, the practical side of behavioural finance can be put to use in investment practice by the ideas of Gigerenzer. Furthermore he suggest that finance is to be regarded as a political subject, because money is not neutral. Slager expects that laws could change the behaviour of investors. As an example he refers to the effects of the ERISA laws of the United States.

In the book, other ideas to change finance have had attention as well: the alternative investment theory with the statistical theory of Mandelbrot, bubble theory, evolutionary finance, political finance, the analysis of rhetoric, the analysis of culture, ethics in the form of virtue and value ethics, and financial history. A more heterodox culture of academic finance and investment practice could accommodate the ideas mentioned: the alternatives for modern investment theory are plenty. How to make finance more heterodox? That starts with awareness of the current problems, the introduction of multiform metaphors for investment theory, and handling the ambiguity of theory uncertainty, that is having competing theories of finance, by presenting, explaining and elaborating the alternatives.

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7

Conclusions

Mainstream investment theory assumes stochastical prediction. Stochastical prediction is a special apodictic form of prediction, which makes the characteristics of a group of outcomes predictable, like the outcomes of throwing a dice. In the book the central question was: *What grounds the use of stochastical predictability in investment theory?* The question has no simple answer because the assumption is implicit in investment theory and backed by statistical theories, of which the assumptions are implicit as well. To get a complete answer to the question of the foundations of stochastical predictability in investment theory, the book used the critical thinking of the humanities, and treated uncertainty economics, philosophy of statistics, history, rhetoric, culture, innovative practices, and literature on alternative investment theories. The purpose of the book was that it should result in a refutation of stochastical predictability in investment theory, and open up a broader heterodox perspective on investing. The new proposed rhetoric, discourse, of heterodox investment theory is that investing takes place under Knightian uncertainty, which makes statistics supportive rather than dominant in decision making. So, investment theory should become more a moral science and less an engineering one: it is about

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judgments, combining virtue and value ethics with historical and theoretical insights, also from alternative investment theories, which can enrich mainstream investment theory and guide practice.

We will now look at the answers to the subquestions of the book as formulated in Chapter 1.:

1) Do heterodox investment theories offer a better explanation, modelling, prediction or handling method?

The history of investment theory provides a good starting point for a discussion of its discourse. Since the 1960s, finance and neoclassical economics belong together, which the name financial economics demonstrates. Yet, the notion that investment theory is a young science and merely has existed since the 1960s is flawed. Finance as relevant for investment theory has existed since the thirteenth century and is grounded on actuarial science and probability theory. The legitimization in the 1860s of investing in stocks, which until the nineteenth century were associated with gambling, is done by vernacular science which results in efficient market theories, because it included probabilistic and abstract reasoning. Investment theory in France in the nineteenth century and in the United States in the first half of the twentieth century is full of treasures, illustrated by the work of Regnault, Bachelier, Fisher, Cowles, Macaulay, Williamson, and many others.

Modern investment theory has interesting rivals, which have in common that they do not pretend to predict financial markets. The alternative theories aim at explanation or modelling of financial markets. The ideological criticism of modern finance, political finance, uses elements of behavioural and bubble criticisms, and combines them with the criticism on free markets in general. Mandelbrot's fractal finance provides within the rational mathematical tradition an alternative statistical theory, which models seemingly predictive patterns in financial markets, wild volatility, and bubbles. The bubble theory explains how bubbles in (financial) markets arise. Behavioural finance is insightful and helps to reflect on decision making, and explains behaviour of market participants. The bottom-up approach of evolutionary finance yields an interesting alternative to the top-down approach of modern investment theory. Concerning the depth of the rival theories of finance, they all have substantial backing and empirical proofs which can compete scientifically with modern investment theory.

2) What philosophy of statistics is applied in investment theory?
The arguments for assuming stochastical predictability are founded on a theory of statistics. The various theories of statistics have implicit assumptions about the structure of reality, in other words, the theories of statistics have different philosophies of probability. Markowitz proposes to use subjective, personal probabilities for decision making with his portfolio theory. To select investment portfolios in practice, the portfolio theory needed reasonable future expected returns and standard deviations. Reasonable expected returns and standard deviations are to be interpreted as more or less predictive. Markowitz left no doubt that he believed in the predictability of investment returns in the long run because they are meant to learn from.

Markowitz's theory is grounded on Savage's personal probability theory. Savage claimed that rational, coherent behaviour under uncertainty is accompanied by personal probabilities. Whether the probability beliefs are reliable is not relevant for Savage's theory: the use of probability beliefs is rational and coherent. So, even if the probability beliefs about the investment returns according to Markowitz are unreliable, in other words, if investment returns are stochastically unpredictable, it still makes sense to use mathematical statistics in the investment theory because it is rational and coherent behaviour under uncertainty. Of course, one has to agree with the definition of rationality applied by Savage to support his ideas. As mentioned, the economic literature has heavily debated Savage's assumptions of rationality. In Chapters 5 and 6 the scope of rationality in neoclassical economics, which reduces ethics to utility, was examined in depth.

The problem is that the gap between the personal and the true probabilities cannot be bridged. Using personal probability beliefs in practicing investment theory gives us no clue to the probability as such that the probability beliefs for the investment decisions are correct. Moreover, using personal probabilities following the investment theory leads to the same decisions as using true probabilities: so, personal 'become' true outcomes, which is dangerous, because decision making on the basis of personal probabilities should not be based merely on statistics: under the condition of Knightian

uncertainty, statistics should merely be used to explicit the intuition on probability beliefs to help making judgments.

The theory of objective probabilities founds the Capital Asset Pricing Model (CAPM), the continuation of Markowitz's portfolio theory. The ergodic assumption as used in the rational expectation hypothesis in the CAPM assumes that objective probability information is available from past data. The ergodic hypothesis as used in the rational expectation hypothesis assumes that objective probability information is available from past data. The assumption is needed to make economics a predictive science, and accommodates a stochastical framework as well. Yet, past data cannot predict the future stochastically because unexpected changes occur.

In Knight's terms, stochastical predictability is a situation of 'risk.' But if probability distributions in investing are unstable, portfolio theory and the CAPM ignore Knight's situation of 'uncertainty,' in which probabilities are unknown. Statistics under Knightian uncertainty become 'merely' an argument, not a stochastical prediction. Yet, the received view ignores Knightian uncertainty. The discourse of modern investment theory as part of mainstream economics simply does not 'allow' talking and thinking in Knightian terms of risk and uncertainty, as risk means the same as uncertainty.

Explicating subjective probability beliefs seems useful. Though the beliefs are not predictive, they still could be of importance for theoretical or historical analysis: they can imagine the future as a probabilistic restatement of intuitive beliefs, or of alternative scenario's, or analyse the past, with historical observations as input. But to be rejected is that investment returns are stochastically predictable, and therefore the role of the portfolio theory cannot be prediction. It follows that if one does not believe in the 'weaker' form of the predictability of subjective probability, the stronger assumption of predictability as assumed in the CAPM cannot be persuasive either.

We cannot prove by empirical induction with statistics that predictability is impossible: the proof of unpredictability lies outside the paradigm of statistics, because statistics assumes that the substrate that produces probability outcomes, is stable. The inference to the best explanation that investment returns are unpredictable, seems more

persuasive than the arguments of investment theory that personal or objective probability beliefs predict. Savage's second pillar of rationality seems a better argument for using Markowitz's theory. But rationality in economics has been critically evaluated as well, and cannot 'repair' unpredictability.

3) What are the arguments for uncertainty as the opposite of predictability? Non-mainstream economics assumes unpredictability instead of predictability and has heavily debated predictability and statistics. Their arguments against predictability and statistics are an important source for making the case against predictability. Knight calls stochastical predictability 'risk': a situation under risk results in certainty when a 'whole' group of cases is available. He calls a situation without stochastical predictability 'uncertain'. Economic and investing phenomena float in between risk and irreducible uncertainty, and are called 'uncertain'. Uncertainty means that the probabilities are unmeasurable. Keynes relates financial markets explicitly to uncertainty, and invents an investment theory upon rational expectations under uncertainty. Furthermore, he introduces the role of animal spirits in economic phenomena, which contrast rationality. Von Mises's argument for uncertainty is first that intent human action features teleological causality, which cannot be predicted, and second that natural sciences do not predict the world as a whole either, so why claim predictability for economics? McCloskey refutes uncertainty by the absence of profitable predictability: if forecasting is easy, economists would get rich by exploiting their knowledge. Taleb's argument for uncertainty is that black swans determine risk and returns of investments; but one cannot predict black swans.

Also is presented a thought experiment about the assumption of stochastical predictability in investment theory. The experiment puts the statistical outcomes of modern investment theory to the test of risk-free arbitrage, that is the other dominant branch of investment theory, which implies, in contrast to modern portfolio theory, certainty of outcomes. The thought experiment uses the paradigm of risk-free arbitrage of finance to illustrate that the paradigm of predictability of finance is flawed. We hope to have been persuasive in showing that stochastical predictability in

investment theory is a false assumption. The thought experiment which elaborates the impossibility of risk-free arbitrage of 'investment theory' stocks seems fair, because of the analogy with the artificial device of a currency hedge with the interest rate parity. Only the certainty of interest rate parity, gives a bank the incentive to offer the currency hedge. But with 'investment theory' stocks such a certainty does not exist.

For the ones not convinced of unpredictability, the thought experiment could make them doubt. It is essential that the use of statistics does not fool one into the idea of predictability. And for the ones who regard the thought experiment as trivial, it should be time to make a step forward in using and interpreting investment theory. Then, we agree that the function of the models of investment theory is not prediction. The investment model enables the investors to 'manage' the future with historical and theoretical insights. So, investment theory can only support decisions. Indeed, if statistics merely supports, it should compete with other theories in handling uncertainty: investment theory would be a part of the approach, not the approach.

4) What is the rhetoric of investment theory?

The analysis of the rhetoric of investment theory in the book is grounded on the approach of the rhetoric of economics by McCloskey. Therefore, the rhetoric of investment theory is, among other things, about the discourse and metaphors (constitutional ideas) of investment theory. McCloskey's discourse analysis considers economics as a product of the modernistic scientific culture of logical positivism, which has led to a dogmatic emphasis on prediction, mathematics, and statistical significance testing. To complete the discourse of investment theory with other findings in the book, investment theory is characterized by stochastical equilibrium theories. Markowitz's portfolio theory uses the theory of valuation which assumes that the price of a security will tend to its intrinsic, equilibrium, value. In the CAPM informational efficiency ensures an equilibrium of risk and return.

The main metaphor in Markowitz's investment theory is the claim that investment management *is* mathematical statistics, in which investment returns are a probability distribution. The application of mathematical statistics assumes calculability and distracts the attention from

uncertainty. The second metaphor in Markowitz's theory is the machine, which can be recognized in the language of, and aspiration to efficiency. The machine metaphor focusses on the process parts of reaching efficiency, such as the efficiency criteria and the algorithms, and beliefs are treated merely as inputs for the calculating machine.

The dominant metaphor in the CAPM is the equilibrium: the market of investments is in balance because of informational efficiency and rational expectations. In equilibrium, risk and return have become predictable. Equilibrium and predictability are exchangeable. The second important metaphor is the informational efficiency. It is again a machine metaphor, but now concerning the processing of information. Because of informational efficiency the market of investments is at any time in balance: new information is immediately being processed into a new equilibrium.

The opponents of predictability in economics and investment theory have used other metaphors. Knight proposed the metaphor of economic phenomena behaving like an organism: the organic includes the aspect of change of economic phenomena. Keynes illustrated the functioning of a financial market using the metaphor of a beauty contest. The metaphor of the beauty contest stresses how human interacting works. A related metaphor of Keynes summarizes how to act under uncertainty and formulates an efficient market theory without some form of equilibrium mechanism, which leads to instability. Von Mises stressed that causes are teleological instead of mechanical: teleological does mean here the striving of many individuals for their goals, which results in unpredictability. McCloskey highlights that predicting in economics is magical. Magic persuades people, because they believe the narrative of expertise. Taleb uses the metaphor of the black swan, which is a rare, very influential, and unpredictable event.

Heterodox investment theories have, of course, metaphors to their aid as well. The ideological criticism of investing equates investing with gambling. By saying investing is gambling the dark side of investing is highlighted, including manipulation and fraud, which can be part of investing. The metaphor of Galbraith, Minsky, Kindleberger, and Shiller is that financial markets are like bubbles which can burst. A bubble consists of nothing but air and can suddenly burst, but as long as

it lasts it can fascinate. The metaphor employed in Mandelbrot's alternative statistical theory is the fractal, a small geometric form which accumulates to some complex phenomenon, which translates into the Pareto probability distribution that has a long, risky, fat tail. Behavioural finance equates decision making with actual human behaviour instead of the behaviour that economic rationality would demand. The metaphor is that investing is irrational human behaviour. Evolutionary finance employs the metaphor that financial markets are an evolution: financial markets develop out of the interaction of actions of participants and can have surprising outcomes.

5) Can virtue and value ethics compensate the assumed epistemological deficiencies of investment theory in decision making?

If the epistemology of mainstream and alternative investment theories is not suited for predicting, practical reason in the form of virtue or value ethics can become relevant, also because the ethics in economics and investment theory is reduced to merely the rationality of prudence. Both McCloskey's virtue approach and Klamer's value approach can compensate for the lack in epistemological strength in the investment theory. McCloskey tried to ensure a balanced approach by reminding us of all the seven virtues, Klamer's approach is a way of making sense for individuals at home or in an organization, and is embedded in the virtues that McCloskey proposed. Both approaches stimulate conscious thinking on decision making. For the practical purpose of making investment decisions, formulating values within a virtue ethics context is important, though the starting point is insight and honesty about the epistemological weakness of mainstream investment theory. Merely reformulating the implicit dogmas of investment theory into values would be a mistake, and strengthen the received view of investment theory.

6) What explanations offers an investigation of the culture of investing for the use of investment theory?

As an extension of rhetoric, the perspective of Klamer's approach of the culture of economics is relevant and applicable to investing, because culture is extension of rhetoric and relates to uncertainty. Uncertainty, a feeling of anxiety, is handled by culture in numerous ways. In Klamer's approach of culture, values and conversations are central. In my view,

the archetypical conversations of investors are about 'The market and the economy,' 'Talk by the model,' 'Money must be put to work,' and 'Doubt and reassurance.'

In my view, the prime shared values of Dutch institutional investors are:

- *Wealth:* the investment of capital in the financial markets aims to earn money for future income or consumption, or to preserve capital. A problem here is that money is never an end, but a means.
- *Optimism:* the optimistic sayings of investment experts are part of the ritual of investing. Even in times of bust, professional investors will maintain their optimism.
- *Rationalism:* Using a predictive method handles uncertainty by replacing a feeling of uncertainty with a rationalistic method. Rational behaviour further consists of self-control and the study of information.

The culture of investing concentrates on wealth. The legitimization of a conversation can consist of three parts: a transcendental justification (religion or truth), a social justification (the meaning for society), and a personal justification (such as the need to make a living). What about truth as a justification for investing? Investors need theories to help them act, but are the theories really true, or are they to be viewed as practical guides? In Chapter 5 the scientific context of modernism was treated. Modernism has moulded investment theory into a stochastical predictive framework. Modernism is a part of the background culture of investment theory and is a possible explanation for the depoliticization of finance. The denial of the normative aspect in modernist science intends to keep science confined to the truth. In finance, a statistical formulation leads to the idea that the applied theory of statistics is meaningful. But an improper theory of statistics fools one into the feeling of certainty, and does not explain nor predict financial markets. Of course, efficient markets as such are an interesting notion of modern finance, just like diversification and value: theories have a worth in themselves, but does that make them a good guide for practice? In practice, the ideas of finance together with other ideas serve as a practical guide, like

engineering serves to build a bridge. But investing is not like engineering, because the analogy of economics as mechanical physics does not hold.

An interesting outcome of investigating practice is that practice combines various theoretical and practical viewpoints as a matter of phronesis, as foreseen by Klamer. Kocken uses his insight gained as a risk manager that Value at Risk-models based on portfolio theory do not function, to implement stress testing as the alternative. Furthermore, he combines the insight of Minsky's instability hypothesis, a non-mainstream macro-economic theory, as an argument for better risk management by stress testing. To understand why risk and investment professionals stick to the current investment theory, he applies insights from behavioural finance. He also advocates the bottom-up approach of evolutionary finance. Concerning investment theory, he advocates the use of option theory for downside protection. Slager combines insights from the practice of investing with management and agency theory. He asks a Socratic question when he asks investors what beliefs they have about investing, and takes uncertainty as a starting point. Next, he emphasizes that organizational aspects are important in investing, that management matters. He also underpins the agency problem for pension funds, which in essence reflects the metaphor of investing as power relations between the participants, the board of the pension fund, and the investment managers. The Shell scenarios approach applied to investing by Heijmans, is of a non-stochastical character. Mechanical statistical forecasting has not been effective in the past for Shell business and is regarded as an enemy to thinking. In essence, the scenario approach is about the social construction of a potential future, founded on uncertainty, conversation, and practical wisdom. The scenario approach has emerged from management practice, the management of uncertainty.

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