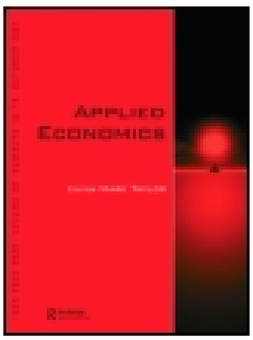

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Accruals quality, managers' incentives and stock market reaction: evidence from Europe

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ABSTRACT

We investigate if accruals quality is a valuable indicator of earnings quality for stock market investors. Our particular focus is on the incremental informative value of taking into account managers' incentives for using accruals. We propose a market-based approach for assessing the usefulness of this indicator to improve investors' decisions. Specifically, we examine the association between accruals quality and information asymmetry among stock market participants. Our empirical study uses data on European firms and our results are consistent with a positive association between poor earnings quality and high information asymmetry. However, given some previous studies suggesting that accruals-based measures may be noisy indicators of earnings quality, we develop a method to increase the informational content of the accruals quality measure. Based on our results, we find that combining accruals quality with the dispersion in analysts' forecasts provides a better indicator of earnings quality rather than only accruals quality.

KEYWORDS

Earnings management; accruals quality; information asymmetry; high-low spread estimator

JEL CLASSIFICATION

D80; G14; M41

I. Introduction

In this research, we analyse the performance of accruals quality as an indicator of earnings quality. We propose a market-based approach to investigate if the accruals quality indicator is useful for investors, allowing them to identify firms with poor earnings quality. Moreover, we analyse the incremental value of combining accruals quality and managers' incentives when assessing the performance of accruals quality.

Our study provides insights into the highly topical issue of earnings quality. In the context of the corporate accounting scandals in the 2000s, it is intriguing why, despite all financial information disclosed by listed firms, the most part of investors could not identify in advance distressed companies. Therefore, it would be useful for investors and other economic agents to have some tools that could help them in assessing earnings quality.

To develop our approach, we rely on the Easley and O'Hara's (2004) contribution, suggesting that in the case of firms with poor public information, informed investors get an informational advantage relative to liquidity traders. In short, informed investors trade on private information while liquidity traders trade on poor public information. Thus, the characteristics of the trading process must reflect the information asymmetry underlying their heterogeneous beliefs. Given that reported earnings represent a fraction of public information, we expect to find a positive association between poor earnings quality and high information asymmetry. Therefore, we analyse the performance of this indicator by empirically studying the association between earnings quality measured by accruals quality and information asymmetry in European stock markets. Prior empirical literature documents a positive association between poor earnings quality and high information asymmetry, for example Jayaraman (2008) and Bhattacharya, Desai, and Venkataraman (2013) for the United States and Cerqueira and Pereira (2015) for Europe.

Consistent with the prior-reported evidence, our results suggest that firms with poor accruals quality tend to exhibit higher levels of information asymmetry in European stock markets. However, our results also show that the association is weaker for some markets when the study is carried out at the country level. Thus, we develop a potential

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justification at the firm level for the variability in accruals quality performance based on managers' incentives for using accruals. To understand this justification, we must take into account that financial statements are prepared according to accounting principles that provide managers with a certain degree of flexibility and discretion in reporting their financial performance. For example, while the adoption of International Financial Reporting Standards (IFRS) relies on the assumption that the use of these standards provides superior information to market participants, there are a number of concerns regarding if this goal has been met. For example, Ball (2006) develops the argument that the fair value orientation of IFRS could add volatility to financial statements and thus increase the potential for managers' discretion. Kvaal and Nobes (2010) state that because the IFRS are based on principles rather than rules, they lead to different interpretations which may be the reason for a higher level of flexibility in financial reporting. Given the presumed increase in flexibility, it is important to understand the incentives underlying managers' decisions when preparing a firm's financial statements. For most of prior research, the level of discretion exercised by managers is reflected in accounting accruals.

Previous works split accruals into two components, a first component reflecting a firm's economic conditions and a residual component called abnormal accruals. Measures based on abnormal accruals have been widely adopted in extant literature to detect poor earnings quality as in Francis et al. (2005) and Bhattacharya, Desai, and Venkataraman (2013). However, another stream in literature argues that abnormal accruals convey value relevant information to outside investors. For example, Badertscher, Collins, and Lys (2012) and Chen et al. (2013) argue that managers may use discretionary accounting choices to communicate their private information about a firms' future performance. The empirical evidence provided by Subramanyam (1996) is consistent with the use of the discretionary component of accruals to increase the ability of earnings to reflect fundamental value. These two trends in the literature lead to two different views of abnormal accruals: they may be used by managers for earnings management or to communicate their private information. In the first case, they are associated with poor earnings quality, while in the second case, they are an indicator of high earnings quality (Perotti and Wagenhofer, 2014). Therefore, accrual-based measures may be noisy indicators of earnings quality. We propose a method to enhance the discriminatory power of accruals quality by taking into account managers' underlying incentives.

Moreover, we expect to have firms where the informative component prevails and other firms where the earnings management component dominates. When examining the performance of the accruals quality indicator at the country level, we expect that the performance of the indicator depends on the fraction of each type of firm.

In order to explain how to separate firms by managers' incentives to exercise discretion, let us assume the case of a firm whose accruals characteristics are consistent with poor earnings quality. However, assume that those accruals were actually used by managers as a mean to communicate value relevant information to outside investors and that managers do not have incentives to opportunistically manage earnings.[1] Under these assumptions, managers should disclose additional information in order to provide a reliable signal to outside investors reflecting the true and fair value of the firm (Dye, 1985; Verrecchia, 1990).[2,3] Hence, if managers succeed in conveying their private information to the market, then information asymmetry among market participants is expected to be low. High disclosure quality reduces information asymmetry by decreasing the likelihood that investors discover and trade on private information (Brown and Hillegeist, 2007). We propose a way to detect the situation just described above that involves the dispersion in financial analysts' forecasts. Because analysts follow all information disclosed by the firm, then their forecasts must reflect the convergence between information provided in reported earnings and other pieces of information about the firm. Therefore, poor accruals quality associated with a

[1]We assume an endogenous relation between earnings quality and voluntary disclosure (Francis, Nanda, and Olsson 2008).
[2]In the case of good private information, managers are encouraged to disclose that information to distinguish it from the worst information that they could possibly have. However, managers may suppress bad information because investors' knowledge of managers' information is incomplete (Dye 1985).
[3]Managers holding high-quality private information tend to disclose more information (Verrecchia 1990).

low dispersion in analysts' forecasts may indicate firms whose abnormal accruals are essentially informative. For those firms, we do not expect to find a high level of information asymmetry among stock market participants. But, managers may have incentives to manipulate earnings either to mislead financial statement users or to bias contractual outcomes. In such case, the accuracy of the additional disclosed information is expected to be lower and one potential implication would be an increased dispersion in analysts' forecasts. So, poor accruals quality associated with a high dispersion in analysts' forecasts may identify firms with opportunistic earnings management. For these firms, the level of information asymmetry must be high.

We begin by estimating our models using a panel data structure with both cross-sectional and time fixed effects. Our results suggest that for nonfinancial European listed firms, accruals quality may be useful as an indicator of earnings quality because we find empirical evidence of a significant positive association between poor accruals quality and high information asymmetry. Moreover, such association also holds for the three countries in our sample with the larger number of firm-year observations. Our findings also confirm our research hypothesis that adding managers' incentives to accruals quality enhances the discriminatory power of this indicator. Such evidence is consistent with investors being able, at least in part, to interpret correctly accruals used by managers to communicate private information.

In order to address potential endogeneity problems resulting from omitted variables that may affect both information asymmetry and accruals quality, we employ a two-stage instrumental variable approach. We include three instrumental variables for accruals quality defined in prior literature (Demerjian et al., 2013; Dechow and Dichev, 2002). The results of regression estimations with panel data time and firm fixed effects are similar using either OLS or two-stage least squares (2SLS) estimations. Another potential econometric problem that may affect estimation results when analysing the relation between information asymmetry and accruals quality is heteroscedasticity. Therefore, in regressions' estimations, *t*-statistics are adjusted with heteroscedasticity-consistent SEs (White, 1980). Regarding multicollinearity, one of the procedures to assess its level in a sample is based on the correlation matrix. Since the absolute values of correlation coefficients are not large, multicollinearity is not a serious econometric issue in this study.

Our contribution to the literature on earnings quality is fourfold. First, using nonfinancial listed European firms, we provide empirical evidence on the association between accruals quality and investors' reactions as reflected in information asymmetry, which is consistent with accruals quality being an indicator of earnings quality. Such study is important because it provides insights into several issues that are of interest to investors, managers, regulators, practitioners and academics. Second, we add to previous literature by showing that including managers' incentives, as captured by analysts' forecasts dispersion, enhances the discriminatory power of accruals quality. This finding is relevant given prior literature suggesting that accruals-based measures are noisy indicators of earnings quality. We show that the combination of accruals quality and analysts' forecasts dispersion enhances the performance of accruals quality as an indicator of earnings quality. Third, we find evidence that, even at the country level, taking into account managers' incentives enhances the performance of the earnings quality indicator. Fourth, the empirical tests suggest that, in the case of European stock markets, larger firms, more liquid stocks and firms with higher stock prices tend to exhibit lower levels of information asymmetry.

The remainder of the article is organized as follows. Section II exhibits a brief literature review and develops the hypotheses analysed in the study. Section III describes the proxies for earnings quality, information asymmetry and the specifications of the empirical model. Section IV presents sample selection procedures and sample characteristics. Section V documents some descriptive statistics and reports the results of the empirical tests. Concluding remarks are provided in Section VI.

II. Literature review and hypotheses development

We investigate the usefulness of accruals quality as a measure of earnings quality for stock market participants. Investors rely on disclosed information, namely information provided by financial statements, to make their investment decisions.

Therefore, better earnings quality should result in more efficient decisions. To examine the performance of this measure of earnings quality, we develop an approach that consists in exploiting the likely relation between a firm's earnings quality and information asymmetry among investors trading on the stock of the firm. Perotti and Wagenhofer (2014) also apply a market-based method to compare several proxies of earnings quality. However, while we study the direct impact of earnings quality on investor's information set, they analyse the indirect impact on securities mispricing.

To assess the expected impact of earnings quality on information asymmetry, we rely on insights provided by rational expectations and market microstructure models. We consider a market with two types of investors: informed and uninformed investors. Uninformed investors form their expectation about a firm's expected cash flows based on public information, while informed investors have access to private information. Information asymmetry is defined as the difference in information precision[4] between informed and uninformed investors (Lambert, Leuz, and Verrecchia, 2012). Assuming that a firm enhances earnings quality, which means increasing the precision of public information, without influencing private information, this implies that better earnings quality reduces information asymmetry. This is consistent with the results of the analytical model developed by Easley and O'Hara (2004) that making some of informed investors' private information public reduces their information advantage, because it increases information precision for uniformed investors while leaving unchanged the precision for informed investors.

However, earnings quality is a non-observable construct and thus, a variety of measures to proxy earnings quality have been proposed in extant literature (see Schipper and Vincent, 2003; Dechow, Ge, and Schrand, 2010). One set of those measures is based on time-series properties of earnings such as earnings persistence and predictability.[5] Smoothness is another measure representing the volatility of earnings or accruals relative to the volatility of cash flows. Two additional measures are abnormal accruals and accruals quality.

When selecting a proxy of earnings quality, the relevance of each measure must be evaluated in the context of a specific decision model (Dechow, Ge, and Schrand, 2010). In our model, the indicator of earnings quality is expected to be related with differences in the precision of investors' beliefs about a firm's prospects. Given that we are using a market-based approach, we rely on the Perotti and Wagenhofer (2014)[6] finding on the superiority of accrual-based measures, particularly accruals quality. Additionally, the selection of accruals quality follows a trend in recent literature that uses measures based on the variability of discretionary accruals over time. For example Chen, Huang, and Jha (2012) study the relationship between idiosyncratic volatility and information quality measuring multiperiod managerial discretion by both discretionary accruals volatility and the correlation between premanaged earnings and discretionary accruals.

Therefore, our main proxy for earnings quality is accruals quality, introduced by Dechow and Dichev (2002), and extended by McNichols (2002), in the operational form proposed by Francis et al. (2005). This measure reflects the degree to which earnings map into cash flows. More specifically, accruals quality is measured by the SD of the residuals obtained by regressing total current accruals on a firm's cash flows and other economic variables. Extant literature associates high SD of the residuals with poor accruals quality and with poor earnings quality (Dechow and Dichev, 2002; Francis et al., 2005; Dechow, Ge, and Schrand, 2010). In a robustness test, we also apply discretionary accruals, which measure the difference between observed total accruals and their expected values. Discretionary accruals have been widely employed to assess earnings management activities. In our study, we use a version of the modified Jones model, Dechow, Sloan, and Sweeney (1995), with lagged return-on-assets proposed by Kothari, Leone, and Wasley (2005).

To analyse the relevance of accruals quality as a measure of earnings quality, we empirically study the

[4]Information precision is the reciprocal of the variance of beliefs about a firm's future cash flows (Lambert, Leuz, and Verrecchia, 2012).
[5]Persistence refers to sustainable earnings and predictability is the ability to predict future cash flows.
[6]Specifically, Perotti and Wagenhofer (2014) propose a stock-price-based measure for assessing the quality of several proxies for earnings quality.

association between accruals quality and information asymmetry, measured by the spread.[7] This method relies on estimating the impact of earnings quality on variables reflecting the market reaction to information, for example Perotti and Wagenhofer (2014) study the impact of earnings quality on the absolute value of the difference between actual returns and expected future returns.

Market microstructure posits that both in quote and limit order-driven markets, the bid-ask spread has three components: order processing costs, inventory costs and adverse selection component. The adverse selection component is associated with information asymmetry among market participants and reflects the expected losses of liquidity providers when trading with informed investors. We develop the argument that with poor public information, the level of information asymmetry increases because of the informational advantage of informed investors, resulting in an increased adverse selection component of spread. Thus, we expect to find a positive association between poor public information and the spread.

Although using different proxies, Jayaraman (2008) and Bhattacharya, Desai, and Venkataraman (2013) study the same relationship in US markets and Cerqueira and Pereira (2015) for European markets. In a first test, we analyse if accruals quality influences the spread without taking into account managers' incentives for using accruals. Previous literature associates poor earnings quality with high spreads, thus we formalize the following hypothesis,

H1: Poor accruals quality is positively associated with high information asymmetry.

Accruals make financial reports more informative because if accruals had no informational content then investors would prefer cash flows to earnings. For example, when forecasting future cash flows, a certain degree of earnings stability is required in past and current earnings. By including accruals, managers can offset some of the cash flow volatility making earnings smoother, because earnings volatility is an obstacle to predictability (Gajewski and Quéré, 2013). Therefore, managers may use smoothing to incorporate into earnings their private information about future cash flows. This is in line with the Graham, Harvey and Rajgopal (2005) reported evidence that managers associate lower earnings volatility with a positive market premium. This branch of the literature argues that managers exercise discretion in reporting their financial performance in order to communicate private information to outside investors (Subramanyam, 1996; Louis and Robinson, 2005). However, most of prior literature suggests that managers have opportunistic motivations when reporting earnings (Jones, 1991; Francis et al., 2005; Francis, Nanda, and Olsson, 2008; Rajgopal and Venkatachalam, 2011; Bhattacharya, Desai, and Venkataraman, 2013). Furthermore, some studies propose that in a given market, some managers engage in opportunistic earnings management, while others use accruals for informative purposes (Badertscher, Collins, and Lys, 2012; Chen et al., 2013).

We propose that in a given market, there are two types of firms: firms where the informational component outweighs the earnings management component and firms where the earnings management component prevails. Thus, a positive association between accruals quality and the spread is expected for firms where the earnings management component prevails. Assuming a market with both types of firms, the relationship between accruals and information asymmetry may be positive, negative or even negligible.

To further understand the impact of accruals quality on information asymmetry, we rely on the underlying managers' incentives for using accruals. To empirically distinguish managers' incentives, we assume that both earnings quality and managers' voluntary disclosure influence investors' beliefs about a firm's future performance. Investors construct their beliefs about firm value based on public and private information, particularly on information reflected in financial reports. The informational content of voluntary disclosure has been investigated in the form of a number of information items disclosed in the annual reports (Francis, Nanda, and Olsson, 2008; Mouselli, Jaafar, and Hussainey, 2012) and items disclosed in 10-K

[7]The adverse selection component of the quoted spread is equal to the revision in the expectations of the market maker conditional on the precision of private information and on the probability that the trader is an informed investor. Hence, such proxy is expected to capture both information precision and information asymmetry.

fillings (Francis, Nanda, and Olsson, 2008). When managers rely on accruals for opportunistic earnings management, substantial differences can occur between the informational content of the accruals quality indicator and voluntary information disclosure. One implication of this is a higher degree of uncertainty in investors' beliefs and an increased dispersion in analysts' forecasts. We propose that the dispersion in analyst's forecasts can partially reveal managers' underlying incentives for using accruals. Therefore, poor accruals quality associated with a high (low) dispersion in analysts' forecasts may indicate firms with opportunistic (informative) earnings management. Although in the context of Initial Public Offerings, Chen et al. (2013) provide evidence that high-discretionary accruals are associated with informative earnings management in the case of firms with low information uncertainty. Thus, we propose that combining accruals quality and the dispersion in analysts' forecasts provides a better indicator of earnings quality than accruals quality solely and we posit the following hypothesis:

H2: The positive association between poor accruals quality and high information asymmetry is stronger for firms with opportunistic earnings management, as identified by poor accruals quality and a high dispersion in analysts' forecasts.

Previous studies report that managers associate firms with low-earnings volatility with better information disclosure (Graham, Harvey, and Rajgopal, 2005) and that earnings smoothness is a favourable attribute of earnings (Perotti and Wagenhofer, 2014). Although investigating a different research topic, we also assume that investors find more difficult to interpret information contained in earnings when abnormal accruals are highly variable over time. Given that the accruals quality measure reflects the volatility of abnormal accruals, we propose that high volatilities are likely to identify firms with poor public information and consequently high levels of information asymmetry. Thus, the association between accruals quality and the spread is expected to be stronger for firms with worst accruals quality anticipating a non-linear relationship between accruals quality and the spread, leading to the following hypothesis:

H3: The positive association between poor accruals quality and information asymmetry is non-linear and such association is stronger for firms with the worst accruals quality.

III. Empirical research design

Data and sample selection

Our sample consists of firms listed in 18 European stock markets, over the period from 2003 to 2011. The sample includes firms from 17 European Monetary Union countries and the United Kingdom. Our primary source of data is the Thomson Reuters Datastream database. Additionally, we collect the number of analysts providing earnings per share estimates for the next financial year and the SD of analysts' earnings per share estimates from I/B/E/S.

In order to allow comparison, we include in our sample firm-year observations if their financial reports are based on IFRS accounting standards. While the mandatory IFRS adoption for listed firms in European Union was made effective from 2005, many firms voluntary adopt IFRS few years before. Thus, we also include in our sample years 2003 and 2004, but in order to ensure that only firm-year observations reported under IFRS were included in estimations, we use the Thomson Reuters Datastream key item Accounting Standards Followed.

For a number of firms included in our sample, some variables are not available over the full sampling period. In order to avoid excluding too many firms, we define as a minimum criterion that firms have at least three full years of data. After applying this restriction, the number of firms in the sample drops to 1999. Additionally, we exclude firms with missing industry code classification, financial firms and utilities (Fama and French industry codes 31, 44, 45, 46, 47 and 48) because they are subject to specific regulations, reducing the number of firms to 1607. After these procedures, four countries were excluded from the sample: Cyprus, Luxembourg, Malta and Slovakia.

Table 1 presents the distribution of firms and firm-year observations for the 14 countries left in our sample after applying the restrictions described

Table 1. Sample firms and firm-observations by country.

Country	Number of firms	Firm-year observations
Austria	24	143
Belgium	45	327
Estonia	3	8
Finland	65	473
France	204	1395
Germany	162	1119
Greece	5	36
Ireland	23	168
Italy	66	396
Netherlands	64	476
Portugal	24	163
Slovenia	7	23
Spain	46	317
United Kingdom	608	3425
Total	1346	8469

Source: Authors' calculations.

This table provides the number of firms and firm-year observations by country included in the study. The sample contains European Monetary Union and UK firms with accounting and market data available on the Thomson Datastream. Financial firms and utilities (Fama and French industry codes 31, 44, 45, 46, 47 and 48) are excluded from the sample. In order to be considered a firm must have at least 3 years of full data over the sampling period, firm-year observations with missing regression variables are also eliminated.

above. Additionally, when estimating a specific regression, observations with missing values in the variables are not included. Thus, the number of firms and firm-year observations depends on the specific regression being estimated.

The number of firms and firm-year observations reported in the table are those of the main regression in our study. This regression includes the spread as the dependent variable, and accruals quality and control variables as explanatory variables. The number of firm drops from 1607 in the full sample to 1346, while the number of firm-year observations is 8469. In a similar regression estimation, firm-year observations for United Kingdom, France and Germany are 3425 (40.4%), 1395 (16.5%) and 1119 (13.2%), respectively. These three markets together represent 70.1% of the full sample.

Accruals quality and information asymmetry

To analyse the relationship between accruals quality and information asymmetry, we use panel data. In fact, our data exhibit both cross-sectional and time series dimensions because they consist of observations collected annually for the same sample of firms. Using such data structure, that is panel data, increases the number of observations and thus provides more precise estimators and test statistics with more power. Furthermore, panel data may reduce the problem of multicollinearity because when explanatory variables have two dimensions, they are less likely to be correlated.

We begin by assuming that accruals quality is an exogenous explanatory variable. However, accruals quality could be endogenous if certain characteristics that affect accruals quality also affect information asymmetry. If there is an omitted variable that affects both the dependent variable and one or more explanatory variables, we have an endogeneity problem. The endogenous variable is correlated with the error term. To address potential endogeneity problems, we can use a panel data structure and fixed effects estimations in the case of time-constant omitted variables. To take into account potential time-varying omitted variables, we can use the method of instrumental variables. Fixed effects 2SLS allows estimation of panel data models addressing endogeneity in explanatory variables as well as unobserved heterogeneity (Semykina and Wooldridge 2010).

Therefore, in our empirical tests, we begin by estimating our panel data models and using time fixed effects and cross-sectional fixed effects at the firm level. We decide to include fixed effects after running a Hausman test, where the null hypothesis is that the preferred model is the random effects. Since the null hypothesis is rejected, the random effects model is not appropriate and instead the fixed effects model must be used. In addition, exploiting the panel data structure, we address the potential endogeneity problem applying and instrumental variable approach and 2SLS estimations.

Independent variables

Accruals quality

Information about earnings measured by accrual accounting provides a better basis for assessing the entity's past and future performance than information about current cash flows. Specifically, accruals are assumed to be useful for investors and other economic agents to the extent that they could help in anticipating future cash flows. However, IFRS provide managers with a certain degree of flexibility when reporting a firm's financial performance. Such flexibility can lead to estimation errors, resulting for example from the use of judgment in measurement estimations, accounting policy choices and vague criteria in IFRS (Nobes 2006). Therefore, a proxy

for earnings quality should be able to capture those estimation errors, as it is the case of the accrual quality measure proposed by Dechow and Dichev (2002) who analyse the stability of the relation between accruals and cash flows.

As justified in the beginning of our literature review, we use the accruals quality metric developed by Dechow and Dichev (2002), as modified by McNichols (2002) and used in prior literature, for example Francis et al. (2005). Dechow and Dichev (2002) measure the quality of accruals by the extent to which current accruals map into past, current and future cash flows, more specifically by the SD of the residuals of the regression of currents accruals on cash flows (estimated at the firm level or at the sector level). McNichols (2002) include in the estimation of residuals the variables current year property, plant and equipment and change in net sales, which are the fundamental variables in the Jones (1991) model. Francis et al. (2005) investigate the impact of this measure on the cost of capital. Specifically, they estimate the regression residuals cross-sectionally, by year, within each of the 48 Fama and French (1997) industry classifications.

To measure accruals quality, we begin by computing total current accruals as the change in noncash working capital,

$$TCA_{i,t} = \Delta CA_{i,t} - \Delta CL_{i,t} - \Delta Cash_{i,t} + \Delta STDebt_{i,t} \quad (1)$$

where ΔCA is the change in current assets, ΔCL is the change in current liabilities, $\Delta Cash$ is the change in cash and $\Delta STDebt$ represents the change in short-term debt.

Accruals quality is measured by the SD of the residuals obtained by regressing total current accruals on operating cash flow in the current period, prior period and future period, change in revenues and gross value of property plant and equipment.

$$TCA_{i,t} = \alpha_0 + \alpha_1 CFO_{i,t-1} + \alpha_2 CFO_{i,t} + \alpha_3 CFO_{i,t+1} + \alpha_4 PPE_{i,t} + \alpha_5 \mathrm{Rev}_{i,t} + e_{i,t} \quad (2)$$

All variables are scaled by average total assets.

We estimate cash flow from operations as the difference between net income before extraordinary items and total accruals (TA),

$$CFO_{i,t} = NIBE_{i,t} - TA_{i,t} \quad (3)$$

where TA is defined as the change in noncash working capital minus depreciation and amortization expense,

$$TA_{i,t} = \Delta CA_{i,t} - \Delta CL_{i,t} - \Delta Cash_{i,t} + \Delta STDebt_{i,t} - Depn_{i,t} \quad (4)$$

In order to obtain the residuals $e_{i,t}$ for firm i and year t, Equation (2) is cross-sectionally estimated in year t at the Fama and French's (1997) industry level. Accruals quality in year t refers to the SD of a firm's residuals calculated over year t – 4 through t.

Independent variables

Discretionary accruals

Our primary measure of earnings quality is accruals quality, but to examine the robustness of our results, we also run tests using the discretionary accruals measure. While accruals quality represents the SD of the total accruals regression residuals, the discretionary accruals measure captures the absolute value of abnormal accruals period by period. Both measures have been used in literature in the context of market-based approaches. For example, Chen, Huang, and Jha (2012) attribute idiosyncratic return volatility to discretionary accrual volatility, while Bhattacharya, Desai, and Venkataraman (2013) explain information asymmetry in stock markets by accruals quality.

The discretionary accruals measure is based on the modified Jones (1991) model (Dechow, Sloan, and Sweeney 1995), with the contribution of Kothari, Leone, and Wasley (2005), which consists in including the explanatory variable-lagged return-on-assets in the residual estimation. However, evidence was reported by Noguer and Munoz (2004) that the standard Jones model and the modified Jones model produce almost identical discretionary accruals distributions. Discretionary accruals are used by Cimini (2015) to investigate the impact of the financial crisis on earnings management for a sample of EU countries.

To estimate discretionary accruals, we begin with total accruals, obtained as in Equation (4). Then, using firm-year observations on total accruals, we estimate annually cross-sectional regressions for

each of the Fama and French's (1997) 48 industry groups with at least 8 firms.

$$TAcc_{i,t} = \alpha_0 + \alpha_1\left(\frac{1}{Assets_{i,t-1}}\right) + \alpha_2\left(\Delta Sales_{i,t} - \Delta AR_{i,t}\right) + \alpha_3 PPE_{i,t} + \alpha_4 ROA_{i,t-1} + e_{i,t} \quad (5)$$

where $TAcc_{i,t}$ is total accruals scaled by lagged total assets, $\Delta Sales$ is the change in sales scaled by lagged total assets ($Assets_{i,t-1}$), ΔAR is the change in accounts receivable[8] scaled by lagged total assets, PPE is net property, plant and equipment scaled by lagged total assets and ROA represents return on assets in period $t-1$. Discretionary accruals are defined as the residuals of Equation (5). These residuals represent the component of total accruals left after controlling for firm performance, firm economic activity and investment in Plant, Property and Equipment.

Dependent variable

Proxies for information asymmetry

There are a number of information differences across investors in securities markets. This information asymmetry is a concern to market participants and securities regulators. One problem is that uninformed investors might be reluctant to invest if they fear to lose in their trading against informed investors. In addition, uninformed traders might demand a return premium for investing in securities exhibiting high level of information asymmetry (Lambert, Leuz, and Verrecchia 2012).

A strand in previous literature uses the bid-ask spread as a proxy for information asymmetry. The spread has three components: the order-processing cost, the inventory-holding cost and the adverse-selection component. The order-processing costs are, for example, those associated with providing the market maker service such as rents, labour costs and equipment (Bollen, Smith, and Whaley, 2004). The inventory-holding cost represents the market maker compensation for the price risk associated with a suboptimal inventory position (Bollen, Smith, and Whaley, 2004). The adverse-selection component of the spread represents the market maker compensation for the losses incurred when trading with investors who are better informed about the true security value.

A recent stream of literature uses intraday data-based measures of information asymmetry, for example the probability of information-based trading developed by Easley, Hvidkjaer, and O'Hara (2002) used by Brown and Hillegeist (2007), Jayaraman (2008), and Bhattacharya, Desai and Venkataraman (2013) and the price impact of trade used by Glosten and Milgrom (1985) and Bhattacharya, Desai, and Venkataraman (2013).

However, for most of the European firms in our sample databases with such type of data are not available. Thus, in our study, we use the Corwin and Schultz (2012) estimator because these authors argue that the estimator can be used both with daily or intraday data and found empirical evidence of a similar performance of the spread estimator as compared to alternative measures based on high-frequency data for US markets. This estimator uses the daily high and low prices to estimate the relative spread. The basic idea is that the spread is the same over a single day period or over one 2-day period, while the variance increases proportionally with the period length. To estimate the spread, we denote the actual high (low) stock price in day t by H_t^A $\left(L_t^A\right)$. Representing by S the relative bid-ask spread, the observed high (low) stock price in day t is $H_t^0 = H_t^A(1 + (S/2))$, $L_t^0 = L_t^A(1 - (S/2))$. Corwin and Schultz (2012) show that the relative spread S can be estimated as

$$S = \frac{2\left(e^{\alpha} - 1\right)}{1 + e^{\alpha}} \quad (6)$$

$$\alpha = \frac{\sqrt{2\beta} - \sqrt{\beta}}{3 - 2\sqrt{2}} - \sqrt{\frac{\gamma}{3 - 2\sqrt{2}}} \quad (7)$$

$$\gamma = \left[\ln\left(\frac{H_{t,t+1}^0}{L_{t,t+1}^o}\right)\right]^2, \qquad \beta = \left[\ln\left(\frac{H_{t,t}^0}{L_{t,t}^o}\right)\right]^2 + \left[\ln\left(\frac{H_{t,t+1}^0}{L_{t,t+1}^o}\right)\right]^2 \quad (8)$$

The estimator is adjusted for overnight returns and negative estimates are set to zero. To estimate the spread on an annual basis, we estimate spreads

[8]Dechow, Sloan, and Sweeney (1995), in the modified Jones model, assume that changes in credit sales are the result of Earnings Management.

separately for each 2-day period and calculate the average across all overlapping 2-day periods in the year.

Empirical models and control variables

In this section, we develop the empirical models used to investigate the impact of earnings quality on information asymmetry. In a first model, we use accruals quality to measure earnings quality and the high–low spread estimator for information asymmetry. Previous studies identify a number of highly significant factors in explaining information asymmetry. Thus, we include in our model a number of control variables that are known to influence the spread and we get the following equation,

$$\begin{aligned} HL\_S_{i,t} &= \alpha_0 + \alpha_1 AQ_{i,t} + \alpha_2 SIZE_{i,t} \\ &\quad + \alpha_3 ILLIQ_{i,t} + \alpha_4 INV\_PRI_{i,t} \\ &\quad + \alpha_5 TURN_{i,t} + \alpha_6 ANALYSTS_{i,t} \\ &\quad + \varepsilon_{i,t} \end{aligned} \tag{9}$$

where *HL_S* is the annual average of the daily high–low spread estimator *S*, defined above.

AQ is the accruals quality measure given by the SD of residuals from Francis et al. (2005) regression model, also defined above. We expect to find higher levels of information asymmetry for firms with poor informational environment. If poor accruals quality indicates poor public information, then a positive sign is expected for the *AQ* regression coefficient.

SIZE denotes the logarithm of market capitalization. Because larger firms tend to produce more information and to disclose such information faster, this must reduce information asymmetry (Chae 2005). Thus, we expect to find a negative association between spread and size.

Market microstructure models propose three components of the spread: order processing costs, inventory costs and adverse selection. As we intend to use the adverse selection component to represent information asymmetry, we must remove the remaining components. To take into account the order processing costs component, we include turnover (*TURN*), following Acker, Stalker, and Tonks (2002) and Bollen, Smith, and Whaley (2004). *TURN* is defined as the ratio of shares traded over year *t*, divided by the total number of shares outstanding. It is expected that these costs decrease with turnover, implying an expected negative regression coefficient. To account for the inventory holding component of spread, we follow Amihud (2002) and Hasbrouck (2009) that propose a measure for illiquidity (*ILLIQ*) defined as the annual average of the ratio between the absolute value of the daily stock return and the corresponding daily trading volume. We expect that more illiquidity means higher spread, leading to a predicted positive-regression coefficient.

INV_PRI which represents the inverse of stock price is used by Jayaraman (2008) as an explanatory variable for spread. This variable is used in microstructure models to take into account the effect of price discreteness due to the minimum tick size (Bollen, Smith, and Whaley 2004). Firms with lower stock prices tend to have larger relative bid-ask spreads, implying an expected positive regression coefficient for the inverse of stock price.

ANALYSTS represents analyst coverage, measured by total number of annual analysts' estimates. On the one hand, firms with poor earnings quality and, consequently, high information asymmetry tend to attract more analysts' estimates because the value of private information is greater. On the other hand, more analysts' estimates increase information production thus reducing information asymmetry (Lobo, Song, and Stanford, 2012). We propose a negative association between analyst coverage and information asymmetry. However, prior literature reports conflicting results about this relationship (Van Ness, Van Ness, and Warr 2001).

In order to take into account managers' incentives, we further develop the basic model by including a dummy variable *DISP* set equal to one for values of the dispersion in analysts' forecasts higher than the 33rd percentile and zero otherwise. The dispersion in analysts' forecasts is defined as the SD in analysts' forecasts scaled by the median forecast. Such development aims at identifying firms that are likely to use accruals mainly for earnings management, thus, we expect to find a stronger positive association between *AQ* and *HL_S*.

$$\begin{aligned} HL\_S_{i,t} &= \alpha_0 + \alpha_1 AQ_{i,t} + \alpha_2 DISP_{i,t} \\ &\quad \times AQ_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 ILLIQ_{i,t} \\ &\quad + \alpha_5 INV\_PRI_{i,t} + \alpha_6 TURN_{i,t} \\ &\quad + \alpha_7 ANALYSTS_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{10}$$

To test the non-linear specification of our basic model, we rank firms by the accruals quality measure and split the sample into quintiles. We include in the regression model four quintile dummies $Q2$, $Q3$, $Q4$ and $Q5$, identifying firms in accruals quality quintiles except for quintile one. For example, $Q2$ is set to one if the firm is included in quintile one and zero otherwise. We expect to find larger spreads especially for the fourth and fifth quintiles.

$$\begin{aligned} HL\_S_{i,t} &= \alpha_0 + \alpha_1 Q2_{i,t} + \alpha_2 Q3_{i,t} + \alpha_3 Q4_{i,t} \\ &\quad + \alpha_4 Q5_{i,t} + \alpha_5 SIZE_{i,t} \\ &\quad + \alpha_6 ILLIQ_{i,t} + \alpha_7 INV\_PRI_{i,t} \\ &\quad + \alpha_8 TURN_{i,t} + \alpha_9 ANALYSTS_{i,t} \\ &\quad + \varepsilon_{i,t} \end{aligned} \tag{11}$$

In a robustness test to our results, the basic model was estimated using discretionary accruals as a different proxy for earnings quality.

$$\begin{aligned} HL\_S_{i,t} &= \alpha_0 + \alpha_1 ACC\_DISC_{i,t} + \alpha_2 SIZE_{i,t} \\ &\quad + \alpha_3 ILLIQ_{i,t} + \alpha_4 INV\_PRI_{i,t} \\ &\quad + \alpha_5 TURN_{i,t} + \alpha_6 ANALYSTS_{i,t} \\ &\quad + \varepsilon_{i,t} \end{aligned} \tag{12}$$

Empirical models

Addressing endogeneity, heteroscedasticity and multicollinearity

In a 2SLS estimation, we begin by selecting for each potential endogenous variable one or more variables not appearing in the structural equation and uncorrelated with the error term of the structural equation. After regressing the potential endogenous variable on the new instruments and on the exogenous variables of the structural equation, we can test the statistical significance of the new instruments. The fitted value of the endogenous variable is then used in place of the endogenous variable to estimate the structural equation. Econometric software provides estimation settings for the 2SLS method, so there is no need to do the two stages manually.

There are a number of variables that have been used in previous literature to control for factors influencing earnings management. An instrumental variable for accruals quality must be related with accruals quality but uncorrelated with the error term of the structural equation. A group of potential instruments for accruals quality is specified in previous works (e.g. Demerjian et al. 2013; Dechow and Dichev 2002). We select three of those variables correlated with accruals quality: sales volatility measured by the SD of sales scaled by average total assets over year $t - 4$ through t, requiring at least three observations. Cash flow volatility given by the SD of cash flow from operations scaled by average total assets over year $t - 4$ through t, requiring at least three observations. The variable losses is the percentage of years with negative net income before extraordinary items over year $t - 4$ through t, requiring at least three observations.

To test for the statistical relevance of the new instruments, we regress the endogenous variable on the new instruments and on the remaining explanatory variables of the structural equation. We test the null hypothesis that the coefficients of the new instruments are zero using an F test. The result $F = 1018.25$ and p-value $= 0.000$ are consistent with those coefficients having statistical significance.

It is also useful to test for endogeneity because the variances of 2SLS estimates are larger than those for OLS. To test for endogeneity, we begin by obtaining the residuals of the regression of the endogenous variable on the instrument variables, including omitted variables and the exogenous variables in the structural equation. Afterwards, the structural equation is estimated adding the residuals and test for the significance of the residuals' coefficient (Wooldridge 2009). If the coefficient is statistically different from zero, we conclude that variable is indeed endogenous and we proceed by estimating the structural equation using the 2SLS. The results are consistent with accruals quality being endogenous, coefficient $= -8.308$, t-statistics $= -11.646$ and p-value $= 0.000$. Thus, to control for endogeneity, we use instrumental variables and 2SLS estimations.

In our tests, we also control for heteroscedasticity, which occurs when the variance of the unobservable error, conditional on the independent variables, changes across different segments of the population. However, heteroscedasticity does not cause bias or inconsistency in the OLS estimators. But, the OLS SEs are no longer valid to construct confidence intervals and t statistics, unless we use heteroscedasticity-consistent SEs. Therefore, in our estimations, we use the White's heteroscedasticity-consistent SEs.

Another potential econometric problem is multicollinearity, which is related to high correlation between two or more independent variables. Multicollinearity increases the variance of estimated coefficients, but does not create biased estimators. In short, multicollinearity does not lead to biased estimators but increases SDs of estimators and coefficient estimators are very unstable experimenting high changes from one sample to another. One of the procedures to assess the level of multicollinearity in a sample is based on the correlation matrix. Multicollinearity is a serious problem if the correlation between two explanatory variables is high (in excess of 0.8) (Gujarati 2004). According to Table 4, the highest correlation coefficient is 0.607 between Market Capitalization and Analysts; therefore, we do not have a multicollinearity problem in our sample.

IV. Empirical results

Descriptive statistics and correlations

Table 2 gives descriptive statistics of the variables used to measure information asymmetry, earnings quality and other explanatory variables for information asymmetry. To mitigate the effect of potential outliers, the variables are winsorized at the first and ninety-ninth percentile.

Our primary variables are accruals quality and the HL spread estimator. The mean value of *AQ* is 0.0341 which is similar to the 0.0442 reported by Francis et al. (2005) for US markets and for the period from 1970 to 2001. In our tests, the variable for information asymmetry is the HL spread estimator multiplied by 100. We find a mean value of the spread measure in European markets of 1.4401 which is slightly lower than that reported for US markets. Specifically, the mean value of the HL spread estimator multiplied by 100 reported by Corwin and Schultz (2012) is 2.10 for the period from 1993 to 2006.

Table 2. Descriptive statistics for selected variables.

	Mean	Median	SD	Minimum	Maximum
HL_S	1.4401	1.2088	0.8542	0.3474	7.1859
AQ	0.0341	0.0263	0.0288	0.0010	0.4746
MKT_CAP	2339,247	263,847	7521,017	2227	67,171,795
ILLIQ	0.0883	0.0013	0.3734	7.7E-08	5.6706
INV_PRI	0.1033	0.0280	0.2419	0.0005	3.0394
TURN	0.6855	0.4336	0.7313	0.0004	4.7113
ANALYSTS	7.9985	5.0	7.5518	1.0	54.0

Source: Authors' calculations.

HL_S: Annual variable defined as the average of the Corwin and Schultz (2012) bid-ask spread estimator multiplied by 100; *AQ*: accruals quality measure given by the SD of residuals from the Francis et al. (2005) regression model; *MKT_CAP*: market capitalization in € thousands; *ILLIQ*: calculated as 100 times the annual average of daily unsigned stock return divided by trading volume; *INV_PRI*: inverse of stock price; *TURN*: ratio of shares traded over the year divided by the total number of shares outstanding; *ANALYSTS*: analyst coverage, measured by total number of annual analysts' estimates.

Table 3. Descriptive statistics for the three major markets.

	United Kingdom		France		Germany	
	Mean	SD	Mean	SD	Mean	SD
HL_S	1.5867	1.0012	1.2901	0.7398	1.4597	0.6259
AQ	0.0381	0.0305	0.0287	0.0224	0.0388	0.0376

Source: Authors' calculations.

HL_S: Annual variable defined as the average of the Corwin and Schultz (2012) bid-ask spread estimator multiplied by 100; *AQ*: accruals quality measure given by the SD of residuals from the Francis et al. (2005) regression model.

Table 3 describes the mean and SD of the main regression variables for the three major markets. The selection of the three major markets is based on the number of firm-year observations. France has both the lower mean value of *HL_S* and *AQ*, which seems consistent with a better earnings quality (low *AQ*) implying lower information asymmetry (low *HL_S*). However, such evidence is not conclusive because these results do not take into account the impact of control variables on the spread estimator.

Table 4 contains the Pearson's correlation coefficients of the variables used to measure information asymmetry, earnings quality and other explanatory variables for information asymmetry. Correlations between *AQ* and *HL_S* are positive (0.213) and statistically significant at the 1% level. This result is consistent with the shares of firms with poor accruals quality exhibiting a high level of information asymmetry. The spread estimator is negatively correlated with firm size, meaning that larger firms exhibit lower levels of information asymmetry. The results show high absolute values of this coefficient consistent with firm size being a main explanatory variable of information asymmetry. Illiquidity and inverse of stock price are positively correlated with the spread estimator, consistent with higher spreads for illiquid stocks and stocks with low prices.

We also find a significant correlation between the independent variables firm size, turnover and the number of analysts which may influence the explanatory power of the variables in the regression model.

In order to anticipate the association between accruals quality and the spread, we split the sample

Table 4. Correlations.

	HL_S	*AQ*	*MKT_CAP*	*ILLIQ*	*INV_PRI*	*TURN*	*ANALYSTS*
HL_S	1						
AQ	0.213***	1					
MKT_CAP	−0.129***	−0.118***	1				
ILLIQ	0.291***	0.064***	−0.069***	1			
INV_PRI	0.243***	0.115***	−0.086***	0.355***	1		
TURN	−0.057***	0.025**	0.176***	−0.180***	−0.100***	1	
ANALYSTS	−0.150***	−0.176***	0.586***	−0.158***	−0.145***	0.482***	1

Source: Authors' calculations.
***, **Indicate significance at the 1% and 5% levels, respectively.
HL_S: Annual variable defined as the average of the Corwin and Schultz (2012) bid-ask spread estimator multiplied by 100; *AQ*: accruals quality measure given by the SD of residuals from the Francis et al. (2005) regression model *MKT_CAP*: market capitalization in € thousands; *ILLIQ*: calculated as 100 times the annual average of daily unsigned stock return divided by trading volume; *INV_PRI*: inverse of stock price; *TURN*: ratio of shares traded over the year divided by the total number of shares outstanding; *ANALYSTS*: analyst coverage, measured by total number of annual analysts' estimates.

Table 5. Mean spreads by accruals quality quintiles.

	Q1	*Q2*	*Q3*	*Q4*	*Q5*	*Q2 − Q1*	*Q3 − Q2*	*Q4 − Q3*	*Q5 − Q4*
HL_S	1.195	1.257	1.367	1.43	1.66	0.062***	0.110***	0.060**	0.229***
AQ	0.010	0.018	0.026	0.038	0.077				

Source: Authors' calculations.
***,**Indicate significance at the 1% and 5% levels, respectively.
HL_S: annual variable defined as the average of the Corwin and Schultz (2012) bid-ask spread estimator multiplied by 100; *AQ*: accruals quality measure given by the SD of residuals from the Francis et al. (2005) regression model.

into five groups after ranking firms based on accruals quality quintiles.[9] Firms in the top quintile are those with the worst accruals quality. Firms in the bottom quintile are those with the best accruals quality. If accruals quality has explanatory power for the spread, then the mean spread must be higher for firms in the top quintile. Table 5 shows the mean spread by quintile.

As predicted, the mean of the spread estimator is larger for firms in the top quintile. The results in Table 5 also show a statistically significant positive difference between the mean spread for a given quintile and that of the previous one, consistent with an increase in information asymmetry for firms with poor earnings quality. It is noteworthy that the mean *AQ* strongly increases for the firms in the top quintile meaning that it includes firms with very poor earnings quality. The analysis by quintiles shows evidence of a market reaction to changes in earnings quality, particularly evident in the observed change in the mean spread between quintiles four and five.

In order to investigate if these results are biased by specific market data, we run this procedure for the United Kingdom that represents about 40% of the full sample observations.

The results reported in Table 6 for the United Kingdom are similar to those reported for the full sample, except for the change between quintiles three and four. The observed change in *AQ* is 0.013 while the corresponding change in the spread estimator is not statistically significant. As in the case of the full sample, the analysis by quintiles for the United Kingdom shows that information asymmetry increases with the reduction in earnings quality, which is especially clear when observing the difference of mean spread values between *Q*4 and *Q*5.

Table 6. Mean spreads by accruals quality quintiles for the United Kingdom.

	Q1	*Q2*	*Q3*	*Q4*	*Q5*	*Q2 − Q1*	*Q3 − Q2*	*Q4 − Q3*	*Q5 − Q4*
HL_S	1.250	1.381	1.592	1.534	1.796	0.131***	0.211***	−0.059	0.262***
AQ	0.011	0.021	0.029	0.042	0.086				

Source: Authors' calculations.
***,**Indicate significance at the 1% and 5% levels, respectively.
HL_S: Annual variable defined as the average of the Corwin and Schultz (2012) bid-ask spread estimator multiplied by 100; *AQ*: accruals quality measure given by the SD of residuals from the Francis et al. (2005) regression model.

[9]Even if the term quintile refers to a cut-off point, hereafter, quintile denotes a group of firms, for example the first quintile corresponds to firms whose magnitude of *AQ* is lower than the twentieth percentile.

Regression of the spread estimator on accruals quality and control variables

Our empirical study proceeds with the estimation of a multivariate regression to analyse the association between earnings quality as measured by accruals quality and the spread as a proxy for information asymmetry. In our regression, we also include a number of independent variables that are known to influence the spread. Specifically, we use as control variables the logarithm of market capitalization, illiquidity, the inverse of the stock price, turnover and analyst coverage.

In spread regressions, we use panel data because combining time series and cross sections increases the number of observations and may offer a solution to the problems caused by unobserved heterogeneity. In regression estimations, we use both cross-sectional fixed effects at the firm level and time fixed effects. Table 7, panel A reports the results for OLS and 2SLS estimations that are similar, and therefore the results are robust to the change in the estimation method. In the 2SLS method, instrument variables for accruals quality are sales volatility, cash flow volatility and losses. Greater sales volatility implies using approximations and estimation in financial reporting resulting in poor accruals quality (high *AQ*). High cash flow volatility indicates high uncertainty in operational environment and thus poor accruals quality. Losses indicate negative shocks in operating environment and are expected to affect negatively accruals quality.

In addition, results in Table 7, panel A show a positive association between *AQ* and *HL_S* and such association is statistically significant at the 1% level for the sample including all firms. As expected, the estimated coefficient for *AQ* quality is always positive meaning that better earnings quality (low *AQ*) reduces information asymmetry among market participants.

Regarding control variables, the coefficient for size is negative and statistically significant at the 1% level, suggesting that larger firms exhibit lower

Table 7. Regression of the spread estimator on accruals quality and control variables.

Panel A: Full sample

	Pred. sign	Panel fixed effects (OLS)		Panel fixed effects (2SLS)	
		Coeff.	*t*-Stat.	Coeff.	*t*-Stat.
INTERCEPT		3.984***	17.516	3.473***	14.503
AQ	+	1.575***	4.426	8.540***	8.302
SIZE	–	−0.229***	−13.171	−0.206***	−11.523
ILLIQ	+	0.726***	9.581	0.733***	8.593
INV_PRI	+	0.213***	2.624	0.188**	2.115
TURN	–	0.194***	14.0542	0.185***	12.809
ANALYSTS	–	0.007***	4.733	0.007***	4.189
Num. Obs.		8469		8469	
Adj. *R*-squared		0.65		0.61	

Panel B: United Kingdom, France and Germany

	Pred. sign	Panel fixed effects (OLS)			Panel fixed effects (2SLS)		
		United Kingdom	France	Germany	United Kingdom	France	Germany
INTERCEPT		4.221***	1.260***	1.138**	3.478***	1.069**	0.545
AQ	+	1.057**	3.720***	0.963*	9.582***	7.307***	4.999***
SIZE	–	−0.267***	−0.034	−0.010	−0.230***	−0.280	0.024
ILLIQ	+	14.509***	0.861***	0.521***	15.431***	0.833***	0.550***
INV_PRI	+	8.444***	0.900***	1.005***	8.870***	0.986***	0.979***
TURN	–	0.259***	0.331***	0.242***	0.254***	0.323***	0.216***
ANALYSTS	–	0.019***	−0.004	−0.000	0.015***	−0.003	0.000
Num. Obs.		3425	1395	1119	3425	1395	1119
Adj. *R*-squared		0.67	0.68	0.69	0.64	0.67	0.67

Source: Authors' calculations.

***, **Indicate significance at the 1% and 5% levels, respectively, based on White (1980) heteroscedasticity-consistent SEs.

This table reports the results of the regression of the spread estimator on accruals quality measure (*AQ*).

HL_S: Annual variable defined as the average of the Corwin and Schultz (2012) bid-ask spread estimator multiplied by 100; *AQ*: accruals quality measure given by the SD of residuals from the Francis et al. (2005) regression model; *SIZE*: log of market capitalization in € thousands; *ILLIQ*: calculated as 100 times the annual average of daily unsigned stock return divided by trading volume; *INV_PRI*: inverse of stock price; *TURN*: ratio of shares traded over the year divided by the total number of shares outstanding; *ANALYSTS*: analyst coverage, measured by total number of annual analysts' estimates.

In the 2SLS method, the instrument 'Sales Volatility' is the SD of sales scaled by average total assets over year $t-4$ through t, requiring at least three observations. 'Cash Flow Volatility' is the SD of cash flow from operations scaled by average total assets over year $t-4$ through t, requiring at least three observations. 'Losses' is the percentage of years with negative net income before extraordinary items over year $t-4$ through t, requiring at least three observations.

spreads. Another statistically significant variable at the 1% level is illiquidity whose regression coefficient is positive, consistent with more liquid stocks having lower spreads. A third variable with explanatory power at the 1% (5% 2SLS) level is the inverse of stock price. Because there is a minimum price variation allowed for quoting, such variation affects more the relative spread of stocks with low prices. So, low stock prices are associated with high relative spreads. The sign of the estimated coefficients for turnover and analysts is positive while both predicted signs are negative. We suggest that this has something to do with the use of the spread estimator, because when running the same tests using the closing bid-ask spread to measure information asymmetry the observed signs match those predicted. This finding is consistent with the results reported by Van Ness, Van Ness and Warr (2001) that the sign of the association between the number of analysts and information asymmetry depends on the model used to estimate the adverse selection component of the spread.

Table 7, panel B reports the results of our tests in the case of the three countries with the higher number of firm-year observations. These results show that accruals quality has always significant explanatory power. In the case of 2SLS, the level of statistical significance is 1% for the three countries. OLS estimations for the United Kingdom, France and Germany exhibit a statistical significance of 5%, 1% and 10%, respectively. This is consistent with accruals quality being an indicator of earnings quality for investors at the individual market level, despite the lower number of observations.

Now, we analyse the results of OLS estimations regarding control variables. In the case of the United Kingdom, all control variables are statistically significant at the 1% level, although the estimated coefficients for turnover and analyst coverage have signs that are different from those predicted as in the case of the full sample. The most intriguing result in the case of France and Germany is that the estimated coefficients for size lose significance. We suggest that this may be due to the reduced number of observations. In these two countries, the estimated coefficients for analyst's coverage are not statistically significant, and the coefficients for turnover have the opposite sign relative to that predicted. Overall, our results confirm our hypothesis H1 that high *AQ* is positively associated with high spreads. Thus, better earnings quality is associated with lower information asymmetry among market participants in European stock markets. Accruals quality, illiquidity and the inverse of stock price appear to be the main factors explaining the spread, while the estimated coefficients for turnover and number of analysts have the opposite sign to that expected.

Estimations using 2SLS result in coefficients statistically significant at the 1% level for all control variables, except for size and analyst coverage that are statistically not significant. Therefore, in practical terms, the results are not sensitive to the change in the estimation method.

Regression of the spread estimator on accruals quality, managers' incentives and control variables

As a further development of our study, we analyse the association between accruals quality and the spread conditional on managers' incentives. To proxy for managers' incentives, we assume that when managers have incentives to manipulate earnings, they provide less expansive disclosure and this implies a higher degree of uncertainty in investors' beliefs and an increased dispersion in analysts' forecasts. We formulate our hypothesis H2 based on assumption that the association between accruals quality and spread is stronger for firms with high analysts' forecast dispersion.

We split our sample into three subsamples, using thirty-third and sixty-sixth percentiles after ranking firms based on the dispersion in analysts' forecasts. We consider that firms with lower analysts' forecast dispersion are likely to use accruals mainly for informative purposes. This is so because when managers rely on accruals to communicate their private information, they use all means to communicate the true firm performance to investors. Thus, we expect to find a lower dispersion in investors' beliefs even with high *AQ* relative to the case where accruals are used mainly for earnings manipulation. We include in our regression a dummy variable, *DISP*, which is set to one for firms with analysts' forecast dispersion higher than thirty-third percentile and set to zero for the remaining firms. Firms with *DISP* equal to one are likely to use accruals mainly for earnings management; thus, we expect to find a stronger positive association between *AQ* and *HL_S*. We

include in our regression a variable, *DISP* × *AQ* that results from multiplying accruals quality and the dummy variable *DISP*. If our hypothesis H2 is true, the coefficient of this variable should be positive and statistically significant. Our results show strong evidence that the coefficients for firms that are likely to use accruals for opportunistic earnings management are significantly larger than the coefficients for the remaining firms.

Table 8, panel A shows the results of OLS and 2SLS regression estimations using panel data fixed effects. The positive association between *AQ* and *HL_S* is stronger for the subsample of firms with high analysts' forecast dispersion. In fact, the coefficient of the variable *DISP* × *AQ* is positive and statistically significant at the 1% level providing strong evidence that the coefficients for firms that are likely to use accruals for opportunistic earnings management are significantly larger than the coefficients for the remaining firms. These results are consistent with our hypothesis H2 that the association between accruals quality and spread is stronger for firms with high analysts' forecast dispersion. Our evidence shows that combining accruals quality and the dispersion in analysts' forecasts provides a better indicator of earnings quality.

Regarding control variables, we find similar results to those described in the basic regression.

In Table 8, panel B, we report the results for United Kingdom, France and Germany. In the case of the United Kingdom, the estimated coefficient of the variable obtained multiplying *AQ* by *DISP* is positive and statistically significant at the 1% level with OLS estimation, while the equivalent coefficient is not significant with 2SLS estimation. In the case of France and Germany, the estimated coefficients are positive and statistically significant either using the OLS or the 2SLS. However, the level of significance is lower than in the full sample. The most interesting result regarding control variables is that the inverse

Table 8. Regression of the spread estimator on accruals quality, dummy and control variables.

Panel A: Full Sample

		Panel fixed effects (OLS)		Panel fixed effects (2SLS)	
	Pred. sign	Coeff.	*t*-Stat.	Coeff.	*t*-Stat.
INTERCEPT		3.392***	16.039	2.408***	6.945
AQ	+	0.702*	1.761	−7.693	−1.310
DISP × *AQ*	+	1.086***	3.551	18.161***	2.618
SIZE	−	−0.181***	−11.517	−0.113***	−4.043
ILLIQ	+	0.788***	5.933	0.730***	4.376
INV_PRI	+	0.290***	2.981	0.276**	2.207
TURN	−	0.191***	14.100	0.170***	9.384
ANALYSTS	−	0.005***	3.801	0.004*	1.932
Num. Obs.		7122		7122	
Adj. *R*-squared		0.67		0.44	

Panel B: United Kingdom, France and Germany

		Panel fixed effects (OLS)			Panel fixed effects (2SLS)		
	Pred. sign	United Kingdom	France	Germany	United Kingdom	France	Germany
INTERCEPT		3.925***	1.057***	0.747	3.434***	−0.216	−1.442
AQ	+	−0.266	0.773	0.215	−0.373	−12.062	−7.994
DISP × *AQ*	+	1.232***	1.956***	0.765*	7.227	22.819*	15.533*
SIZE	−	−0.235***	−0.018	0.017	−0.203***	0.069	0.172*
ILLIQ	+	6.450	1.188***	0.605***	8.005	0.718	0.609*
INV_PRI	+	9.616***	1.231***	1.266***	8.878***	1.514***	1.674***
TURN	−	0.284***	0.285***	0.234***	0.278***	0.298***	0.157***
ANALYSTS	−	0.008	−0.001	−0.001	0.005	−0.000	−0.003
Num. Obs.		2714	1198	977	2714	1198	977
Adj. *R*-squared		0.71	0.71	0.72	0.68	0.44	0.37

Source: Authors' calculations.

***, **Indicate significance at the 1% and 5% levels, respectively, based on White (1980) heteroscedasticity-consistent SEs.

This table reports the results of the regression of the spread estimator on the accruals quality measure taking into account managers' incentives.

HL_S: Annual variable defined as the average of Corwin and Schultz (2012) bid-ask spread estimator multiplied by 100; *AQ*: accruals quality measure given by the SD of residuals from the Francis et al. (2005) regression model; *DISP*: dummy variable which is set to one for firms with analysts' forecast dispersion higher than 33rd percentile and set to zero otherwise; *SIZE*: logarithm of market capitalization in € thousands; *ILLIQ*: calculated as 100 times the annual average of daily unsigned stock return divided by trading volume; *INV_PRI*: inverse of stock price; *TURN*: ratio of shares traded over the year divided by the total number of shares outstanding; *ANALYSTS*: analyst coverage, measured by total number of annual analysts' estimates.

In the 2SLS method, the instrument 'Sales Volatility' is the SD of sales scaled by average total assets over year $t-4$ through t, requiring at least three observations. 'Cash Flow Volatility' is the SD of cash flow from operations scaled by average total assets over year $t-4$ through t, requiring at least three observations. 'Losses' is the percentage of years with negative net income before extraordinary items over year $t-4$ through t, requiring at least three observations.

of stock price and turnover present the most stable coefficient estimates regarding sign and the level of significance across countries either using OLS or 2SLS. The sign of estimated coefficients and the level of significance nearly match those reported in panel A for the full sample.

Testing the non-linear specification model of the spread

In the descriptive statistics section, firms are ranked by accruals quality and assigned to quintiles so that the first quintile includes firms with the lowest values of *AQ*, which means better earnings quality. After, we compute the mean values of both *AQ* and *HL_S* for each quintile. We observe an increase in the mean values of *HL_S* along with the increase in the mean values of *AQ* from the first to the fifth quintile. Moreover, we find a large increase in both the mean *AQ* and the mean *HL_S* in the fifth quintile relative to the fourth quintile.

To test the non-linear specification of our spread model, we include four dummy variables *Q*2, *Q*3, *Q*4 and *Q*5, identifying firms in accruals quality quintiles except for quintile one. We investigate if the estimated coefficients increase from the bottom quintile to the top quintile.

Table 9 reports the results of OLS estimations with panel fixed effects. The estimated coefficients relative to the quintile dummies (*Q*2–*Q*5) are all positive and statistically significant, except for *Q*2. Given that these estimated parameters reflect differences in the mean spread relative to the *Q*1 group then all groups, except for *Q*2, exhibit higher mean spreads than *Q*1. Moreover, the relationship between *AQ* and the spread is non-linear because we observe a non-significant change in the spread between the first and the second quintile while there is a substantial increase in the spread for other quintiles, especially for the fourth and fifth quintiles.

Thus, the results are consistent with our hypothesis H3 that the positive association between *AQ* and information asymmetry is stronger for firms in higher level quintiles, because these firms are likely to use accruals mainly for earnings management. Therefore, accruals quality is an effective indicator of earnings quality because firms with high values of *AQ*, which represent more volatile abnormal accruals, exhibit higher levels of information asymmetry. This means that high-volatile abnormal accruals identify firms with poor public information which provides an informational advantage to informed investors. In addition, we suggest that this high level of *AQ* results from earning management activities, otherwise managers would disclose additional information in order to reduce information asymmetry among market participants.

Table 9. Testing the non-linear specification model of the spread.

	Full Sample			
	Pred. sign	Coeff.	*t*-Stat.	*p*-Value
INTERCEPT		4.013***	28.658	0.000
Q2	+	−0.003	−0.157	0.875
Q3	+	0.029	1.634	0.102
Q4	+	0.046**	2.437	0.015
Q5	+	0.134***	6.127	0.000
SIZE	−	−0.230***	−21.573	0.000
ILLIQ	+	0.726***	21.256	0.000
INV_PRI	+	0.212***	4.086	0.000
TURN	−	0.196***	16.362	0.000
ANALYSTS	−	0.007***	4.429	0.000
Num. Obs.	8469			
Adj. *R*-squared	0.65			

Source: Authors' calculations.

This table reports the results of the regression of the spread estimator on accruals quality quintiles (*Q*2–*Q*5).

HL_S: Annual variable defined as the average of the Corwin and Schultz (2012) bid-ask spread estimator multiplied by 100; *Qi*: accruals dummy variable set to one for firms in quintile 'i' and zero otherwise; *SIZE*: log of market capitalization in € thousands; *ILLIQ*: calculated as 100 times the annual average of daily unsigned stock return divided by trading volume; *INV_PRI*: inverse of stock price; *TURN*: ratio of shares traded over the year divided by the total number of shares outstanding; *ANALYSTS*: analyst coverage, measured by total number of annual analysts' estimates.

Robustness test regression of the spread estimator on discretionary accruals and control variables

In this section, we aim to analyse if the results are sensitive to changes in the proxy used to measure earnings quality. Table 10, panel A contains the results of OLS regression estimation when discretionary accruals are used instead of accruals quality. For the full sample, the estimated coefficient for discretionary accruals has a positive sign and it is statistically significant at the 1% level. This result is consistent with that obtained when using accruals quality.

However, when analysing the results at the country level, the estimated coefficients for discretionary accruals are not statistically significant for the United Kingdom and France, while these coefficients are statistically significant for the three countries, when using accruals quality. Our results suggest

Table 10. Regression of the spread estimator on discretionary accruals and control variables.

Panel A: Without the dummy for managers' incentives					
	Pred. sign	Full sample	United Kingdom	France	Germany
INTERCEPT		4.416***	4.559***	1.829***	1.559***
ACC_DISC	+	0.292***	0.143	0.275	0.678***
SIZE	−	−0.260***	−0.292***	−0.070***	−0.038
ILLIQ	+	0.563***	16.551***	0.786***	0.288***
INV_PRI	+	0.219***	7.564***	0.737***	0.717***
TURN	−	0.186***	0.235***	0.309***	0.254***
ANALYSTS	−	0.010***	0.0213***	−0.001	0.001
Num. Obs.		9779	4026	1606	1299
Adj. *R*-squared		0.64	0.67	0.69	0.64
PANEL B: Including the dummy for managers' incentives					
	Pred. sign	Full sample	United Kingdom	France	Germany
INTERCEPT		3.628***	4.032***	1.254***	1.063***
ACC_DISC	+	−0.197	−0.286	−0.315	−0.108
DISP × ACC_DISC	+	0.472***	0.447**	0.609**	0.609*
SIZE	−	−0.198***	−0.244***	−0.029	−0.005
ILLIQ	+	0.726***	7.762***	0.922***	0.567***
INV_PRI	+	0.368***	9.861***	1.413***	1.123***
TURN	−	0.181***	0.263***	0.291***	0.239***
ANALYSTS	−	0.008***	0.011***	−0.001	0.001
Num. Obs.		7860	3056	1296	1072
Adj. *R*-squared		0.67	0.70	0.72	0.71

Source: Authors' calculations.
***, **, *Indicate significance at the 1%, 5% and 10% levels, respectively, based on White's (1980) heteroscedasticity-consistent SEs.
This table reports the results of the regression of the spread estimator on discretionary accruals (*ACC_DISC*) taking into account managers' incentives.
HL_S: Annual variable defined as the average of Corwin and Schultz (2012) bid-ask spread estimator multiplies by 100; *ACC_DISC*: absolute value of discretionary accruals given by the Kothari, Leone, and Wasley (2005) version of the Jones Model; *SIZE*: logarithm of market capitalization in € thousands; *ILLIQ*: calculated as 100 times the annual average of daily unsigned stock return divided by trading volume; *INV_PRI*: inverse of stock price; *TURN*: ratio of shares traded over the year divided by the total number of shares outstanding; *ANALYSTS*: analyst coverage, measured by total number of annual analysts' estimates.

that both measures are valuable indicators of earnings quality, because they have significant impact on information asymmetry. However, the results at the country level suggest that accruals quality is a better measure of earnings quality than discretionary accruals.

Table 10, panel B reports the results of the robustness test that uses discretionary accruals instead of accruals quality to measure earnings quality and includes a dummy variable for managers' incentives. These results show that the estimated coefficient of discretionary accruals is larger for the subsample of firms with higher analysts' forecast dispersion, consistent with those reported when using accruals quality. Thus, the association between the earnings quality measure and information asymmetry is stronger for firms that are likely to use accruals for noninformative reasons.

V. Conclusions

A first conclusion of this study is that using the full sample, we found evidence of a significant and positive association between earnings quality and information asymmetry. Therefore, our study emphasizes the relevance of accruals quality as an indicator of earnings quality and that improving earnings quality reduces information asymmetry. This conclusion is robust to changes in the estimation method between OLS and two-stage instrumental variable approach.

Moreover, another relevant finding is that combining accruals quality and the dispersion in analysts' estimates, which we use as a proxy for the underlying managers' incentives, increases the performance of accruals quality as an indicator of earnings quality. Accruals may be used to communicate private information, thus reducing information asymmetry. But, accruals may also be used for opportunistic earnings management, thus increasing information asymmetry. Assuming a market with both types of firms, the relationship between accruals quality and information asymmetry may be positive, negative or even negligible. In the case of European firms, we find evidence that the earnings management component of accruals tends to outweigh the informational component, in line with the results reported for the US case.

Our results are consistent with a non-linear relationship between earnings quality and information asymmetry, because the association between the two

variables is stronger for firms with worst accruals quality. This enhances the finding that accruals quality is an effective indicator of earnings quality because firms with the poorest earnings quality exhibit higher levels of information asymmetry and this should be a concern not only for investors and regulators but also for other economic agents.

In addition, our results also show a slightly change in the explanatory power of accruals quality in some countries, namely United Kingdom and Germany. We suggest that this may be the result of differences in the relative importance of the earnings management component and the informational component of accruals at the country level.

Our results are robust to changes in the proxy used to measure earnings quality, because we obtain similar regression results either using accruals quality or discretionary accruals.

Another important conclusion of this study is about the performance of the high–low spread estimator as a proxy of information asymmetry, in line with the evidence provided by Corwin and Schultz (2012) about the accuracy of this estimator as an alternative to intraday data-based measures.

This study also provides important results regarding the impact of control variables. Our tests show that, in the case of European stock markets, larger firms, more liquid stocks and firms with higher stock prices tend to exhibit lower information asymmetry as it was expected.

Our finding that combining accruals quality with the dispersion in analysts' forecasts provides a better indicator of earnings quality can be useful for a number of economic agents including investors in general, managers, auditors, regulators, policy makers and academics.

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