Financial Reporting Quality and Information Asymmetry in Europe

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Abstract
We investigate whether Financial Reporting Quality (FRQ), measured by discretionary accruals, affects investors' decisions in European stock markets. To analyze the impact on investors' perception about firm value we use an indicator of the level information asymmetry among market participants. The relative bid-ask spread is commonly applied in market microstructure studies to evaluate information asymmetry and most recent works use intraday data based measures. This study is based on the high-low Corwin and Schultz spread estimator because for a number of European markets intraday data is not available. In U.S. markets, Bhattacharya et al. (2013) find evidence of a positive association between earnings quality and information asymmetry. In agreement with the microstructure theory that poor financial reporting implies more informed trading, we find that in European stock markets discretionary accruals are positively related with the high-low spread estimator. Therefore, our results suggest that the earnings management component of accruals outweighs the informational component. Further, such association tends to be stronger for firms with high levels of positive discretionary accruals. However, we do not find evidence of such relation for the large negative discretionary accruals group. Consistent with the evidence provided by Corwin and Schultz (2012), our results suggest that the high-low spread estimator is more efficient than the closing bid-ask spread when analyzing the impact of financial reporting quality on information asymmetry.

Keywords: *Information quality, information asymmetry, discretionary accruals, high-low spread estimator.*
JEL Codes: G12, G14, M40, M41, D80.

1. Introduction

There is a widespread consensus among academics, practitioners, regulators, investors and other agents on the importance of regulating the publication of information by public companies in order to improve financial reporting quality. However, there is an intense debate on whether the quality of financial reporting has been improving over the last years and about the ability of several proxies to capture the quality of information. Several works analyze the statistical association between some of these proxies and the likely consequences of information quality such as the cost of capital and information asymmetry among market participants. In this paper, we investigate the association between financial reporting quality and information asymmetry for a large sample of European stock markets, using the Corwin and Schultz (2012) high-low spread estimator.

As far as we are aware this is the first study to investigate the relation between financial reporting quality and information asymmetry for a significant group of European countries. Leuz and Verrecchia (2000) also analyze earnings quality and information asymmetry but they use a smaller sample of German firms and investigate the impact of changes in regulatory environment on information asymmetry. Additionally, our work innovates by applying the Corwin and Schultz (2012) high-low spread estimator to measure information asymmetry in stock markets.

Although reduced in number, there are some studies on the relation between earnings quality and information asymmetry but our results are not comparable to theirs because they are based on different methodologies, proxies and mainly because they use samples of U.S.A. firms. Bhattacharya et al. (2013) find that poor earnings quality exacerbates information asymmetry and suggest that poor earnings offer a greater informational advantage for informed traders. Jayaraman (2008) find evidence that information asymmetry measured by bid-ask spreads or the probability of informed trading is higher with more managers' discretionary choices, which proxies for poor earnings quality. Prior research document several links between earnings quality and information asymmetry, Brown and Hillegeist (2007) and Bhattacharya et al. (2012). Their results suggest that poor earnings quality produces higher information asymmetry and lower financial market liquidity. These findings are consistent with differences in the composition of information between public and private information affecting information risk Easley and O'Hara (2004), where poor or less public information implies more information asymmetry.

At first we may think that information asymmetry is only a theoretical concept without practical implications. However, information asymmetry has very relevant implications for academics, practitioners, regulators, standard setters, stock exchange managers, firm managers and investors in general. The concept is widely used in many economic and financial areas.

Information asymmetry is expected to increase the cost of capital because in microstructure models, asymmetric information between buyers and sellers tends to reduce liquidity in the market for firm shares, implying that firms must issue capital at a discount, Leuz and Verrecchia (2000). In addition, recent research suggests that, except for perfect capital markets, information asymmetry is positively related to the cost of capital, Armstrong et al. (2011), Lambert et al. (2012) and Bhattacharya et al. (2012).

Standard setters choose accounting standards taking into account the quality of financial information and its impact on information asymmetry. In a sample a German firms that switch from German Generally Accepted Accounting Principles (GAAP) to either IAS or U.S. GAAP, which is thought to represent a change in financial reporting quality, Leuz and Verrecchia (2000) found evidence of a reduction in the level of information asymmetry as measured by relative bid-ask spread.

Information asymmetry is also a concern for stock exchange managers, regulators and standard setters because of the decision about the optimal level of market transparency. Market transparency is related to the ability of market participants to observe information about the trading process. Prior literature suggests that informed investors prefer less transparent trading systems while uninformed investors prefer more market transparency, Madhavan (2000).

In a less transparent market uninformed investors require a higher return because of the adverse selection problem that arises from trading with informed traders, but informed trading makes prices more informative, reducing the risk premium required by uninformed investors, Easley and O'Hara (2004).

In a context of information asymmetry informed traders tend to trade more actively and market makers increase the adverse selection costs component of spread to recover the losses when trading with informed investors. Such increase in transaction costs is a concern for investors, regulators, standard setters and exchange managers.

Market microstructure models posit that investors differ on the quantity and quality of the information they possess. Information asymmetry among market participants and consequent adverse selection arises when some investors have better information than others about a firm. If abnormal accruals are the outcome of managerial discretionary choices, which are expected to affect negatively the quality of public information, then high abnormal accruals imply that

informed investors get an informational advantage because of their private information or superior ability to process public information, thus increasing information asymmetry among market participants. Prior studies found evidence that sophisticated investors profit from trading in the stock of firms with high accruals, which is considered to reflect poor public information, Hirshleifer et al. (2011).

Several proxies have been used to measure earnings quality, Schipper and Vincent (2003), Dechow et al. (2010) and Ewert and Wagenhofer (2011). One set of those measures is based on time-series properties of earnings such as earnings persistence and predictability. Another set of measures relies on the volatility of earnings or accruals relative to the volatility of cash flows. Two additional measures are abnormal accruals and accruals quality. The relevance of each measure must be evaluated in the context of a specific decision model, Dechow et al. (2010). For example earnings persistence and earnings predictability should be applied when forecasting earnings based on current earnings. In this study we use a metric measure that is expected to assess earnings management activities, following the prevailing research trend that associates high abnormal accruals with more managerial discretionary choices. Abnormal accruals have been widely employed as a proxy for earnings quality. In our study we use a version of the modified Jones model, Dechow et al. (1995), with lagged return-on-assets proposed by Kothari et al. (2005).

Several proxies have been used to measure information asymmetry. The adverse selection component of spread is used by Bhattacharya et al. (2012) to measure information asymmetry, following the estimation procedure proposed by Huang and Stoll (1996). Another proxy for information asymmetry is the probability of informed-based trading (PIN), Easley et al. (2002) and Bhattacharya et al. (2012). We had to overcome an additional difficulty in choosing the approach to measure information asymmetry because recent research uses intraday data based measures that are not available for most of the companies in our sample. The Corwin and Schultz (2012) high-low spread estimator was applied because these authors found empirical evidence of a similar performance of the spread estimator as compared to alternative measures based on high-frequency data for U.S.A. markets.

Based on a sample that includes firms from 18 European countries, 17 European and Monetary Union countries and the United Kingdom, for the period from 2003 to 2011, we find that earnings quality affects information asymmetry among market participants. Our results are consistent with the prediction that poor or less public information implies more information asymmetry. In our tests earnings quality is measured by discretionary accruals, where high discretionary accruals represent poor earnings quality. The high-low spread estimator is applied as a proxy for information asymmetry, where high spread represents a high level of information asymmetry among market participants.

We find evidence of a positive relation between discretionary accruals and the spread and that such relation holds even after controlling for factors that are considered to affect the spread. In addition, we find that the impact on information asymmetry is stronger for lower levels of earnings quality which is consistent with the results of Bhattacharya et al. (2013) for U.S.A. firms. These results highlight the importance of financial reporting quality for information asymmetry on European stock markets. In a robustness test, we find weaker results when the closing bid-ask spread is used instead of the high-low spread estimator as a proxy for information asymmetry.

This work adds to extant research on financial reporting quality and information asymmetry in several ways. We analyze the impact of financial reporting quality on information asymmetry for European stock markets, more specifically for 18 European countries, 17 European Monetary Union countries and the United Kingdom. We find evidence of a positive relation between financial reporting quality and information asymmetry after controlling for variables that influence information asymmetry.

Our work contributes to the debate about whether abnormal accruals should be interpreted as an indicator of poor financial information or as a mean to communicate private information. Our results suggest that, in European markets, the earnings management component of accruals outweighs the informational component.

This work innovates in applying a methodology based on the Corwin and Schultz (2012) high-low spread estimator to test the impact of financial reporting quality on information asymmetry. Our results suggest that the high-low spread estimator can be a valuable alternative to the closing bid-ask spread for markets where intraday data is not available.

The remainder of the paper is organized as follows. Section 2 exhibits a brief literature review and develops the hypotheses analyzed in the study. Section 3 describes the proxies for earnings quality, information asymmetry and the specifications of the empirical model. Section 4 presents sample selection procedures and sample characteristics. Section 5 documents some descriptive statistics and reports the results of the empirical tests. Concluding remarks and suggestions for future work are provided in section 6.

2. Literature review and hypotheses development

Our research is motivated by the debate about whether earnings quality affects information asymmetry among stock market participants in European markets. Using data on U.S. firms, Bhattacharya et al. (2013) and Jayaraman (2008) provide empirical evidence on the association between measures of earnings quality and measures of information asymmetry, reporting a positive association between poor earnings quality and high levels of information asymmetry. In European markets, Leuz and Verrecchia (2000) use a sample of German firms to investigate the impact of changes in regulatory environment on information asymmetry

The association between earnings quality and information asymmetry can be explained by market microstructure theory where poor or less public information is considered to increase information risk implying an informational advantage of informed investors relative to liquidity traders, because informed traders have access to private information or because of their superior ability to process information. The consequences of this informational advantage are empirically documented in Hirshleifer et al. (2011) where sophisticated investors trade actively on the stock of firms with poor earnings quality in order to profit from their informational advantage.

In microstructure models, when public information is less informative uninformed investors see assets with poor public information as being riskier Aslan et al. (2011). Moreover, informed investors trade more actively and market makers must be rewarded from their expected losses when trading with informed investors. When the fraction of informed investors present on the market increases, market makers increase the adverse selection component of spread, so that this component of spread is considered as an indicator of the level of information asymmetry among market participants.

Recent studies measure information asymmetry using the daily bid-ask spread Chae (2005) and Jayaraman (2008), intraday data bid-ask spread Armstrong et al. (2011) and trade data based constructs, namely the price impact of trade, Bhattacharya et al. (2013) and the Probability of Informed Trading (PIN), Jayaraman (2008), Mohanram and Rajgopal (2009) and Aslan et al. (2011). The price impact of trade measures the magnitude of quote revisions made by the market maker after a trade. The Probability of Informed Trading is positively related to the portion of informed investors present in the market.

In our study we had to select an alternative measure because for many European markets databases with trade data are not available. We measure information asymmetry as the adverse selection component of the spread, based on the Corwin and Schultz (2012) high-low spread estimator. In addition, we also use the daily closing relative bid-ask spread. In order to obtain the adverse selection component of spread we perform a regression approach with control variables that capture the order processing costs and the inventory costs components of the relative spread.

As regards earnings quality, several proxies have been employed. We must emphasize that earnings quality is a latent variable that is not directly observable, but it is rather inferred from a number of measures or proxies, including earnings persistence, Dechow et al. (2010); earnings predictability, Ewert and Wagenhofer (2011); smoothness, Jayaraman (2008); abnormal accruals Jones (1991), Dechow et al. (1995) and Kothari et al. (2005); and accruals quality, Dechow and Dichev (2002). See, for example, Schipper and Vincent (2003), Dechow et al. (2010) and Perotti and Wagenhofer (2011) for a detailed description of several of these measures.

In our study we use abnormal accruals as a proxy of earnings quality. We employ the expression abnormal accruals and discretionary accruals interchangeably even if discretionary accruals seem more associated with earnings management. Discretionary accruals have been employed as an indicator of earnings quality to study the relation between the quality of financial reporting and information asymmetry, Bhattacharya et al. (2013) Bhattacharya et al. (2012). Another study that uses discretionary accruals as a measure of earnings quality in a different context is Francis et al. (2005) that investigate the impact of earnings quality on the cost of capital. We use an accruals-based measure of earnings quality estimated by the modified-Jones model with lagged return-on-assets as proposed by Kothary et al. (2005).

While for most of prior research higher abnormal accruals indicate poor earnings quality resulting from earnings management activities there is an alternative view where abnormal accruals are used by managers to communicate their private information about firm performance, Perotti and Wagenhofer (2011), Ewert and Wagenhofer (2011).

Assuming that for a group of firms the earnings management component outweighs the informational component this implies poor public information and higher information asymmetry among market participants, resulting in a positive association between abnormal accruals and information asymmetry. If the inverse relation holds we expect to observe a negative relation between abnormal accruals and information asymmetry. Assuming a sample with the two types of firms can result in a negligible relation between abnormal accruals and information asymmetry.

Evidence from American markets suggests that poor earnings quality increases information asymmetry among market participants. For example, Jayaraman (2008) finds that information asymmetry, measured by the annual average daily closing bid-ask spread, is higher both when earnings are smoother than cash-flows or more volatile than cash flows, which indicate poor earnings quality. Therefore we formalize the following hypothesis:

Hypothesis 1: Financial reporting quality is negatively related to the level of information asymmetry in European stock markets.

In addition, we investigate if the relation between discretionary accruals and high-low spread is linear or non-linear. Bhattacharya et al. (2013) document a u-shaped association between discretionary accruals and information asymmetry where both large positive and large negative discretionary accruals are associated with higher levels of information asymmetry. In addition, while using a different proxy for earnings quality, Jayaraman (2008) also find a u-shaped association between earnings quality and information asymmetry. Thus we posit the following two hypotheses:

Hypothesis 2: The positive relation between discretionary accruals and information asymmetry is stronger for large positive discretionary accruals.

Hypothesis 3: The positive relation between absolute values of discretionary accruals and information asymmetry is stronger for large negative discretionary accruals.

3. Proxies and Empirical Model

A. Proxies for Earnings Quality

In our model discretionary accruals are considered an indicator of earnings quality. We obtain discretionary accruals based on the modified Jones model with lagged return-on-assets proposed by Kothari et al. 2005.

To estimate discretionary accruals we begin with total accruals for firm i in year t defined as,

$$TA_{i,t} = \Delta CA_{i,t} - \Delta CL_{i,t} - \Delta Cash_{i,t} + \Delta STDEBT_{i,t} - DEPN_{i,t} \quad (1)$$

Where ΔCA is the change in current assets, ΔCL is the change in current liabilities, $\Delta Cash$ is the change in cash, $\Delta STDEBT$ represents the change in short term debt and $DEPN$ is the depreciation and amortization expense.

Using firm-year observations on total accruals we estimated cross-sectional regressions at industry level.

$$TAcc_{i,t} = \alpha_0 + \alpha_1\left(\frac{1}{Assets_{i,t-1}}\right) + \alpha_2\left(\Delta Sales_{i,t} - \Delta AR_{i,t}\right) + \alpha_3 PPE_{i,t} + \alpha_4 ROA_{i,t-1} + e_{i,t} \quad (2)$$

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 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.

As in the modified Jones model, discretionary accruals are defined as the residuals of equation (2).

B. Proxies for Information Asymmetry

We measure information asymmetry using the spread estimator developed by Corwin and Schultz (2012) that is based on daily high and low prices.

Current research on market microstructure uses information asymmetry measures estimated at the transaction level, using high frequency data. For example, Bhattacharya et al. (2012) uses intraday information on trades to capture adverse selection on a specific transaction. However, for most of the European firms in our sample such type of data is not available, thus the Corwin and Schultz (2012) high-low spread estimator, which can be used both with daily data or intraday data, was applied because these authors found empirical evidence of a similar performance of the spread estimator as compared to alternative measures based on high-frequency data for U.S.A. markets. Additionally, this estimator can be a valuable alternative to the closing bid-ask spread for markets where intraday data is not available.

The spread estimator is based on the insight that the sum of the price ranges over two consecutive single days reflects two day's volatility and twice the spread, while the price range over one two-day period reflects two day's volatility and one spread.

The spread estimator uses the high-to-low ratio for a single two-day period and the high-to-low ratios for two consecutive single days, $\frac{H_{12}}{L_{12}}, \frac{H_1}{L_1}, \frac{H_2}{L_2}$

The high-low spread estimator is given by,

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

Where,

S is the relative spread

$$\alpha = \frac{\sqrt{2\beta} - \sqrt{\beta}}{3 - 2\sqrt{2}} - \sqrt{\frac{\gamma}{3 - 2\sqrt{2}}}$$

and

$$\gamma = \left[\ln\left(\frac{H^0_{t,t+1}}{L^o_{t,t+1}}\right)\right]^2$$

$$\beta = \left[\ln\left(\frac{H^0_{t,t}}{L^o_{t,t}}\right)\right]^2 + \left[\ln\left(\frac{H^0_{t,t+1}}{L^o_{t,t+1}}\right)\right]^2,$$

H^0_t *and* L^0_t, are the observed high and low stock prices for day t.

$$H_t^0 = H_t^A\left(1+\frac{S}{2}\right)$$

and

$$L_t^0 = L_t^A\left(1-\frac{S}{2}\right)$$

$H_t^A\ \left(L_t^A\right)$ denoting the actual high (low) stock price on day t.

Further adjustments are proposed for overnight price changes, infrequently traded stocks and negative high-low spread estimates. We take into account these adjustments in our empirical tests.

C. Model Specification

In this section we develop the empirical model used to investigate the impact of earnings quality on information asymmetry. We use discretionary accruals (DISC_ACC) to assess earnings quality and the high-low spread estimator for information asymmetry. Prior studies on information asymmetry propose a number of well known variables to explain the spread which leads us to the following equation,

$$HL\_S_{i,t} = \alpha_0 + \alpha_1 DISC\_ACC_{i,t} + \alpha_2 TURN_{i,t} + \alpha_3 ILLIQ_{i,t} + \alpha_4 SIZE_{i,t} + \alpha_5 ANALYSTS_{i,t} + \alpha_6 INV\_PRI_{i,t} + \varepsilon_{i,t} \quad (3)$$

$HL\_S_{i,t}$ is obtained from the daily high-low spread estimator S defined in a previous section, then we compute the annual average of this estimator,

$$HL\_S_{i,t} = \frac{1}{n_{i,t}} \sum_{day=1}^{n_{i,t}} S_{i,day}$$

Where $n_{i,t}$ is the number of days in year t and i refers to the firm for which the spread estimator is available.

$DISC\_ACC_{i,t}$ is the discretionary accruals measure, previously defined.

Prior empirical studies find higher levels of information asymmetry for firms with poor informational environment (Bhattacharya et al., 2013). We expect that higher discretionary accruals indicate lower information quality and cause more information asymmetries, implying an expected positive sign for the DISC_ACC regression coefficient.

Equation (3) includes several control variables. 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, $TURN_{i,t}$, following Bollen et al. (2004), Acker et al. (2002). Turnover 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 we follow Amihud (2002) and Hasbrouck (2009) that propose a measure for illiquidity defined as daily unsigned stock return divided by trading volume. This measure is highly related to the inventory component of spread, because more illiquidity increases the risk of losses in the stock inventory position Jayaraman (2008), so it is expected that more illiquidity means higher spread, leading to a predicted positive regression coefficient. In the model the measure of illiquidity is given by the following annual average,

$$ILLIQ_{i,t} = \frac{1}{n_{i,t}} \sum_{day=1}^{n_{i,t}} \frac{\left|R_{i,day}\right|}{Vol_{i,day}}$$

Where $\left|R_{i,day}\right|$ is the absolute value of daily stock return for firm i and $Vol_{i,day}$ is the firm i daily trading volume in euros.

$SIZE_{i,t}$ and $ANALYSTS_{i,t}$ denote respectively the logarithm of market capitalization and analyst coverage, measured by total number of annual analyst estimates. These indicators have been included in several works as proxies for information asymmetry. Chae (2005) argues that larger firms and firms followed by more analysts tend to produce more information and to disclose such information faster, then reducing information asymmetry. However, Bhattacharya et al. (2013) suggest that size and analyst coverage are associated with both quantity and quality of information production in financial markets. In this study, we attempt to assess the portion of information asymmetry related to the intrinsic quality of earnings. Firms with similar quality of financial reporting could exhibit different degrees of information asymmetry because their financial reports are subject to more scrutiny and they produce additional information. Therefore we include size and analyst coverage to account to the component of spread not explained by earnings quality.

$INV\_PRI_{i,t}$ which represents the inverse of stock price is used by Jayaraman (2008) as a predictor of spread. This variable is used in microstructure models to take into account the effect of the minimum tick in percentage spreads. Firms with lower stock prices tend to have larger relative bid-ask spreads, implying a positive regression coefficient.

4. Data and Sample selection

Our sample includes firms from 18 European countries, 17 EMU countries and the UK, for the period from 2003 to 2011. While the main database is Thomson Datastream we collect the number of analysts providing earnings per share estimates for the next financial year from I/B/E/S.

For comparison reasons we do not include years before 2003 because firms followed local standards and just from 2005 the IFRS adoption was mandatory for listed firms in European Union. However, many firms voluntary adopt IFRS few years before 2005 and we include firms that followed IFRS based on Datastream variable accounting standards followed.

The total number of firms in the initial sample is 14,411, but the distribution by country is highly variable, with a maximum of 5,732 firms for the UK and the minimum number of 21 firms for Malta.

For most companies in the initial sample many variables needed to perform the empirical study are not available in the Thomson Datastream database. We define as a minimum criterion that companies have at least three full years of data. This restriction led to a considerable reduction in the number of firms in the sample. The total number of firms fell from 14,411 to 1,999 and for example from 5,732 to 882 in the UK. Another result of this restriction is that four countries are excluded from the sample: Cyprus, Luxembourg, Malta, Slovakia.

After applying of the procedures mentioned above the sample includes 17,991 firm-year observations. Additionally, we exclude financial firms (two-digit SIC code 60 to 69) and utilities (two-digit SIC code 49) because they are subject to specific regulations, reducing firm-year observations to 14,553.

Each firm must have all the necessary variables for estimating spread regressions, resulting in a final sample including 11,652 firm observations, as reported in table 1. It is worth noting that in the final sample the most representative country is the UK with 41.2% of the observations, followed by France with 16.9% and Germany with 12.4%.

Table 1: Sample firms and firm-observations by country

This table provides the number of firms and firm-year observations by country included in the study. The sample contains European Monetary Union and United Kingdom firms with accounting and market data available on the Thomson Datastream. Financial firms (two-digit SIC codes 60 to 69) and utilities (two-digit SIC code 49) are excluded from the sample. In order to be considered a firm must have at least three years of full data over the sampling period. Firm-year observations with missing regression variables are also eliminated.

Country	Number of firms	Firm-year observations
Austria	26	199
Belgium	49	387
Estonia	5	26
Finland	81	655
France	249	1,972
Germany	210	1,443
Greece	5	45
Ireland	23	191
Italy	83	637
Netherlands	72	598
Portugal	29	220
Slovenia	12	72
Spain	52	411
United Kingdom	721	4,796
Total	1,617	11,652

Our full sample is also categorized into various subsamples. One of the subsamples consists of firm-year observations with positive discretionary accruals. Firms are also ranked each year based on discretionary accruals and assigned to quintiles, creating the large positive discretionary accruals group (top quintile) and the large negative discretionary accruals group (bottom quintile).

5. Empirical Results

A. Descriptive Statistics

Table 2 details the distribution of the variables used to measure information asymmetry, earnings quality and other explanatory variables for information asymmetry. To mitigate the problem of extreme outliers, the variables are winsorized at the first and ninety-ninth percentile.

Table 2: Descriptive Statistics on variables

Variable definitions:
HL_S = annual variable defined as the average of Corwin and Schultz (2012) bid-ask spread estimator, based on high and low daily prices. BA_S = closing bid-ask spread. DISC_ACC = discretionary accruals given by the Kothary et al. (2005) version of the Jones Model. TURN = ratio of shares traded over the year divided by the total number of shares outstanding. ILLIQ = annual average of daily unsigned stock return divided by trading volume. SIZE = market capitalization in € thousands. ANALYSTS = number of analysts for each firm. INV_PRI = inverse of stock price.

	Mean	Median	Standard deviation	Minimum	Maximum
HL_S	0.014399	0.012087	0.008540	0.003474	0.071859
BA_S	0.026017	0.012351	0.038236	0.000410	0.298223

DISC_ACC	0.000312	0.000706	0.076124	-0.355496	0.383541
SIZE (10^3 €)	2,339,897	264,136	7,518,510	2,226.55	67,171,795
ILLIQ	0.000883	1.28E-05	0.003733	7.7E-10	0.056706
TURN	0.685468	0.433652	0.731090	0.000392	4.711282
ANALYSTS	7.996567	5.0	7.549299	1.0	54.0
INV_PRI	0.103291	0.027973	0.241783	0.000479	3.039438

In our results, the mean HL spread estimator, for European markets and for the period from 2003 to 2011, is 0.014399 when negative spread estimates are set to zero. Using a similar adjustment, Corwin and Schultz (2012) report a mean HL spread estimator 0.0210 for the USA markets and for the period from 1993 to 2006.

Table 3 describes mean and standard deviation of the main variables by country. The analysis of the mean values by country shows some degree of variability in these distribution parameters. For example, the maximum value of the mean spread estimator (0.019302 - Estonia) is approximately twice the mean spread estimator for Slovenia (0.009594). In the case of the variable DISC_ACC the mean value of positive discretionary accruals is 0.050983 and it is -0.051756 for negative discretionary accruals. These means have similar absolute values resulting in a negligible mean discretionary accruals of 0.000312.

Table 3: Descriptive Statistics by country

	HL_S Mean (Stand.Dev.)	BA_S Mean (Stand.Dev.)	ABS(ACC-DISC) Mean (Stand.Dev.)	ASSETS (10^3 €) Mean (Stand.Dev.)
Austria	0.012365 (0.006278)	0.014170 (0.025695)	0.051994 (0.051374)	2,554,796 (4,452,267)
Belgium	0.012098 (0.006047)	0.011969 (0.012950)	0.046590 (0.050959)	2,591,756 (8,595,257)
Estonia	0.019302 (0.010421)	0.025401 (0.024364)	0.045857 (0.054741)	343,007 (612,497)
Finland	0.013042 (0.007658)	0.016851 (0.025867)	0.045901 (0.047826)	1,843,504 (4,407,964)
France	0.012896 (0.007392)	0.016763 (0.026750)	0.044418 (0.049177)	5,233,559 (13,900,263)
Germany	0.014597 (0.006259)	0.021826 (0.039015)	0.057468 (0.059904)	6,353,251 (23,546,918)
Greece	0.013641 (0.004310)	0.010164 (0.006495)	0.033290 (0.032334)	2,173,534 (2,304,248)

Ireland	0.016183	0.022289	0.044204	1,443,695
	(0.010594)	(0.029035)	(0.043503)	(1,934,641)
Italy	0.012449	0.013936	0.039003	4,123,863
	(0.004211)	(0.017368)	(0.044058)	(12,501,847)
Netherlands	0.013017	0.015211	0.048506	7,115,506
	(0.008108)	(0.030178)	(0.045821)	(25,401,515)
Portugal	0.013293	0.015846	0.044548	2,281,362
	(0.008164)	(0.027866)	(0.044760)	(3,130,706)
Slovenia	0.009594	0.023081	0.036049	804,948
	(0.005227)	(0.022130)	(0.037294)	(633,057)
Spain	0.012696	0.010167	0.048802	6,060,023
	(0.005232)	(0.020933)	(0.050759)	(15,741,372)
United Kingdom	0.015867	0.037883	0.056533	2,104,148
	(0.010012)	(0.045142)	(0.062481)	(11,061,922)

Table 4 contains correlations between the variables included in our model. Our dependent variable is the high-low spread estimator that is negatively correlated with firm size, meaning that larger firms exhibit lower levels of spread. Illiquidity and inverse of stock price are positively correlated with spread, 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.

Table 4: Correlation of variables

This table contains the correlations between variables.
Variable definitions:
HL_S = annual variable defined as the average of Corwin and Schultz (2012) bid-ask spread estimator, based on high and low daily prices. ABS(DISC_ACC) = absolute value of discretionary accruals given by the Kothary et al. (2005) version of the Jones Model. TURN = ratio of shares traded over the year divided by the total number of shares outstanding. ILLIQ = annual average of daily unsigned stock return divided by trading volume. SIZE = logarithm of market capitalization. ANALYSTS = number of analysts for each firm. INV_PRI = inverse of stock price.

	HL_S	ABS(DISC_ACC)	TURN	ILLIQ	LOG(SIZE)	ANALYSTS	INV_PRI
HL_S	1,0000	0,0918	0,0104	0,2462	-0,3541	-0,1389	0,2089
ABS(DISC_ACC)	0,0918	1,0000	0,0015	0,0453	-0,1528	-0,1494	0,0213
TURN	0,0104	0,0015	1,0000	-0,1584	0,4222	0,4811	-0,1069
ILLIQ	0,2462	0,0453	-0,1584	1,0000	-0,2002	-0,1539	0,3426
LOG(SIZE)	-0,3541	-0,1528	0,4222	-0,2002	1,0000	0,7752	-0,1641
ANALYSTS	-0,1389	-0,1494	0,4811	-0,1539	0,7752	1,0000	-0,1478
INV_PRI	0,2089	0,0213	-0,1069	0,3426	-0,1641	-0,1478	1,0000

B. Regression Analysis using the high-low spread estimator

In the empirical tests we use panel data because combining time series of cross-sections increases the number of observations, may offer a solution to the problem of bias caused by

unobserved heterogeneity and reveal dynamics that are difficult to analyze with cross-sectional data.

To decide between fixed and random effects we run 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.

Table 5 reports the results of the regression of the high-low spread on discretionary accruals and other determinants of information asymmetry. In the table we can find the estimated regression coefficients for the explanatory variables, t-statistics, predicted signs for the coefficients, number of observations and the adjusted R2.

Four regressions are estimated based on the following groups of discretionary accruals: all values, positive discretionary accruals, large positive discretionary accruals (top quintile) and large negative discretionary accruals (bottom quintile).

Panel A presents the results for the full sample. As expected, the estimated coefficient for discretionary accruals (absolute value) is always positive meaning that better financial reporting quality reduces information asymmetry among market participants. All the coefficients are statistically significant except for firms in the bottom accruals quintile, corresponding to large negative discretionary accruals. This finding does not support the hypothesis that high negative discretionary accruals are associated with high levels of information asymmetry, in opposition to Jayarman (2008) for the U.S. markets.

The positive association between discretionary accruals and the spread tends to be stronger for firms with high levels of positive discretionary accruals, as we can see by comparing the estimated coefficients in the positive and large positive discretionary accruals groups: the estimated coefficient for firms with positive discretionary accruals is 0.003541, while the estimated coefficient for firms in the top quintile, which have large positive discretionary accruals, is 0.007886 representing more than twice the mean value for firms with positive discretionary accruals. This suggests that financial statements including high levels of discretionary accruals are less informative to market participants.

Table 5: Regression of the high-low spread on discretionary accruals and control variables

This table reports the results of the regression of the high-low spread estimator on discretionary accruals (DISC_ACC). The high-low spread estimator measures information asymmetry, while financial reporting quality is assessed by discretionary accruals.
Four regressions are estimated based on the following DISC_ACC groups: all values, positive, top quintile and bottom quintile.
Variable definitions:
HL_S = annual variable defined as the average of Corwin and Schultz (2012) bid-ask spread estimator, based on high and low daily prices. DISC_ACC = absolute value of discretionary accruals given by the Kothary et al. (2005) version of the Jones Model. TURN = ratio of shares traded over the year divided by the total number of shares outstanding. ILLIQ = annual average of daily unsigned stock return divided by trading volume. SIZE = logarithm of market capitalization. ANALYSTS = number of analysts for each firm. INV_PRI = inverse of stock price.
*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

	DISC_ACC All values	DISC_ACC Positive	DISC_ACC Large positive	DISC_ACC Large negative
PANEL A: FULL SAMPLE				
INTERCEPT	0.044161	0.042439	0.048030	0.048821
t-statistic	34.30479***	21.62135***	12.35882***	12.94712***
DISC_ACC (+)	0.002924	0.003541	0.007886	0.001059
t-statistic	3.054544***	2.356385**	2.635935***	0.363935
SIZE (-)	-0.002603	-0.002484	-0.003065	-0.003025
t-statistic	-26.19068***	-16.30183***	-9.762939***	-10.10357***
ILLIQ (+)	0.562675	0.520615	0.417997	0.565841
t-statistic	18.72520***	12.20514***	6.618973***	6.757924***

TURN (-)	0.001861	0.001780	0.001962	0.002547
t-statistic	16.52665***	10.02185***	5.087193***	7.369786***
ANALYSTS (-)	9.74E-05	0.000127	0.000227	0.000126
t-statistic	6.148664***	5.303946***	3.990393***	2.303706**
INV_PRI (+)	0.002194	0.001909	0.002664	0.000671
t-statistic	4.580260***	2.733902***	1.936412**	0.549996
Num.Observ.	9,779	4,928	1,893	1,929
Adj.R-squa.	0.64	0.64	0.60	0.61

PANEL B: UNITED KINGDOM

INTERCEPT	0.045595	0.044546	0.040513	0.062438
t-statistic	21.63629***	14.56048***	5.786390***	9.051013***
DISC_ACC (+)	0.001435	0.001359	-0.000760	0.002125
t-statistic	0.906920	0.524005	-0.143213	0.455334
SIZE (-)	-0.002919	-0.002830	-0.002564	-0.004539
t-statistic	-17.19092***	-11.46027***	-4.391791***	-7.971423***
ILLIQ (+)	16.55116	20.87659	19.35120	55.26983
t-statistic	7.372623***	5.769846***	2.287911**	5.192171***
TURN (-)	0.002346	0.002402	0.002076	0.003083
t-statistic	12.69564***	8.362130***	3.300551***	5.081809***
ANALYSTS (-)	0.000213	0.000230	0.000344	0.000429
t-statistic	6.419494***	4.674773***	2.931934***	4.082688***
INV_PRI (+)	0.075636	0.060689	0.083397	0.088126
t-statistic	12.04663***	6.779069***	3.853191***	3.887332***
Num.Observ.	4,026	2,036	750	790
Adj.R-squa.	0.67	0.69	0.64	0.64

PANEL C: FRANCE

INTERCEPT	0.018296	0.017637	0.026884	0.014222
t-statistic	6.592658***	4.302510***	4.07043***	1.759580*
DISC_ACC (+)	0.002748	0.000406	0.002182	0.002380
t-statistic	1.508835	0.162742	0.510645	0.403747
SIZE (-)	-0.000704	-0.000611	-0.001555	-0.000477
t-statistic	-3.398331***	-1.990403**	-3.074737***	-0.753689
ILLIQ (+)	0.785683	0.961710	0.958248	0.431189
t-statistic	13.88574***	10.05148***	6.879445***	2.013060**
TURN (-)	0.003091	0.003094	0.004198	0.004580
t-statistic	11.82297***	7.487197***	4.284906***	6.436852***
ANALYSTS (-)	-5.46E-06	-1.61E-05	0.000204	4.49E-06
t-statistic	-0.168523	-0.335298	1.923684**	0.039771
INV_PRI (+)	0.007367	6.83E-05	0.006168	0.012297
t-statistic	5.900856***	0.031514	1.841654*	4.854373***
Num.Observ.	1,606	858	327	304
Adj.R-squa.	0.69	0.66	0.75	0.70

PANEL D: GERMANY

INTERCEPT	0.015590	0.028895	-0.002403	0.000193
t-statistic	4.294961***	4.273493***	-0.155647	0.026082
DISC_ACC (+)	0.006782	0.004136	0.019422	0.009154
t-statistic	3.474337***	1.240434	2.673345***	1.761598*
SIZE (-)	-0.000384	-0.001406	0.000974	0.000725
t-statistic	-1.417314	-2.774570***	0.916651	1.291597
ILLIQ (+)	0.287938	0.290022	0.778790	0.799740
t-statistic	6.149485***	4.178989***	6.409410***	5.313364***
TURN (-)	0.002543	0.003029	0.001739	0.002507

t-statistic	10.20063***	6.607525***	1.560666	3.891125***
ANALYSTS (-)	1.20E-05	5.46E-05	-7.72E-05	8.64E-05
t-statistic	0.396626	1.043286	-0.614916	0.897373
INV_PRI (+)	0.007171	0.002651	0.009014	0.007949
t-statistic	4.660389***	1.019724	1.559983	2.262433**
Num.Observ.	1,299	658	260	259
Adj.R-squa.	0.64	0.60	0.57	0.72

The estimation results regarding the variable size confirm that large firms, which tend to produce more information, exhibit lower levels of information asymmetry, consistent with the negative and statistically significant (1% level) estimated coefficients for all the four discretionary accruals based sub-samples. The sign of the illiquidity coefficient is positive and statistically significant (1% level) for all the sub-samples indicating that more liquid stocks have lower levels of information asymmetry. As predicted the sign of the coefficient for the inverse of stock price is positive and statistically significant for all but the sub-sample of large negative discretionary accruals because firms with lower stock prices tend to have larger relative spreads. The signs of the coefficients for turnover and number of analysts are positive in opposition to expected. One likely explanation for those signs is the significant correlation between size and turnover (0.42) and size and the number of analysts (0.78). However, such explanation is not sustainable because those signs do not change even after excluding size from the regression estimation. Another reason that can explain such signs is the spread estimator used in our study, considering that those signs change from positive to negative when the bid-ask spread is used as the dependent variable instead of the high-low spread estimator.

We also run similar regressions for the three European countries with the higher number of firm-year observations which together represent close to 72% of the full sample. The corresponding estimation results are in panel B, C and D of table 5, respectively for United Kingdom, France and Germany.

The estimation results at the country level are different from those of the full sample. A likely explanation is the reduction in sample size, as we can confirm by noting that the lower the number of observations the lower is the statistical significance of the estimation results. This evidence can be found both at the country level and at the subsample level within each country.
In the case of the United Kingdom the major difference from the full sample is the lack of statistical significance of the discretionary accruals coefficients. This finding may provide evidence that in the UK stock market the informational component of accruals outweighs the earnings management component. The signs of the coefficients for turnover and number of analysts are positive and statistically significant in opposition to expected, while the coefficients for the remainder variables are equal to expected values and statistically significant.

As regards France, the number of estimated coefficients that are not statistically significant increases considerably. As for the United Kingdom the Discretionary Accruals coefficients are not statistically significant. Size has always the predicted sign and is statistically significant except for the bottom accruals quintile subsample. The illiquidity coefficients are positive according to predicted and statistically significant. The signs of the coefficients for turnover are positive in opposition to expected and statistically significant.

For Germany the estimated coefficients for discretionary accruals are always positive. The coefficients are statistically significant at the one percent level, except for firms in the positive accruals subsample and bottom quintile. The positive association between discretionary accruals and the spread tends to be much stronger for firms with high levels of positive discretionary accruals, as in the case of the full sample. The illiquidity variable holds its explanatory power and remains statistically significant, while the size variable loses much of its explanatory power.

Overall, our results confirm that better financial reporting quality is associated with lower information asymmetry among market participants in European stock markets. Our results show that the positive association between discretionary accruals and spread tends to be stronger for firms with high levels of positive discretionary accruals. This relation is obtained using firm-year observations for all the countries in the sample and for all discretionary accruals

based subsamples, except for large negative discretionary accruals group. However, the estimated coefficients have no statistical significance when considering individually firm-year observations for the UK and France. Size, 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.

C. Regression Analysis using the relative bid-ask spread

In addition, we perform a robustness test based on a different proxy for information asymmetry. The relative bid-ask spread is the alternative proxy for information asymmetry and the predicted positive association between the relative bid-ask spread and discretionary accruals is analyzed, Jayaraman (2008) ****. As in the case of the high-low spread estimator, multivariate regressions are estimated for the following subsamples of discretionary accruals: all values, positive, large positive (top quintile) and large negative (bottom quintile).

Panel A, table 6 shows the estimation results for the full sample. The coefficients for discretionary accruals are always positive, except for the bottom quintile. However, the coefficient estimators are not statistically significant. These results are different from those obtained above when the high-low spread estimator is applied as a variable for information asymmetry that confirm the influence of financial reporting quality on information asymmetry. Thus, our finding seems to provide evidence on the relevance of the Corwin and Schultz (2012) high-low spread as an alternative to the relative bid-ask spread when analyzing the relation between discretionary accruals and information asymmetry. This is consistent with the evidence provided by Corwin and Schultz (2012) on the performance of the high-low spread estimator at capturing the effective spread as measured by intraday data. Their results suggest that the estimator produces daily spreads that are very accurate in comparison with effective spreads estimated using intraday data.

The estimated coefficients for the variables size and illiquidity have the predicted signs (negative for size and positive for illiquidity) and are statistically significant at the one percent level, for all discretionary accruals groups. These results are consistent with large firms exhibiting lower levels of information asymmetry and in the case of illiquidity the results indicate that more liquid stocks tend to have lower levels of information asymmetry

The estimated coefficients with respect to the turnover variable have the expected sign for all discretionary accruals groups, confirming that firms with higher turnover tend to exhibit lower levels of information asymmetry. The estimated coefficients are statistically significant (5%) for groups including all firms and firms with positive discretionary accruals.

As regards the variables Analysts and the Inverse of Stock Price the results show no evidence of statistical significance.

Table 6 reports the results of the regression of the relative bid-ask spread on discretionary accruals and other explanatory variables for information asymmetry.

This table reports the results of the regression of the bid-ask spread on discretionary accruals (DISC_ACC). The bid-ask spread measures information asymmetry, while financial reporting quality is assessed by discretionary accruals.

Four regressions are estimated based on the following DISC_ACC groups: all values, positive, top quintile and bottom quintile.

Variable definitions:

BA_S = annual relative bid-ask spread using daily closing bid and ask spreads. DISC_ACC = discretionary accruals given by the Kothary et al. (2005) version of the Jones Model. TURN = ratio of shares traded over the year divided by the total number of shares outstanding. ILLIQ = annual average of daily unsigned stock return divided by trading volume. SIZE = logarithm of market capitalization. ANALYSTS = number of analysts for each firm. INV_PRI = inverse of stock price.

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

	DISC_ACC Abs. value	DISC_ACC Positive	DISC_ACC Large positive	DISC_ACC Large negative Abs. value
PANEL A: FULL SAMPLE				

INTERCEPT	0.134275	0.134178	0.159767	0.125370
t-statistic	33.23482***	22.13945***	13.36149***	10.42615***
DISC_ACC (+)	0.003023	0.006706	0.006898	-0.008508
t-statistic	1.006593	1.446755	0.749591	-0.918277
SIZE (-)	-0.008952	-0.008913	-0.011037	-0.008232
t-statistic	-28.69665***	-18.94061***	-11.42968***	-8.625824***
ILLIQ (+)	2.051756	1.536150	0.789499	2.932537
t-statistic	22.35536***	11.84470***	4.064293***	11.34747***
TURN (-)	-0.000875	-0.001166	-0.000780	-0.001037
t-statistic	-2.476107**	-2.127852**	-0.657448	-0.941510
ANALYSTS (-)	-8.57E-05	-8.17E-05	-4.13E-05	-0.000144
t-statistic	-1.721637*	-1.101974	-0.235945	-0.825433
INV_PRI (+)	-0.001589	-0.003418	-0.000368	-0.001141
t-statistic	-1.059041	-1.587984	-0.086898	-0.293942
Num.Observ.	9,800	4,937	1,900	1,936
Adj.R-squa.	0.77	0.78	0.77	0.75

PANEL B: UNITED KINGDOM

INTERCEPT	0.0107193	0.105201	0.109015	0.107954
t-statistic	15.82218***	10.586839***	4.682155***	4.726604***
DISC_ACC (+)	0.000111	0.003558	0.002928	-0.002415
t-statistic	0.021890	0.433536	0.165977	-0.156243
SIZE (-)	-0.006903	-0.006746	-0.006882	-0.007242
t-statistic	-12.64349***	-8.633076***	-3.544766***	-3.840179***
ILLIQ (+)	133.9174	163.7111	217.9064	286.4073
t-statistic	18.55362***	14.30086***	7.747280***	8.123419***
TURN (-)	-0.001021	-0.000602	9.12E-05	0.000626
t-statistic	-1.718379*	-0.662246	0.043593	0.311459
ANALYSTS (-)	6.32E-05	0.000147	0.000115	2.14E-05
t-statistic	0.592108	0.945205	0.293698	0.061357
INV_PRI (+)	0.365806	0.285899	0.202845	0.415128
t-statistic	18.12116***	10.09374***	2.818280***	5.528717***
Num.Observ.	4,027	2,036	750	791
Adj.R-squa.	0.82	0.84	0.81	0.79

PANEL C: FRANCE

INTERCEPT	0.031392	0.044626	0.065995	0.020828
t-statistic	6.223378***	5.497562***	3.459246***	1.680387*
DISC_ACC (+)	0.002253	-0.004266	-0.019896	0.011891
t-statistic	0.680590	-0.864504	-1.612107*	1.315480
SIZE (-)	-0.001676	-0.002443	-0.003914	-0.001358
t-statistic	-4.448850***	-4.021150***	-2.679481***	-1.399280
ILLIQ (+)	2.833137	3.570961	2.311601	2.330713
t-statistic	27.54830***	18.84754***	5.745302***	7.095614***
TURN (-)	-0.000553	-0.002436	-0.003892	0.004211
t-statistic	-1.164397	-2.976702***	-1.375155	3.859130***
ANALYSTS (-)	-7.76E-05	-0.000195	-0.000314	0.000170
t-statistic	-1.317264	-2.045681**	-1.024643	0.980531
INV_PRI (+)	0.003986	-0.010466	0.000960	0.015384
t-statistic	1.756754*	-2.440498**	0.099210	3.960209***
Num.Observ.	1,606	858	327	304
Adj.R-squa.	0.79	0.77	0.57	0.83

PANEL D: GERMANY

INTERCEPT	0.031133	0.037091	-0.037865	0.038375

t-statistic	3.351579***	2.085085**	1.027311	2.388254**
DISC_ACC (+)	0.006792	0.010139	-0.001511	0.005794
t-statistic	1.351548	1.151014	-0.086998	0.516687
SIZE (-)	-0.001409	-0.001847	-0.001896	-0.001872
t-statistic	-2.028943**	-1.383113	-0.666998	-1.533805
ILLIQ (+)	1.656600	1.307774	1.439928	2.765388
t-statistic	14.79633***	7.379921***	4.931710***	8.692034***
TURN (-)	-0.002099	-0.002846	-0.002075	-0.002743
t-statistic	-3.263499***	-2.349750**	-0.777184	-1.961192**
ANALYSTS (-)	-5.64E-05	1.10E-05	-0.000188	-0.000206
t-statistic	-0.721358	0.079136	-0.624688	-0.990474
INV_PRI (+)	3.18E-05	0.000450	0.018443	-0.009755
t-statistic	0.008167	0.066002	1.328744	-1.286600**
Num.Observ.	1,331	675	267	263
Adj.R-squa.	0.79	0.74	0.79	0.84

Panels B, C and D report the estimation results for the subsamples organized by the three European countries with the higher number of firm-year observation. The results show that discretionary accruals coefficients are not statistically significant as in the case of the full sample.

In the case of the United Kingdom as regards the variables size, illiquidity and inverse of stock price, estimated coefficients have the predicted sign and are statistically significant at the one percent level. The sign of the estimated coefficient for turnover is equal to the expected and statistically significant (10%) only in the case of the subsample including all firm-year observations. The coefficient of the variable representing the number of analysts has no statistical significance.

As regards France, size has always the predicted sign and it is statistically significant at the one percent level, except for the bottom accruals quintile subsample. The illiquidity coefficients are positive according to predicted and statistically significant at the one percent level for all the subsamples. The results for the variables turnover, analysts and inverse of stock price are inconclusive.

For Germany, size has always the predicted sign but it is only statistically significant (5%) for the subsample including all firm-year observations. The illiquidity coefficients are positive according to predicted and statistically significant at the one percent level for all the subsamples. The results for the variable turnover have always the expected sign and they are always statistically significant, except for the large positive discretionary accruals subsample. The coefficients of the variables number of analysts and inverse of stock price have no statistical significance.

Overall, our results based on the closing bid-ask spread do not provide statistical significant evidence of the relation between financial reporting quality and information asymmetry, in contrast to the results when the high-low spread estimator is applied as a variable for information asymmetry. Size and illiquidity appear to be the main factors explaining the spread, while the estimated coefficients for turnover have the predicted sign and are statistically significant for the subsample including all firm-year observations and the positive discretionary accruals subsample.

6. Conclusions

Information asymmetry is a concern for several market participants because it increases the adverse selection risk and lowers liquidity. Poor financial reporting quality affects negatively the quality of public information implying that informed investors get an informational advantage over other market participants because of their private information or superior ability to process public information, thus increasing information asymmetry.

This paper provides evidence on the association between financial reporting quality and information asymmetry in Europe, using discretionary accruals as a proxy for financial

reporting quality and the Corwin and Schultz (2012) high-low spread estimator to measure information asymmetry.

Our work documents a positive relation between discretionary accruals and the high-low spread estimator. Further, such association is not linear and tends to be stronger for firms with high levels of positive discretionary accruals. Therefore, our results suggest that in European stock markets the earnings management component of accruals outweighs the informational component.

Despite the conclusion that, on average, the earnings management component of accruals outweighs the informational component we find that such superiority is not observable for all the subsamples, namely for the UK firms and large negative discretionary accruals subsample.

In addition, our results suggest that the high-low spread estimator is more efficient than the closing bid-ask spread when analyzing the impact of financial reporting quality on information asymmetry. This is consistent with the evidence provided by Corwin and Schultz (2012) suggesting that their estimator produces daily spreads that are very accurate in comparison with effective spreads estimated using intraday data.

Another conclusion refers to the main determinants of the spread. In agreement with prior literature we find that larger firms tend to exhibit lower levels of information asymmetry. Illiquidity appears to have a high explanatory power with more liquid stocks showing lower levels of information asymmetry. The inverse of stock price is positive and statistically significant for all sub-samples except for the large negative discretionary accruals, consistent with lower stock prices being associated with larger relative spreads. The estimated coefficients for turnover and number of analysts have the opposite sign to that expected.

We suggest that future research may provide evidence on the relation between financial reporting quality and information asymmetry in Europe, replacing discretionary accruals with alternative proxies to test for the robustness of the relation. Further, additional research is needed to find out why the estimated coefficient of turnover in spread regressions, which is expected to capture the order processing costs of spread, takes the opposite sign to that expected.

References

Acker Daniella, Mathew Stalker, and Ian Tonks. 2002. Daily closing inside spreads and trading volumes around earnings announcements. *Journal of Business Finance and Accounting* 29 (9/10): 1149-1179.

Amihud, Yakov. 2002. Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets* 5 (1): 31–56.

Armstrong, Christopher, John Core, Daniel Taylor, and Robert Verrecchia. 2011. When does information asymmetry affect the cost of capital? *Journal of Accounting Research* 49 (1): 1-40.

Aslan, Hadiye, David Easley, Soeren Hvidkjaer, and Maureen O'Hara. 2011. The characteristics of informed trading: Implications for asset pricing. *Journal of Empirical Finance* 18(5): 782-801.

Bhattacharya, Nilabhra, Hemang Desai, and Kumar Venkataraman. 2013. Does earnings quality affect information asymmetry? Evidence from trading costs. *Contemporary Accounting Research* 30 (2): 482–516.

Bhattacharya, Nilabhra, Frank Ecker, Per M. Olsson, and Katherine Schipper. 2012. Direct and mediated associations among earnings quality, information asymmetry, and the cost of equity. *The Accounting Review* 87 (2): 449–482.

Bollen, Nicolas, Tom Smith, and Robert Whaley. 2004. Modeling the bid/ask spread: measuring the inventory-holding premium. *Journal of Financial Economics* 72 (1): 97–141.

Brown Stephen, and Stephen A. Hillegeist. 2007. How disclosure quality affects the level of information asymmetry. *Review of Accounting Studies* 12(2/3): 443-477.

Chae, Joon. 2005. Trading volume, information asymmetry, and timing information. *Journal of Finance* 60(1): 413-442.

Corwin Shane A., and Paul Schultz. 2012. A simple way to estimate bid-ask spreads from daily high and low prices. *Journal of Finance* 67 (2): 719-759.

Dechow, Patricia, Weili Ge, and Catherine Schrand. 2010. Understanding earnings quality: A review of the proxies, their determinants and their consequences. *Journal of Accounting and Economics* 50 (2-3): 344-401.

Dechow, Patricia, and Ilia Dichev. 2002. The quality of accruals and earnings: The role of accrual estimation errors. *The Accounting Review* 77 (Supplement): 35-59.

Dechow, Patricia, Richard Sloan, and Amy Sweeney. 1995. Detecting Earnings Management. *The Accounting Review* 70 (2): 193-225.

Easley David, and Maureen O'Hara. 2004. Information and the cost of capital. *The Journal of Finance* 59(4): 1553-1583.

Easley, David, Soeren Hvidkjaer, and Maureen O'Hara. 2002. Is information risk a determinant of asset returns? *Journal of Finance* 57 (5): 2185-2221.

Ewert, Ralf, and Alfred Wagenhofer. 2011. Earnings Quality Metrics and What They Measure. Working paper, University of Graz, August.

Francis, Jennifer, Ryan LaFond, Per Olsson, and Katherine Schipper. 2005. The market pricing of accruals quality. *Journal of Accounting and Economics* 39 (2), 295-327.

Hasbrouck, Joel. 2009. Trading costs and returns for U.S. equities: Estimating effective costs from daily data. *Journal of Finance* 64(3): 1445-1477.

Hirshleifer, David, Siew Hong Teoh, and Jeff Jiewei Yu. 2011. Short arbitrage, return asymmetry, and the accrual anomaly. *Review of Financial Studies* 24 (7): 2429-2461.

Huang, Roger, and Hans Stoll. 1996. Dealer versus auction markets: A paired comparison of execution costs on Nasdaq and the NYSE. *Journal of Financial Economics* 41 (3): 313–357.

Jayaraman, Sudarshan. 2008. Earnings volatility, cash flow volatility and informed trading. *Journal of Accounting Research* 46 (4): 809-851.

Jones, Jennifer. 1991. Earnings management during import relief investigations. *Journal of Accounting Research* 29 (2): 193-228.

Kothari, Andrew Leone, and Charles Wasley. 2005. Performance matched discretionary accrual measures. *Journal of Accounting and Economics* 39 (1): 163–197.

Lambert, Richard A., Christian Leuz, and Robert Verrecchia. 2012. Information Asymmetry, Information Precision, and the Cost of Capital. *Review of Finance* 16 (1): 1-29.

Leuz, Christian, and Robert E. Verrecchia. 2000. The economic consequences of increased disclosure: Evidence from international cross-listings. *Studies on Accounting Information and the Economics of the Firm, Supplement to the Journal of Accounting Research* 38: 91-124.

Madhavan, Ananth. 2000. Market microstructure: A survey. *Journal of Financial Markets* 3 (3): 205-258.

Mohanram, Partha, and Shiva Rajgopal. 2009. Is PIN priced risk? *Journal of Accounting and Economics* 47 (3): 226–243.

Perotti, Pietro, and Alfred Wagenhofer. 2011. Earnings Quality Measures and Excess Returns. Working paper, University of Graz, December.

Schipper, Katherine, and Linda Vincent. 2003. Earnings quality. *Accounting Horizons* 17 (Supplement): 97-110.