

Financial Development and Asymmetric Information

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Abstract.

In this paper, we test the hypothesis that the degree of asymmetric information should decrease as financial systems develop and move towards the capital-market-based norm –as opposed to the bank-based one, in a panel co-integration framework with annual data for 33 countries for which relevant data exist. As in much of the existing literature, we proxy asymmetric information with the dispersion in analysts' earnings-per-share forecasts for the FTSE and MSCI stock market indices, from the I/B/E/S/ *Global Aggregates* database. In addition, we proxy the level of financial development with the extensive set of indices found in the World Bank's *Financial Development and Structure* database which measure the size, activity and efficiency of all segments of the financial system, in a consistent across countries and across time way. The econometric results are consistent with expectations. Briefly, the proxy of asymmetric information is negatively related to indices measuring financial liberalization (which, presumably, tilts the balance towards market-based systems), and the development of the stock and bond markets as well as of the insurance industry. In addition, the proxy for asymmetric information is positively related to indices associated with a more bank-based financial system in which banks do not face intense competition from capital markets.

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1. Introduction

In this paper, we explore the well-developed but, to the best of our knowledge, not tested so far hypothesis that the degree of asymmetric information should decrease as financial systems develop and move towards the capital-market-based norm –as opposed to the bank-based one. In short, the need for public information, which is crucial for the assessment of firms' prospects and, hence, for giving them the external funds they need in order to realize these prospects, is higher in capital-market-based financial systems than in bank-based ones. In the latter, the private information banks acquire thanks to their long-run relationships with the borrowing firms, together with banks' higher leverage vis-à-vis these firms as compared to the leverage of bond holders and minority shareholders, attenuate this need. For more details, the interested reader may refer to Beim and Calomiris (2001, pp. 150-192) and Mishkin (2000, pp. 181-198).

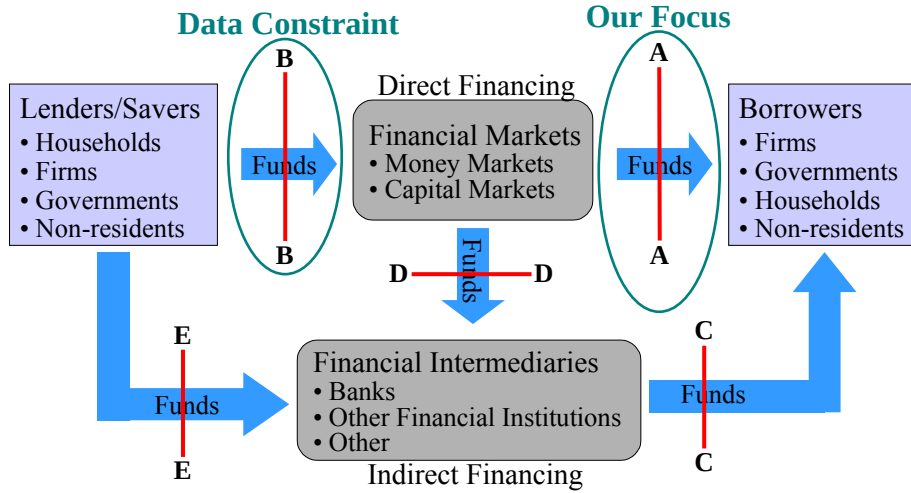
Testing this hypothesis stumbles upon the difficulty of quantifying the dependent and the explanatory variables, i.e., the degree of asymmetric information and financial development, both of which are qualitative and multi-faceted. Luckily though, several proxies have been used in the literature for the first variable. Following the classification of Clarke and Shastri (2001), these proxies fall into four broad groups of which the first is based on the analysts' forecasts, the second is associated with the set of investment opportunities of firms, the third is related with stock returns and the fourth with market microstructure characteristics. Yet, as the brief review in the next section indicates, their use is not without problems, owing mainly to the fact that their interpretation is ambiguous.

From these proxies, we use the dispersion of analysts' forecasts, perhaps the most widely used proxy and the one with the most solid logical underpinnings (Chang et al. (2000), Pantzalis (a)). Specifically, we use the dispersion in analysts' earnings-per-share forecasts for the FTSE and MSCI indices for 33 countries for which relevant data exist. These forecasts come from the I/B/E/S/ *Global Aggregates* database. Unlike, however, most of the existing literature, we use this proxy as the dependent variable instead of as an explanatory one.

The logical foundations of our work are illustrated in figure 1, which portrays the structure of the financial system. In this figure, the line segments AA, BB, CC, DD and EE mark the 'points' where asymmetric information exists. Our focus is on the

point marked by the AA-segment. Yet, owing to the proxy used, we essentially measure asymmetric information at the point marked by the BB-segment.

Figure 1. Financial System Structure and Asymmetric Information



Measuring asymmetric information at the point marked by the BB-segment adds an additional source of noise in dependent variable that comes from the extensively analysed biases and conflicts of interest of financial analysts (Healy and Palepu (2001), Pantzalis (b)). Nevertheless, as the quality and quantity of information increases, both the biases and conflicts of interest will exert a smaller influence, for the leeway of analysts in analyzing the publicly available information, both qualitative and quantitative, should decrease.

In essence, we test a joint hypothesis: (a) The degree of asymmetric information is negatively related to financial development; and (b) The dispersion of analysts' forecasts has two components positively related to asymmetric information: one relating to the unobservable 'true' asymmetric information between firm insiders and outsiders (line segment AA), and one related to analysts biases and conflicts of interest (segment BB).

We further proxy the level of financial development with the extensive set of indices found in the Word Bank's *Financial Development and Structure* database. These indices measure, the size, activity and efficiency of the various segments of the financial system, i.e., of financial intermediaries, the insurance industry and of the stock and bond markets, in a consistent across countries and across time way.

For the econometric analysis, we employ a panel co-integration framework, with annual data for the period 1990-2004. The sample period, as well as the sample countries, is dictated by data availability in the two aforementioned databases. In addition, we use several macroeconomic variables to control for macroeconomic uncertainty, a factor that is expected to affect the dependent variable, the dispersion of analysts' forecasts.

The econometric results are consistent with expectations. Briefly, the proxy for asymmetric information is negatively related to indices measuring financial liberalization (which, presumably, tilts the balance towards market-based systems), and the development of the stock and bond markets as well as of the insurance industry. In addition, the proxy for asymmetric information is positively related to indices measuring the relative significance of bank intermediation and the inefficiency of the banking system. Higher values for the latter indices are indicative of more bank-based financial systems in which banks do not face intense competition from capital markets. Last but not least, several robustness checks reinforce the above findings.

To the best of our knowledge, this is the first paper that attempts to measure/quantify the relationship between financial development and asymmetric information. A related paper (Chang et al. (2000)) links asymmetric information, for which it uses the same proxy as here, with observable country characteristics, such as, average firm size, stock market capitalization over GDP, legal origin, and an index measuring quality of disclosure standards. In tune with this paper, it finds that, *ceteris paribus*, an Anglo-Saxon legal system, which presumably is more conducive to the development of capital markets, is associated with lower dispersion.

Relative to this paper, the value-added of this one stems from several facts. To begin with, the observable characteristics are not always good indicators of the level of financial development. As several observers have noted, there may exist countries with the same set of characteristics but different financial systems, for factors, such as, historical experience, have shaped them (references). In addition, using these characteristics, which do not vary very much over time, one cannot track/examine the evolution of the financial system and asymmetric information. Last but not least, the estimation technique employed here, panel analysis with time and country dummies, takes into account the influence of these time-invariable characteristics examined in the cross-sectional analysis of Chang et al. (2000).

The remainder of the paper is organized as follows. Section 2 presents the proxies for asymmetric information and financial development. Section 3 discusses the econometric issues related to unit-root testing and co-integration in a panel setting. Section 4 presents the empirical results, while Section 5 concludes.

2. Proxies for Asymmetric Information and Financial Development

Proxies for Asymmetric Information.

The proxies for asymmetric information used so far in the literature fall into four broad groups of which the first is based on the analysts' forecasts, the second is associated with the set of investment opportunities of firms, the third is related with stock returns and the fourth with market microstructure characteristics (Clarke and Shastri (2001)). Note, however, that all proxies are not without problems for their interpretation is not unique.

Specifically, the proxies in the first group include the *dispersion in earnings per share forecasts*, as measured by the standard deviation and the coefficient of variation of analysts' forecasts, *the accuracy of these forecasts*, measured with the absolute mean forecast error, and the *analyst coverage*, which refers to the number of analysts covering a particular stock or a market.

The justification for the use of the first two proxies can be traced in the findings of Blackwell and Dubbins (1962) who claimed that different opinions tend to merge as the supply of information regarding an unknown quantity increases. Later, Dickey and Fischer (1975) showed that, if the information is common to all, then beliefs converge to consensus even more rapidly than the individual beliefs tend to converge to uncertainty, while Barry and Brown (1985) demonstrated that analysts tend to converge their beliefs as the amount of public information increases. Thus, there should be a positive relationship between the degree of asymmetric information with the dispersion of analysts' forecasts and a negative relationship with the accuracy of forecasts.

As for the *analyst coverage*, it presumably measures the supply of information pertaining to a particular stock or market and should be negatively related with the degree of asymmetric information. Logically, firms and markets with larger analyst coverage should have a smaller amount of private information filtered to investors

(Bushan (1989)) which, additionally, decreases the adverse selection costs (Brennan and Subrahmanyam (1995)).

As noted above, these proxies are not without problems for they may be interpreted in more than one ways, some of which capture the strategic interaction among managers, analysts and investors. To begin with the first two proxies may reflect the level of a firm's risk associated with the volatility of its earnings in addition to the asymmetric information. Pertaining to the third, Chung et al. (1995) claim that analysts have an incentive to focus on firms with severe information asymmetry problems because the value of private information is higher for them. Hence, the relationship between analyst coverage and information asymmetry would be positive and not negative as postulated above. Moreover, there is plenty of evidence suggesting that this variable is heavily influenced by the so-called optimism or selection bias of analysts (see, among others, Healy & Palepu (2001), Pantzalis (a), Doukas et al. (2004)).

The proxies in the *investment opportunities* group include the *Market to Book of Equity* and *Market to Book of Total Assets ratios* (McLaughlin et al. (1998), Adam and Goyal (1999) and Clarke and Shastri (2001)), which are simplified proxies of the Tobin's Q ratio, plus the *Price to Earnings ratio P/E* (Chung and Charoenwong (1998) and Clarke and Shastri (2001)). Their use is based on the notion that the managers of companies with high growth rates know better than the managers of firms with low growth rates the investment opportunities and the future cash flows of their companies, a fact which implies a lower degree of asymmetric information (Smith and Watts (1992)). Accordingly, firms which have low Market to Book and low P/E ratios should be related with greater asymmetric information.

The main criticism for the use of these variables as proxies of asymmetric information is that they have also been employed as proxies of several other variables, such as, managerial efficiency, risk, valuation and market mis-pricing, monopoly market power, whose influence cannot be readily separated from the influence of asymmetric information.

The third group of asymmetric information proxies uses the so-called *residual volatility*, which is measured by the standard deviation of residuals of daily abnormal stock returns estimated by the market model (Bhagat et al. (1985), Blackwell et al. (1990), Fee and Thomas (1999), Clarke and Shastri (2001)). The underlying logic is that to the extent that residual volatility reflects uncertainty about firm's value among insiders, i.e., managers and large shareholders who presumably are better informed

investors, and outsiders, i.e., retail investors, there should be a positive relationship between this proxy and asymmetric information. Nevertheless, it is very difficult to disentangle the influence asymmetric information from that of other factors, both firm-specific and economy wide, which affect the volatility of stock returns.

The fourth group of asymmetric information proxies comes from the vast literature of markets' microstructure. One such proxy is the *bid-ask spread*. Several studies (Jaffe and Winkler (1976), Copeland and Galai (1983) and Glosten and Milgrom (1985), Madhavan (2000)), postulate that a large bid-ask spread indicates a large degree of information asymmetry. The positive association between information asymmetry and the bid-ask spread is justified by the adverse selection component of the spread which compensates the market-makers or dealers for transacting with better informed traders from which they lose, in contrast with the so-called uninformed or liquidity motivated traders from which they gain.

The problem with the use of the bid-ask proxy is, as Clarke and Shastri (2001) report, that the models which have been developed so far generate very different estimates of the adverse selection component ranging between 10% to 40% approximately and on top of this they may be misspecified, something that makes a very difficult task to isolate the influence of the other two components of the bid-ask spread, namely the order processing and inventory components. The order-processing or transaction costs pertain to the commission costs, taxes, clearance and settlement fees, while the inventory holding costs are the opportunity costs relating to carry long/short positions in securities. For a better description of these costs and their estimation, see Keim & Madhavan (1997) and Coughenour & Shastri (1999).

Another proxy is the *concentration of managerial and other insiders' holdings*. Studies such as those of Chiang and Venkatesh (1988) and Bharath et al. (2005) show that the higher the probability of informed trading, the higher the probability of asymmetric information. A third proxy is the *trading volume*, with the rationale that an increased trading volume is triggered by the existence of superior private information among investors and the divergence of their opinions regarding the true value of firms (see, among others, Grossman (1976) and Goetzmann and Massa (2005)). Two more proxies are the *relative size* in terms of net sales or market capitalization and the relative age of firms. The underlying assumption (Clarke and Shastri (2001)) is that for relatively smaller and younger companies there will be larger asymmetric information, since for these companies, due to the lower degree of attention they will receive from

the analysts and the financial press. Alternatively, a smaller size of companies may be associated with a higher level of business and financial risk and a higher expected return (“small-firm” anomaly).

From the above proxies, we use the dispersion of analysts’ earnings per share forecasts, measured by their standard deviation, which is the most widely used by both empirical¹ and theoretical studies (Elton et al. (1984), Barry and Brown (1985), Harris (1986), Wang (1993), Gilson et al. (1997), Krishnaswami and Subramaniam (1999), Clarke and Shastri (2001), Doukas et al. (2004a, 2006), Pantzalis (a), Halov (2006)). It is also the one with the strongest logical underpinnings and the weakest drawbacks. In addition, it is readily available at the country level at which our analysis is focused, while the other variables are not and they cannot be accurately estimated at that level.

Proxies for Financial Development.

Ideally, to measure financial development, one should quantify how well financial systems accomplish their functions, i.e., the mobilization of savings, the easing of exchange of goods and services, the production of information ex ante about investments and the allocation of capital, the monitoring and the exertion of control of realized investments ex post, and the facilitation of trading, the diversification and management of risk (Levine, 2004). However, this is easier said than done, for the majority of these functions are qualitative in nature. In addition, financial systems may accomplish their functions equally efficiently under different structures.

To overcome this objective difficulty of measuring financial development, several indices have been used in the literature, which attempt to do so through the outcomes (e.g. Beck et al, (2000), Demirgüç-Kunt and Levine (1999), Rajan and Zingales (1998)), through the institutional setting (e.g. Kaminsky and Schmuckler (2002)), or through a combination of the two.

In this paper we use the outcomes for the different segments of the financial system. Specifically, we use the extensive set of indices in the World Bank’s *Financial Development and Structure database* (Beck et al, 2000). These indices are consistent across countries and time, and capture the development of the financial sector across

¹ With the exception of Goetzmann & Massa (2005) who did not use the dispersion of analysts’ forecasts as a measure of divergence of investors’ opinions, because they had access on a privileged database of the actual retail investors accounts and the study of Barry & Jennings (1992) who claimed that the analyst coverage is a superior measure of estimation risk.

different dimensions, such as banks, other financial intermediaries, insurance industry, stock market, private and public bond markets.

Table 1 summarizes the fourteen indices used for each country. The first column reports the symbol used, the second provides a short description and the third further details, while the fourth column reports the expected sign. The indices are organized in four groups, each group corresponding to a major segment of the financial system: seven indices, denoted as FI_i ($i=1,7$), measuring the evolution of the size and activity of banks and other financial intermediaries, as well as the efficiency and structure of the banking sector of the financial system; two indices, denoted as INS_i ($i=1,2$), measuring the development of the insurance industry; three indices, denoted as SM_i ($i=1,3$), measuring the size, activity and efficiency of the stock market; and two indices, denoted as BM_i ($i=1,2$), measuring the size of the private and public bond markets. Due to data availability constraints, the sample period is restricted to 1990-2004, mainly because of lack of data for the efficiency and structure of banks in each country.

Insert Table 1 here

In greater detail, FI_1 measures the extent of central bank involvement in the financial intermediation process. It is defined as the ratio of deposit money bank claims on domestic non-financial real sector to the sum of deposit money bank and Central Bank claims on domestic non-financial real sector. An increase in FI_1 indicates a more liberalized financial system, in which the central bank plays a diminishing role in the intermediation process. So, the screening of investment projects by banks and their effort to gain shares of the market amplifies. In addition, financial liberalization is also associated with the creation and/or deepening of financial markets. This evolution results to increase flow of information about firms that may be diffused to the economy, and thus leads to lower asymmetric information.

FI_2 , which is equal to claims on domestic real non-financial sector by deposit money banks as a share of GDP, reflects the importance of the banking segment in the economy. FI_3 captures the activity of the financial intermediaries, i.e., banks and other financial intermediaries, in one of their main function: channelling savings to private investors. It is defined as the ratio of private credit by deposit money banks and other financial institutions to GDP. Intuitively, when private credit expands, financial intermediaries are more engaged in analyzing firms, producing information for potential

investment projects, and exerting corporate control. FI_4 , which is equal to deposits in deposit money banks and other financial institutions as a share of GDP, measures the overall size of the financial system. An increase in FI_2 , FI_3 and FI_4 is expected to be positively associated with asymmetric information, since the role of banks and other financial intermediaries as private information agents is at the core of their business.

The FI_5 to FI_7 indices are measures of the efficiency and structure of the banking segment. Specifically, FI_5 and FI_6 refer to overhead costs and the net interest margin of banks respectively, as shares of their assets. High values of these indices indicate an inefficient and non competitive banking segment that does not face significant competitive pressures from other segments of the financial system. In such a system, the degree of asymmetric information is expected to be higher. FI_7 measures banking concentration, and is defined as assets of the three largest banks as a share of assets of all commercial banks in the system. High concentration could be the product of, either a non developed and non competitive banking segment, or, through mergers and acquisitions between banks, of a highly competitive and developed banking sector. So, we remain agnostic about the association of this variable to asymmetric information.

As far as it concerns the remaining indices, which capture aspects of the development of the other segments of the financial system, namely, the insurance industry and the stock and bond markets, they are expected to be negatively related with the degree of asymmetric information because the development of the insurance industry and capital markets is inherently associated with increased disclosure, high levels of external control and, thus, better information dissemination. In greater detail, INS_1 and INS_2 , which measure life and non-life insurance penetration respectively as shares of GDP, capture the development of the insurance industry. The indices SM_1 , defined as stock market capitalization to GDP, SM_2 , defined as stock market total value traded to GDP, and SM_3 , defined as stock market total value traded to stock market capitalization, measure the size, liquidity and depth of the stock market. The later can be viewed as an efficiency measure of the stock market, since it captures trading frictions and the flow of information that induces transactions, although it does not measures directly trading costs or the ability to sell securities at posted prices (Beck et al 2000). Lastly, BM_1 and BM_2 refer to the size, that is the capitalization, of the private and public bond markets respectively, as shares of GDP.

3. Econometric Issues

The joint hypothesis we aim to test in this study has three parts. First, the degree of asymmetric information between investors and firms at a country level is negatively related to financial development; second, the proxy used, i.e., the standard deviation of the analysts' EPS forecasts, has a component positively related to asymmetric information; and third the World Bank's indices are good proxies to measure financial development. This proxy of asymmetric information is been considered to have other two components, which can be attributed to analysts' specific factors and macroeconomic uncertainty.

The asymmetric information proxy comes from the I/B/E/S Global Aggregates database. This database provides forecasts for countries and major international indices rather than individual stocks. The earnings expectations of all stocks in an index or country are taken to create weighted forecast earnings for each market. All company level data is calendarized prior to aggregation. Finally, an index aggregate is constructed, as a weighted average of the company calendarized data (for details about calendarization and aggregation see *I/B/E/S Global Aggregates Reference Guide 2*). For each available index are provided earnings expectation data for fiscal years 1 and 2, where fiscal year 1 (henceforth FY_1) corresponds to forecasts for the current calendar year.

So, the weighted average standard deviation of the EPS forecast for the calendarized FY_i period i ($i=1,2$) for the FTSE (denoted FY_{iFTSE}) and MSCI (denoted FY_{iMSCI}) indices for each country are used as proxies for asymmetric information. These data are available over the period 1987-2004 and we use them on an annual basis. The FTSE index includes twenty two countries, namely: Australia, Austria, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Mexico, Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, U.K. and U.S.A. The MSCI index additionally includes Chile, Greece, India, Indonesia, Korea, Pakistan, Peru, Philippines, Poland, Portugal, Thailand and Turkey.

To test the aforementioned hypothesis, we apply a panel co-integration analysis using the model below.

$$Y_{ht} = \alpha + \sum_{j=1}^7 \delta_j FI_{jht} + \sum_{j=1}^3 \varepsilon_j SM_{jht} + \sum_{j=1}^2 \zeta_j BM_{jht} + \sum_{j=1}^2 \theta_j IPF_{jht} + \sum_k \lambda_k CONTROL\ VARIABLES_{kht} + v_h + \xi_t + u_{ht} \quad (1)$$

where the dependent variable is the different measures of the aforementioned proxy for asymmetric information (FY_{iFTSE} ($i=1,2$) and FY_{iMSCI} ($i=1,2$)) and h is the country subscript. It is a fixed effects model with country specific intercepts v_h and time dummies ξ_t . These time specific intercepts are intended to account for time varying omitted variables and stochastic shocks that are common to all countries. To account for macroeconomic uncertainty, we include in equation (1) the real GDP growth rate, inflation –measured with the CPI— and its standard deviation which is calculated from the relevant monthly change in CPI in a 12-month basis.

All variables in the above equation were tested for unit roots in a panel framework, using the Breitung's and Hadri's panel common unit root tests. The former employs a null hypothesis of a unit root, and is preferred relative to the Levin, Lin and Chu test, as having substantially higher power (Baltagi, p.243). The later uses a null of no unit root, being analogous to the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test in the time series framework. A variable is characterized as $I(1)$ when both tests give this indication. With the exception of the GDP growth rate, all variables were found to be integrated of order 1. The results of the panel unit root tests are not reported here but are available upon request.

To estimate the long-run (co-integrating) relationship between the $I(1)$ variables in equation (1) we use panel Dynamic OLS estimator. As is well known, this estimator uses a parametric approach to deal with serial correlation, and is more promising than the Fully Modified OLS in estimating the co-integrated panel regressions (Baltagi, p.258). We apply the Schwarz criterion to choose the number of leads and lags for the explanatory $I(1)$ variables. Thus, we use one lead and two lags in all cases, that is, for all independent variables. Also, a number of F-tests are employed to test for group-wise heteroskedasticity in the residuals of equation (1), and is found to be present in all cases.

Because in our sample the number of explanatory variables is greater than T , the number of observations in the time dimension, we cannot perform any test for cross-sectional dependence. Nevertheless, we use the cross-section SUR (Panel Corrected Standard Errors - PCSE) standard errors and covariance method, corrected for degrees of freedom, to deal for cross-section heteroskedasticity and possible cross-section contemporaneous correlation. Finally, the residuals of the above equation were tested for unit roots, using the aforementioned panel unit root tests, and were found to be

stationary, indicating the presence of panel co-integration between the statistically significant I(1) variables.

As a robustness check, we test our hypothesis in a cross section framework, ignoring the within time variability of the variables under consideration. Thus, we run the between cross sections regression, i.e., the regression of averages across time of all variables in equation (1). This procedure will help us to test whether different countries, which experience a variety of financial structures and levels of financial development, encounter also different levels of asymmetric information. In the equation to be estimated shown below, the bars above the variable names denote time averages for each country/cross-sectional unit.

$$\begin{aligned}\bar{Y}_h = & \gamma + \sum_1^7 \rho_j \bar{FI}_{jh} + \sum_1^3 \pi_j \bar{SM}_{jh} + \sum_1^2 \tau_j \bar{BM}_{jh} + \\ & + \sum_1^2 \varphi_j \bar{IPF}_{jh} + \sum_k \psi_k \overline{CONTROLVARIABLE}_k + e_k\end{aligned}\quad (2)$$

4. Results

Tables 2 and 3 summarize the empirical results. The first presents the results of the panel co-integrating equations for the FTSE index in Panel A and the MSCI index in Panel B; and the second the relevant results of the between estimation, that is the OLS cross section equation using the time averages of the relevant variables. The two tables have the same structure: the first row shows the dependent variable, while the other rows report the estimated coefficients (and their t-statistics in parentheses) of the statistically significant regressors and the adjusted R^2 . The Durbin Watson statistic is also reported in Table 2 for the panel co-integrating estimation.

In summary, the results are consistent with expectations. Asymmetric information is negatively related to several financial development indices, both in the panel and in the cross section framework. In the former, there is a long-run relationship between asymmetric information proxies and the indices that measure the development and the efficient functioning of financial intermediaries, the insurance industry, and the stock and bond markets. In the later, the results are essentially the same, reinforcing the empirical conclusion that asymmetric information decreases as banks become more efficient and markets develop. Perhaps, what is astonishing in these results is their statistical and economic significance despite the major differences between the sample

countries' level of financial development and financial structure, and despite the use of imperfect proxies for asymmetric information.

More specifically, in the panel co-integrating vectors of the Y_{iFTSE} and Y_{iMSCI} ($i=1,2$) variables enter indices that measure the size and/or activity of the financial intermediaries (indices FI_2 , FI_3 and FI_4), with a positive sign, indicating the crucial role that private information plays to the functioning of these institutions. However, as financial systems are being liberalized, and banks become more competitive and efficient, asymmetric information decreases, as the negative signs of the respective FI_1 , FI_6 and/or FI_7 indices indicate.

In addition, the development of the insurance industry, the size of the stock and/or the private and public bond markets (indices INS_1 , SM_1 , BM_1 and BM_2 indices), together with the efficient functioning of the stock market (SM_3 index) are negatively related to asymmetric information, providing the empirical evidence of the role of markets as promoters of publicly available information.

Inflation also enters the co-integrating vectors in most cases, with a negative sign, probably indicating that the EPS have an inflationary component. Intuitively, firms' earnings consist of two parts, one which is attributed to the presence of inflation in the economy, and the other to firms' real activity. When inflation is rising, the proportion of the inflationary part to total earnings is relatively bigger than the real earnings' part, and most importantly, it is for publicly available information, thus, reducing the importance of firm specific information. As for the standard deviation of inflation, which has in general a positive sign, indicates that macroeconomic uncertainty contributes to the increase of the dispersion in analysts' forecasts.

In greater detail, as Panel A in Table 2 documents, the standard deviation of the analysts' EPS forecasts for the FTSE index for fiscal years 1 and 2 form a panel co-integrating vector with the FI_1 , FI_4 , INS_1 , SM_1 , SM_3 and INF variables in the first case and with the FI_4 , FI_7 , SM_3 , INF and $STDINF$ in the second.

Insert Table 2 here

The sign of these variables are reasonable and interesting. Specifically, the negative coefficient of FI_1 in the equation for Y_{iFTSE} (coefficient/t-statistic: -214.96/-3.36) indicates that an increase in this variable, which denotes a more liberalized financial system, is associated with a smaller standard deviation of the EPS forecast for

fiscal year 1. Also, the negative coefficients of INS_1 , SM_1 and SM_3 (coefficients/t-statistics: -427.35/-3.14, -6.98/-1.98 and -13.92/-5.04 respectively) show that the development of the life-insurance industry and the stock market size and depth is related to reduced EPS forecasts' dispersion.

On the contrary, the coefficient of FI_4 is positive (coefficient/t-statistic: 28.79/5.32), indicating that as the overall size of the financial intermediaries sector increases relatively to the economy, asymmetric information increases, probably due to the key role private information plays in the intermediation process. Finally, inflation has a negative sign (coefficient/t-statistic: -12.43/-13.08). The results are essentially the same for the equation for Y_{2FTSE} , which provides a measure of asymmetric information in a longer horizon. Specifically, FI_4 and FI_7 , measures of the size of the financial sector and concentration of banks, enter the relevant co-integrating vector, being positively and negatively related respectively to the dependent variable (coefficients/t-statistics: 14.12/2.88 and -15.17/-2.68). The depth of the stock market and inflation are also significant with the same sign as in the case of fiscal year 1 forecasts, while the standard deviation of inflation has a negative sign which is difficult to explain.

Panel B reports the results for the relevant variables for the MSCI index. Y_{1MSCI} is positively associated with the size of banks, measured with the FI_2 index, and the (in)efficiency of banks (index FI_6) (coefficients/t-statistics: 5.61/1.91 and 552.68/4.60). Stock and private bond market size are also negatively related to the dependent variable, while the opposite holds for the standard deviation of inflation (coefficient/t-statistic: 0.20/3.89). As for Y_{2MSCI} , FI_5 replaces FI_2 in the co-integrating vector, which is supplemented with BM_1 , BM_2 and INF , all with negative signs, and the standard deviation of inflation with the same sign as before.

Insert Table 3 here

The results for the between estimation are more clear cut, as Table 3 indicates. Specifically, in Panel A of this Table are reported the statistically significant variables for the FTSE index asymmetric information proxy, which explain about 45% of its variation. These are the net interest margin of banks (index FI_6) with a positive sign (coefficient/t-statistic: 1725.48/3.08), and the life insurance penetration, the depth of the stock market, the size of the public bond market and inflation (indices INS_1 , SM_3 , BM_2 and INF respectively) with coefficients/t-statistics -542.31/-2.02, -57.84/-2.08, -59.69/-

1.91 and -0.35/-3.12 respectively. The results are the same for Y_{2FTSE} . As for Y_{1MSCI} and Y_{2MSCI} in Panel B, the statistically significant regressors are only FI_6 and INF , with the same negative sign as in the FTSE index case. The relevant adjusted R^2 s are smaller than in the FTSE case, 29% and 27% respectively, probably due to the greater variability between countries' financial structure and development in this sample.

Lastly, several robustness checks have been employed in order to gain confidence about the results. In greater detail, we proxied asymmetric information with the accuracy of analysts' forecasts, the open interest of the futures contracts on the FTSE and MSCI indices for each country, as percentages of total contracts traded, and used lagged financial development variables. The results were essentially the same, giving further reassurance about the empirical conclusions.

5. Concluding Remarks

Asymmetric information is a friction that refers to the superior information one party has over the other in a financial contract, regardless of the type of the contract, i.e. a deposit to a bank by a household, a loan from a financial intermediary to a firm, the purchase of shares of bonds by investors,... In this paper, we focus on asymmetric information between investors and managers of public firms. The latter, through financial reporting and disclosure reveal information about their firms' performance and governance to potential outside investors. However, they have incentives to hide or postpone the revealing of pieces of information that are crucial about firms' prospects and/or financial status. So, an information 'gap' arises between entrepreneurs and investors, which is known only to the former, and results to inefficient operation of capital markets and, finally, a misallocation of funds between firms (Healy and Palepu, 2001). Unfortunately this gap is difficult to identify and measure directly.

This paper makes a significant –we believe— contribution to this direction, by linking the degree of asymmetric information to observable characteristics of the financial system and by showing that the problem in question decreases as financial systems develop. Perhaps, what is more important in the empirical findings are the findings themselves for the sample countries differ in the structure of their financial systems as well as in several other relevant factors, such as, legal system, quality of law enforcement, history,... (see several papers by Rajan and Zingales, and La Porta, Lopez-de-Silanes, Shleifer and Vishny).

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Table 1. Financial Development Indices

	Index	Definition	Expected Sign
FI ₁	Deposit money bank vs. central bank assets	Ratio of deposit money bank claims on domestic nonfinancial real sector to the sum of deposit money bank and Central Bank claims on domestic nonfinancial real sector	—
FI ₂	Deposit Money Bank Assets to GDP	Claims on domestic real nonfinancial sector by deposit money banks as a share of GDP	+
FI ₃	Private credit by deposit money banks and other financial institutions to GDP	Private credit by deposit money banks and other financial institutions to GDP	+
FI ₄	Financial system deposits	Demand, time and saving deposits in deposit money banks and other financial institutions as a share of GDP	+
FI ₅	Overhead costs	Accounting value of a bank's overhead costs as a share of its total assets.	+
FI ₆	Net interest margin	Accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets.	+
FI ₇	Concentration	Assets of three largest banks as a share of assets of all commercial banks in the system	?
INS ₁	Life insurance penetration	Life insurance premium volume as a share of GDP	—
INS ₂	Non-life insurance penetration	Nonlife insurance premium volume as a share of GDP	—
SM ₁	Stock market capitalization to GDP	Value of listed shares to GDP	—
SM ₂	Stock market total value traded to GDP	Total shares traded on the stock market exchange to GDP.	—
SM ₃	Stock market turnover ratio	Ratio of the value of total shares traded and average real market capitalization	—
BM ₁	Private bond market capitalization to GDP	Private domestic debt securities issued by financial institutions and corporations as a share of GDP	—
BM ₂	Public bond market capitalization to GDP	Public domestic debt securities issued by government as a share of GDP	—

Source: *Financial Development and Structure* database, World Bank.

Table 2. Panel Co-integrating Equations

	Panel A – FTSE Index		Panel B – MSCI Index	
	Y _{1FTSE}	Y _{2FTSE}	Y _{1MSCI}	Y _{2MSCI}
Constant	270.51 (4.43)***	62.05 (8.69)***	-1.86 (-0.36)	14.72 (3.56)***
FI ₁	-214.96 (-3.36)***			
FI ₂			5.61 (1.91)**	
FI ₄	28.79 (5.32)***	14.12 (2.88)***		
FI ₅				221.89 (2.98)***
FI ₆			552.68 (4.60)***	
FI ₇		-15.17 (-2.68)***		
INS ₁	-427.35 (-3.14)***			
SM ₁	-6.98 (-1.98)**		-9.43 (-4.24)***	
SM ₃	-13.92 (-5.04)***	-17.20 (-4.28)***		
BM ₁			-32.46 (-4.48)***	-10.82 (-1.72)**
BM ₂				-9.13 (-2.21)**
INF	-12.43 (-13.08)***	-11.58 (-8.71)***		-2.04 (-6.70)***
STDINF		-0.16 (-1.80)**	0.20 (3.89)***	0.12 (3.29)***
Adj. R ²	0.96	0.94	0.91	0.95
D.W.	1.96	1.97	1.59	2.08

Notes:

1. Sample period: 1990-2004.
2. Sample countries:
 - FTSE index: Australia, Austria, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Mexico, Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, UK, US.
 - MSCI index: All the above plus Chile, Greece, India, Indonesia, Korea, Peru, Philippines, Portugal and Thailand

3. The table reports the statistically significant I(1) variables (t-statistics in parentheses) in the DOLS equation. In all cases the DOLS (1,2) and the cross-section SUR (PCSE) standard errors and covariance (d.f. corrected) method was used.
4. Variable definitions:
 - Y_{IFSTE} and Y_{IMSCI} ($i=1,2$): Weighted average standard deviation of the EPS forecast for the calendarized FY_i fiscal period for the respective index for each country
 - FI_i ($i=1,7$): Financial intermediaries indices. See Table 1 for details
 - SM_1 : Stock market capitalization as a share of GDP
 - SM_3 : Stock market turnover ratio
 - BM_1 : Private bond market capitalization as a share of GDP
 - BM_2 : Public bond market capitalization as a share of GDP
 - INF : Change in CPI, end of period
 - $STDINF$: Standard deviation of change in CPI, rolling 12-month periods
5. One (*), (**) and three (***) asterisks denote significance at respectively the 10%, 5% and 1% level.
6. Sources: IBES Global Aggregates, World Banks' Financial Development and Structure Database, Datastream and authors' calculations.

Table 3. Between Estimation

	Panel A – FTSE Index		Panel B – MSCI Index	
	Y_{1FTSE}	Y_{2FTSE}	Y_{1MSCI}	Y_{2MSCI}
C	45.89 (1.30)	64.95 (1.28)	-8.51 (-1.79)*	-11.75 (-1.85)**
FI_6	1725.48 (3.08)**	2465.36 (3.07)***	513.76 (3.79)***	664.23 (3.67)***
INS_1	-542.31 (-2.02)**	-769.99 (-1.99)**		
SM_3	-57.84 (-2.08)**	-82.65 (-2.07)**		
BM_2	-59.69 (-1.91)**	-85.27 (-1.90)**		
INF	-0.35 (-3.12)***	-0.51 (-3.15)***	-0.07 (-2.92)***	-0.09 (-2.76)***
Adj-R ²	0.45	0.44	0.29	0.27

Notes:

1. Cross-section OLS estimation for time averages of all variables for the sample period 1990-2004.
2. Countries included:
 - FTSE Index: Australia, Austria, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Mexico, Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, UK, US.
 - MSCI Index: All the above plus Chile, Greece, India, Indonesia, Korea, Peru, Philippines, Portugal and Thailand
3. Panel reports the statistically significant variables (t-statistics in parentheses)
4. Variable definitions:
 - Y_{iFTSE} and Y_{iMSCI} ($i=1,2$): Weighted average standard deviation of the EPS forecast for the calendarized FY_i fiscal period for the relevant index for each country
 - F_6 : Banks' net interest margin
 - INS_1 : Life insurance premium volume as a share of GDP
 - SM_3 : Stock market turnover ratio
 - BM_2 : Public bond market capitalization as a share of GDP
 - INF : Change in CPI, end of period
5. One (*), (**) and three (***) asterisks denote significance at respectively the 10%, 5% and 1% level.
6. Sources: IBES Global Aggregates, World Banks' Financial Development and Structure Database, Datastream and authors' calculations.