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Financial reforms and time-varying microstructures in emerging equity markets

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ABSTRACT

This paper seeks to investigate the impact of financial reforms on time-varying microstructures in emerging equity markets. We develop annual indicators of informational efficiency, market volatility and transaction costs, using daily data for a panel of 28 emerging markets over the 1996–2007 period. We then analyze the impact of insider trading regulations, trading system automation and accounting standardization on microstructures through a set of panel regressions controlling for financial development and simultaneous reforms. Our results suggest that emerging market microstructures are affected by economic and political context, are strongly related to one another and depend on specific institutional reforms.

1. Introduction

Recent empirical literature has focused on the relationship between specific institutional reforms and equity market development in an effort to determine the optimal financial reform sequence in emerging countries. In a seminal paper de la Torre et al. (2007), highlighted how the introduction of electronic trading, the enforcement of insider trading laws and pension system reforms foster the development of emerging capital markets. Similarly, Yartey and Adjasi (2007) underlined the importance of electronic trading, regional partnerships and accounting regulations for equity market development and integration in Africa. In addition to market size and international linkages, it may nonetheless be argued that the effect of equity trading on economic development also depends on microstructures such as informational efficiency, volatility and liquidity levels (Ngugi et al., 2004).

Efficient stock prices are indeed necessary for an efficient allocation of savings. By conveying information through price signals, they allow agents to diversify risks, thereby decreasing risk premia for domestically listed firms (Wang et al., 2009). Unbiased equity prices may also serve as a conduit for improved corporate governance when used as managerial incentives (Stulz, 1999). High volatility deters investor participation, thereby impeding the development of emerging capital markets (Schill, 2004). It also significantly increases capital costs and reduces the level of investment in segmented emerging markets in which risk premia depend on domestic risks (Bekaert and Harvey, 1997). Finally, adequate liquidity allows companies to enjoy permanent access to capital raised through equity issues. Liquidity makes investment less risky by allowing savers to acquire and sell assets rapidly without affecting stock prices, thereby decreasing risk premia and the cost of capital while increasing the level of investment (Bekaert et al., 2001). Liquidity levels also determine the ability of market participants to incorporate information flows into their trading orders, thereby increasing efficiency (Demirguc-Kunt and Levine, 1996).

Analyzing the impact of specific reforms on efficiency, volatility and transaction costs may thus provide an additional indication as to how an optimal sequencing of policy decisions could be attained. For instance, Ghosh and Revilla (2007) showed that the availability of stock lending and short selling, as well as legal guarantees for minority shareholders, is conducive to market liquidity and efficiency. The objective of this paper is to contribute to this body of literature by investigating the within-country determinants of emerging market microstructures, accounting for both market development variables and specific reforms. The remainder of the paper is structured as follows: Section 2 presents our database. Section 3 develops a battery of recursive microstructure indicators. Section 4 investigates the impact of specific reforms on these indicators by means of panel regressions. Finally, Section 5 brings together our conclusions.

2. Data

Emerging countries are usually fast-growing economies in the midst of economic transition, and therefore provide a relevant

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sample for the purpose of our analysis.[1] Our microstructure indicators are calculated using daily indices for all countries included in the S&P/IFC Global indexes for the 1996–2007 period. The S&P/IFC Global indices cover all listed stocks and are calculated using a homogeneous methodology, allowing consistent comparisons among emerging markets. Series are taken in constant US$ to control for differences in rates of inflation. We capture specific reforms through a set of dummy variables taking a value of 1 after policy decisions, and 0 before. Reforms are selected based on economic relevance and data availability and can be described as follows.

Following de la Torre et al. (2007), we hypothesize that the enforcement of insider trading regulations has a strong impact on the protection of minority shareholders. The selected date for insider trading laws enforcement is the date of the first prosecution, as compiled in Bhattacharya and Daouk (2002). Electronic trading systems may also increase liquidity and improve efficiency by reducing transaction costs for remote investors (Domowitz and Steil, 1999). The dates of the introduction of electronic trading systems are taken from Jain (2005).

Finally, studies suggest that accounting reforms improves the informational environment of listed companies, with positive effects on market development (Leuz and Verrecchia, 2000). Dates for the "de jure" implementation of IFRS accounting regulations were obtained from the International Accounting Standards website[2] (www.iasplus.com).

Since market microstructures refer to the processes governing the determination of prices within the stock markets, our control variables must be representative of the development of domestic financial markets, rather than the economy as a whole.

Increases in market size usually enlarge the investor base and provide diversification opportunities, thereby increasing efficiency through competition among investors, while also diminishing volatility and transaction costs. We therefore measure size using total current US$ domestic market capitalization, a variable usually highly correlated to other market development indicators (listed firms, value traded...).

Financial integration may also impact the dynamics of market microstructures by giving a stronger role to indiscriminating foreign investors in the determination of local prices. To avoid multicollinearity issues, integration levels are measured using total portfolio equity inflows in current US$ (rather than as a percentage of market size).

Finally, the competitiveness of domestic financial institutions determines their ability to compile information, which may strongly impact price patterns (Kono and Schuknecht, 1998). We thus incorporate financial and insurance industry exports as a percentage of commercial exports (a standard measure for competitive advantages in financial outsourcing) as a proxy for financial know-how in our regressions. These variables are taken from the World Bank's *World Development Indicators* database. We also control for the number of capital market reforms implemented by each country by including a variable which is a total of all different reform dummies other than that of the reform under analysis in each case. By representing the holistic impact of the reform program, this variable should shed light on the marginal effect of each investigated reform. When merging these databases, we had to omit Bahrain, Kuwait, Oman, Qatar and United Arab Emirates due to limited data availability, leaving a total of 28 countries in the sample.

3. Measuring market microstructures

3.1. Informational efficiency

3.1.1. Methodology

Non-parametric tests for the random walk hypothesis are recommended in the case of non-normal time series. In particular, Wright's (2000) test based on ranks was shown to have high power against a wide range of models displaying serial correlation. Given T observations of first differences of a variable, $\{y_1 \ldots y_T\}$ Wright's $R1$ and $R2$ test statistics are defined as:

$$R_1(k) = \left(\frac{1/Tk \sum_{t=k}^{T} (r_{1t} + \ldots + r_{1t-K+1})^2}{\frac{1}{T}\sum_{t=1}^{T} r_{1t}^2} - 1 \right) \times \phi(k)^{-1/2}$$
$$R_2(k) = \left(\frac{1/Tk \sum_{t=k}^{T} (r_{2t} + \ldots + r_{2t-K+1})^2}{\frac{1}{T}\sum_{t=1}^{T} r_{2t}^2 - 1} \right) \times \phi(k)^{-1/2}. \quad (1)$$

$$r_{1t}\left(r(y(t)\frac{T+1}{2}\right) \Big/ \sqrt{\frac{(T-1)(T+1)}{12}}$$
$$r_{2t} = \Phi^{-1}(r(y_t)/(T+1)) \quad (2)$$

In (1), $\phi(k) = \frac{2(2k-1)(k-1)}{3kT}$, r_{yt} is the rank of y_t among observations $y_1 \ldots y_T$, and Φ^{-1} is the inverse of the standard normal cumulative distribution function. Under the martingale difference sequence, r_{yt} are particular permutations of numbers 1,2,...,T, each having equal probability of realization. The exact distribution of $R_1(k)$ and $R_2(k)$ is approximated using a bootstrap method. The process is to calculate $R_1(k)$ for 1000 permutations of $r(x_t)$ and to observe the empirical distribution of the obtained series in order to compute p-values for a two-tailed test. However, Wright's test suffers from size distortion when they sequentially applied at several k values, as using variance ratio tests at various aggregation intervals tends to artificially increase rejection rates (Belaire-Franch and Opong, 2005). Following Kim and Shamsuddin (2008) and Belaire-Franch and Contreras (2004), we thus test for a random walk using the following extremum statistics:

$$CD_{(R_1)} = \max\{|R_1(k_1)|, |R_1(k_2)|, \ldots, |R_1(k_m)|\}$$
$$CD_{(R_2)} = \max\{|R_2(k_1)|, |R_2(k_2)|, \ldots, |R_2(k_m)|\} \quad (3)$$

Under the i.i.d assumption, the $CD_{(R_j)}$ tests are distributed as:

$$\max\{|R_j^*(k_1)|, |R_j^*(k_2)|, \ldots, |R_j^*(k_m)|\} \quad (4)$$

Where $R_j^*(k_1)$ is the ranks-based test computed with any random permutation of the elements {1,2,...,T}

3.1.2. Results

We first compute the $CD_{(R_1)}$ and $CD_{(R_2)}$ statistics for the whole sample period. As shown in Fig. 1, the efficiency hypothesis can be rejected for all countries.

In addition, the magnitude of the test statistic can be interpreted as a relative indicator of efficiency: the higher the test statistic, the lower the probability of making a type-I error when rejecting the efficiency hypothesis.[3] Israel, Taiwan and Turkey thus seem the closest to the EMH over the entire study period, while Zimbabwe, Nigeria, Colombia, Sri Lanka and Morocco seem to be the least efficient markets.

Recursive p-values are shown in Tables 1 and 2. The proportion of countries for which the efficiency hypothesis is rejected ranges from 24 and 23 in 1996 to 8 in 2006 for the $R1$ and $R2$ statistic,

[1] According to the World Bank, a country must have a low, lower-middle or upper-middle-income economy for at least three consecutive years, as well as a low investable market capitalization to GDP ratio in order to qualify as an '*emerging market*'. A country is reclassified as 'developed' if its investable market capitalization to GDP ratio reaches the top 25% of the emerging market universe for three consecutive years.

[2] After these dates, preparation of auditors' reports for listed companies refers to conformity with IFRS.

[3] The impact of these test statistics on market efficiency, however, is non linear.