Integration and Informational Efficiency for Local and Regional Equity Markets During the Subprime Crisis

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Abstract:

Objective: To study the link between the market integration and informational efficiency in the local and regional market, while taking into account the global financial crisis.

Method: The pooled ordinary least squares (OLS),

Results: the markets that are more integrated with the US market are also more efficient. This association lost its explanatory power during the crisis period than their developed counterparts.

Originality / relevance:the first study to examine the integration and efficiency of local and regional markets taking into account periods of crisis.

Keywords: Informational efficiency;Price delay,Pricing error, Market integration; subprime crisis

Intégration et efficience informationnelle des marchés locaux et régionaux pendant la crise de subprimes

Résumé :

Objectif : Etudier le lien entre l'intégration et l'efficience informationnelle sur le marché local et régional, tout en tenant compte de la crise de subprimes.
Méthode : Moindre carré ordinaire : MCO

Résultats : Les marchés les plus intégrés au marché américain sont également plus efficients. Cette association a perdu son pouvoir explicatif pendant la période de crise que leurs homologues développés.

Originalité / pertinence : La première étude qui examine l'intégration et l'efficience des marchés locaux et régionaux en tenant compte des périodes de crise.

Mots-clés : Efficience informationnelle ; L'erreur d'évaluation des prix. ; Intégration du marché et crise de subprimes

Introduction

In the last decade, the fast pace of the market deregulation, liberalization, and globalization, coupled with the advanced information technology led to a better integration of the emerging markets into the world one, which facilitates the growth of direct and portfolio investments in to the emerging markets, as well in active foreign listing and acquisition activities. In addition, the emerging equity markets are generally characterized by a lack of liquidity, and low transaction volume (Harrison and Moore (2012)). Moreover, empirical evidence suggests that when markets are highly integrated with the word market, they have lower price volatility, lower cost of capital, and increasing real investment opportunities, which prompts local productivity and contributes to economic growth (Bekaert & Harvey 2000; Henry 2000; Bekaert et al. 2005; Mitton 2006; Tai 2007). However the speed of informational transmission increases under a more globally integrated stock market.

Therefore the informational efficiency helps improve the capital locative efficiency, which leads to a higher productivity and faster growth (Durnev et al. 2004). Nevertheless, the occurrence and ramifications of a series of financial crises since the 1990s and the recent subprime crisis; have generated discussions on the desirability of full-scale financial liberalization and market integration. Due to the important implications of the informational efficiency on the real sphere and the controversies surrounding this subject, it seems necessary to examine the potential effects of financial and macroeconomic reforms on the stock market performance.

However, many studies have wondered if the real benefits of the market integration effectively explain the spillovers and the volatility associated with an integrated world capital market. In addition, in the spirit of Henry (2007) and Kose and al (2009) there is evidence of the lack of a definite conclusion on the growth enhancing benefits of capital openness. In this context, Carrieri and al. (2011) and Bekaert and al. (2011) stated that liberalization policies have increased the integration of the stock markets worldwide. In accordance with this global agreement, the central question in this paper is whether the increased market integration with the world stock market is associated with higher degrees of informational efficiency in the stock markets. In this study, we employ the methodological approach adopted by Hooy and Lim's (2013). The aggregate country-level price delay serves as an inverse measure of informational efficiency, which captures the relative speed of each aggregate stock market and reacts to global common information. Hence, the major objective of this study is to investigate if the increased integration with world capital markets at a higher degree of informational efficiency for the local and regional markets. Therefore, a review of the theoretical and empirical treats of the relationship between financial liberalization and the notion of efficiency, gives rise to two main currents totally different research.

The first states that financial liberalization strengthens the degree of informational efficiency by increasing the quantity of information available on financial markets and which results from the increase in competitiveness between local and foreign investors, and which leads to an increase in the competitiveness between local and foreign investors: Bae and al. (2006). In addition, foreign participants demand higher transparency of information, the disclosure of stricter rules and the application of international accounting standards: those conditions reduce information asymmetry and eliminate insider trading leading to more efficient valuation of financial assets. Also, the presence of investors on domestic markets facilitates rapid distribution information on the international market and encourages the inflow of capital flows, reflecting the liquidity of financial markets: Levine and Zervos (1998). Therefore, thus, a liquid market encourages foreign and local investors to exploit arbitrage opportunities. In this case the prices of financial assets converge towards equilibrium values, which generate a reduction in sources of inefficiency. The second supports the idea that development is too rapid and poorly controlled liberalization process contributes to significant dysfunctions in financial markets, illustrated by serious economic and financial crises (the Asian crisis in 1997, the Internet bubble in 2001the global economic crisis (2008, 2009). However, the link between the market integration and its efficiency is very under researched. One of the few studies study has empirically examined the relationship between the market integration and its efficiency in regional and local stock markets taking into account the effect of crises.

The rest of this paper is organized as follows. Section I presents an overview of the existing literature. Section IIdevelops the empirical model. Section III describes the data. The empirical results are reported in section IV. Section V Concludes.

1- Literature review

Aymen and Adel (2013) examined the impact of financial liberalization on the degree of informational efficiency in emerging stock markets while considering three types of financial crises, i.e. banking, currency and twin crises using a panel of 13 emerging economies for the period 1986-2008. Their empirical results showed that in recent years, there has been a greater efficiency and that financial liberalization ameliorates the degree of efficiency and also reduces the probability of financial crises.

For their part, Hooy and Lim (2013) investigated whether a more integrated stock market is associated with a higher degree of informational efficiency. They employed the adjusted pricing error from an equilibrium international asset pricing model as a proxy for market integration to explain the

aggregate country-level price delay as informational efficiency measures. They found robust evidence supporting the hypothesis according to which the markets that are more integrated with the world are also more efficient and while the positive association is only significant in the sub-sample of emerging equity markets.

On the other hand, Neha Seth and Sharma (2016) studied the informational efficiency and the integration of the Asian and US stock markets altogether by using the daily stock market data over the last ten years, while considering the impact of the recent financial crisis. They concluded that the markets under study are inefficient in the weak form, which creates the chances of earning abnormal returns for investors.

For their part, Tai, K.G and Hooy, C. W (2017) examined the effect of the market integration on the informational efficiency at the firm's level. In their study, the degree of the market integration is measured with the variance ratios while informational efficiency is captured through the price delay measure. They found different results regarding the stock price efficiency.

As for Rizvi and Arshad (2017), they studied the efficiency and the market integration in the Japanese economy over a period of 24 years, using the MEDAF and MGARCH models to find out how the efficiency and integration of a stock market has been balanced during the different phases of the Japanese business cycle. Their results showed that there has been an improvement of efficiency over the mentioned period. However regardingthe market integration, their results are in line with those of the recent literature on the business cycles, as each recession that looms ahead creates a break of the integration, which leads to a decrease of integration

In a recent study, Aawaar. G et al. (2018) have examined the link between the stock market integration and informational efficiency (market efficiency) in Africa's stock markets by testing the hypothesis that a more globally integrated market is also informally more efficient. The authors used a panel of 11 African stock markets for the period 2002-2014.They found compelling evidence that the markets the most integrated with the global market tend to be more efficient. They also suggested that the political efforts made for the market integration and information efficiency should be complementary because the two policy objectives are closely linked.

Moreover, Syed And al. (2018) analyzed the time-varying changes of three parameters,such as volatility, efficiency and integration on stock markets, using a four-step process of multifactor analysis of delayed trend fluctuation to measure the efficiency. In fact, they showed that lower volatility was found in the short term for countries. In addition, the increase of volatility is explained

by a short-term decrease of efficiency, while the increase ofthe market integration during the crisis periods results in a higher volatility.

2- Hypothesis, model specification and measurement of variables

2.1. Hypothesis development

Our hypothesis in this paper is that there exists a positive association between stock market integration and informational efficiency, when this association is measured in terms of the speed with which each global stock market responds to global information. To rationalize the positive relationship of this assumption, we compared the proportion of global stock returns, explained by the local factors of three different scenarios. First, if a market is fully segmented from the rest of the world, its stocks are exposed to purely local market shocks. On the other hand, in the extreme case of perfect integration, the market is sensitive to world events. In this case, global factors explain the variation in stock returns. Finally, between the two extremes cases, stock returns are determined by a combination of local and global factors, which increase with the degree of integration.

2.2 Model specification

In the spirit of Hooy and Lim (2013), our model to estimate and which allows us to establish a link between market integration "Integration" and informational efficiency "Delay". We employ the pooled ordinary least squares (OLS) to examine the empirical relationship between the two variables. The factors that affect price delay are well-grounded both in the theoretical and empirical literature (see Lim, 2009). Due to the data availability, the final analysis focuses on the macro-level counterparts for the firm's size (SIZE), trading volume (VOLUME), (VOLATILITY) and the degree of investibility (INVEST). Hence, the following pooled cross-sectional OLS regression is estimated as follows:

$$\mathrm{Delay}_{z,t} = \mu + \beta_1 Integration_{z,t} + X'_{z,t}\delta + \gamma_{zi} + \xi_t + v_{z,t} \quad (1)$$

β_1 : measures the impact of the market integration on the informational efficiency. Then, the four control variables (SIZE, VOLUME, INVEST and VOLATILITY) are presented in vector $X'_{z,t}$ with a coefficient vector δ. The term $\gamma_i$is an indicator variable that affects the level of the market efficiency, while ξ_t is an indicator variable, representing the common shock to the price delay and$v_{i,t}$, measures the disturbances of other factors during the regression. First, we estimate the link between "$Integration_{z,t}$" and "$\mathrm{Delay}_{z,t}$" first, at the local marketlevel, then at the regional marketlevel (z (i.e. local or regional market)).

2.2.1 The empirical measure of the stock market integration "Integration"

We adopt the international model of valuation of international financial assets MEDAFI to measure the degree of financial integration. This model which was developed by Stehle (1977) is written as follows:

$$r_{i,t}^{Z} = \alpha_i + \beta_i r_t^{us} + \varepsilon_{it} \qquad (2)$$

where $\mathrm{r}_{\mathrm{i,t}}^{\mathrm{z}}$: is the monthly local (regional) market excess return , and $\mathrm{r}_{\mathrm{t-k}}^{\mathrm{us}}$: the monthly world excess return.

Following Hooy and Lim (2013), we take the absolute value of the pricing error in equation (1) in which the positive and negative deviations explain the market segmentation. Our empirical measure of the market integration is taken as the absolute pricing error multiplied by (-1).

$$Integration_{z,t} = -|\alpha_{zt}| \quad (3)$$

Hence, a higher value of integration indicates a greater level of integration between the domestic stock market and the rest of the world.

2.2.2 The empirical measure of the stock market informational efficiency "Delay"

For a cross-country /(and or regional) study, it is more appropriate to use global market-wide public news so that the price delay captures the relative speed with which each aggregate stock market reacts to this common information set. We utilize the country-level price delay measure proposed by Lim and Hooy (2013), which involves an unrestricted ICAPM in the following specification:

$$r_{i,t}^{z} = \alpha_i + \beta_i r_t^{us} + \sum_{k=1}^{n} S_{i,k}\, r_{t-k}^{us} + \varepsilon_{it} \quad (4)$$

where $r_{i,t}^{z}$: is the monthly local (regional) market excess return, and r_{t-k}^{us} : the monthly world excess return t.

The R-squares from equations (2) (restricted version) and (3) (unrestricted version) are then used to estimate the price delay measure in the following form:

$$DELAY \;\; = 1 - \frac{R^2_{restricted}}{R^2_{unrestricted}} \qquad (5)$$

Then, the price delay a reversedis an inverse measure of informational efficiency, and a higher value of the DELAY indicates a lower degree of efficiency. Moreover the higher the value of the "DELAY", the more variations there are in the domestic market index returns, which is explained by the world market laggedreturns, indicating a greater delay in the response of the domestic stock market to the global market-wide news that has common effects across countries.

3- Data description

The data comprise monthly Morgan Stanley Capital Index (MSCI) of the aggregate prices for 30 markets (10 developed (United Stated, Unite-Kingdom,France,Germany,Italy,Spain,Canada,Japon ,Australia, Hong-Kong) and 20 emerging(Brazil ,Chile, Colombia, Mexico, Peru, Czech Republic, Greece, Hungary, Egypt, Jordan, South Africa, Turkey, China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan, Thailand)) during a period from April1994 to April 2016. These series are in a common currency (the US dollar) to ensure uniformity in the currency and lay emphasis on global factors rather than on local macroeconomic factors. For the empirical measure of the stock market integration, we estimate equation (2) annually using monthly indices and then calculate the "INTEGRATION" based on equation (3). This gives us 20 annual observations for each stock market (local and regional). Similarly, equation (4) is annually estimated using monthly index returns then the "DELAY**"** is computed for each market (local and regional) based on equation (5).

The sources of the control variables are as follows:

The SIZE (stock market size) is used as a proxy by the natural logarithm of market capitalization of listed companies. Trading volume (VOLUME) uses a proxy by the natural logarithm plus one plus the turnover ratio. The three control variables (SIZE, VOLUME and Volatility) are calculated using the panel data on the market capitalization of listed companies and turnover ratio from the World Bank Development Indicators and Standard deviation of returns. . We calculate the investable (INVEST) at the level of each country, as the percentage of the total capitalization of a firm (share price * number of shares) legally open to foreign investors. This ratio is a quantitative measure to determine the degree of availability of domestic stock market to foreign investors. This variable ranges from zero (completely closed to foreign investors) to one (completely open market with no foreign restrictions). We use the same data for each country and region.

4- Empirical results:

Table 1 reports the correlation matrix of all the explanatory where variables all the correlation coefficients are statically significant. Then, all the regressors (INTEGRATE, SIZE, DEGREE OF INVESTIBOLITY and VOLUME) are negatively correlated with both the dependent variable and the stock price delay for local and regional markets. Compared to the four control variables, the SIZE has the lowest degree of correlation with the informational efficiency (DELAY) in the local markets. In the explanatory variables, the highest correlation is between the SIZE and the degree of investibility, while on the regional market, the integration has the lowest degree of correlation with the informational efficiency.

Table 1:Correlation matrix

Countries	**Delay**	**Integration**	**Size**	**Trading volume**	**Investability**
Delay	**1**				
Integration	-0.392*	**1**			
Size	-0.6027*	0.287*	**1**		
Transaction volume	-0.3168*	0.0333*	0.5277*	**1**	
Investability	-0.55036*	0.1917*	0.6285*	0.4048	**1**
Regions					
Delay	**1**				
Integration	-0.6631*	**1**			
Size	-0.4080*	0.4692*	**1**		
Trading volume	- 0.2486*	0.6556*	0.3927*	**1**	
Investability	-0.2897*	0.6533*	0.3698*	0.5139*	**1**

Notes: Thresholds of significance: * p <0.01.

In the explanatory variables, the highest correlation is between the transaction volume and the market integration. It is worth noting that all the reported correlation coefficients are statistically significant, while the degree of correlation is not high, indicating that multicollinearity is not a major concern.

4-2- The standard pooled OLS regression results

In this section, we evaluate the hypothesis of the positive relationship between the market integration and the informational efficiency, which implies that the stock markets that are more integrated with the world market are also informational more efficient.We also estimate our model for local and regional market during the whole period, the pre-crisis period, the crisis period and the post-crisis period. Table 3 presents, step par step the general model using the pooled regression OLS for the four periods.

4-2-1- The standard pooled OLS regression results in the local market

Table 3 presents the estimates of the general model; using the pooled regression OLS with the market integration measure (INTEGRATE) as the only explanatory variable in the four sub-periods.

Over the whole period: we begin with a simple univariate regression between this “Delay” and the independent variable “Integration”. The results reported in column (1) indicate that the coefficient for the explanatory variable “Integration” is statistically significant and negative at 1% level. In fact, the negative coefficient suggests that a higher level of the market integration is associated with a lower value of price delay, which implies a higher degree of informational efficiency. Next, we add a time trend to the model to check whether the result in the model may be influenced by the common trend in both variables. The inclusion of the time trend does not subsume the explanatory power of

INTEGRATE, because the time trend has a significant negative coefficient of -0.1989, but its inclusion adds only 61.29% to the R^2 of the regression.

We also tried to introduce the control variables one by one, in the initial model into columns (3) to (6). Market size, trading volume, volatility and degree of investability are all highly significant with the expected negative coefficients. The results indicate that these variables remain important determinants of how fast stock prices adjust to common information at the country level. It is worth noting that among the four control variables, the inclusion of INVEST contributes the most to the R^2 of the regression, at approximately 53.90%. This is followed closely by the SIZE, with a 48.16% contribution. Our key variable of interest, INTEGRATE, is still negatively and significantly related to the price delay in all the model specifications.

In our analysis our variable INTEGRATE, is still negatively and significantly the related to the price delay in all the model specifications. Finally, we determine whether the market integration can still explain the time-series and the cross-sectional variation in the price delay after controlling for all the four competing variables. As reported in column (7), INTEGRATE retains its negative sign and statistical significance along with the SIZE, Volatility and degree of investibility, whereas the trading volume loses its predictive power during the whole period. The results further indicate that the market size, volatility and degree of investibility, respectively, have a negative and statistically significant relationship with the stock price delay.

In the pre-subprime crisis; the regressor of INTEGRATE is still statistically and significantly negative at 1% level. Next, we enter the control variables one by one into columns (3) to (6). Market size, trading volume, volatility and degree of investability are all highly significant with the expected negative coefficients. This proves the negative effect of these variables the stock price delayand thus a positive effect on information efficiency. The inclusion of the degree of investibility contributes the most to the R^2 of the regression, at approximately 57.94%. The results reported in column (7) show that INTEGRATE retain its negative sign and statistical significance along with the SIZE, and the degree of investibility, whereas the other two regressors, such as the trading volume and volatility lost their predictive power during this period. This implies that both the market size and the degree of investibility positively influence the market informational efficiency.

The subprime crisis period: the integration variable and degree of investibility lost their predictive power during this period but the volatility became positively significant. The results indicated that the financial crisis has negatively affected the positive association between the market integration and the informational efficiency as the strong volatility makes markets more volatile. This result is

consistent with that of the study of Ben Rejeb and Boughrara, A (2013) which indicated that volatility increased during the financial crisis.

The post subprime -crisis period: the regressor of INTEGRATE is still statistically and significantly negative at 1% level. Next, we introduce the control variables one by one into columns (3) to (6). It is shown that the market size, the trading volume, and the degree of investibility are all highly significant with expected negative coefficients, which proves thatthese variables have a negative effect on the stock price delay and a positive one on the informational efficiency. According to the results reported in column (7), the INTEGRATE has retained its negative sign and statistical significance along with SIZE, Trading Volume, and degree of investibility, whereas volatility is the only regressor that became positively significant during this period. However, the coefficient relative to the volatility variable is significantly positive, which explains the positive effect of volatility on the informational efficiency "Delay". Then, the inclusion of the degree of investibility contributes the most to the R^2 of the regression, at approximately 63.90%. The degree of investibility is an imperfect measure of market integration.

During the three sub-periods (thepre-subprime crisis period, the crisis period and the post-crisis period) the pooled OLS results strong evidence to support our hypothesis of a positive association between the market integration and informational efficiency. However, during the subprime crisis, the positive association between market integration and informational efficiency has negatively affected.

4-2-2- The standard pooled OLS regression results in regional market

Table 2 summarizes the pooled OLS results with the regional level price delay measure as the dependent variable during over the whole period and three subprime crisis periods (the pre-crisis period; the crisis period, and the post-crisis period). We investigate the initial model with the regional market: Latin America, Europe, Asia and Africa and the Middle East.

Over the whole period: The regressor of INTEGRATE is still statistically significant and negative at 1% level. In fact, we have introduced the control variables one by one into columns (3) to (6). As a result, the Market size, the trading volume, and the degree of investability are all highly significant with the expected negative coefficients. However,volatility is the only regressor that was found to be positively significant during this period. On the other hand, the inclusion of the degree of investibility contributes the most to the R^2 of the regression, at approximately 8.90%. The results reported in column (7), showthat the INTEGRATE and volatility retain negative sign and statistical significance along with the SIZE, and the degree of investibility, whereas the trading volume is the only regressor

that lost its predictive power during this period, which implies that the market size, the degree of investibility and volatility positively influence the market informational efficiency.

The pre-crisis period: The INTEGRATE regressor is still statistically significant and negative at 1% level. Next, we have introduced the control variables one by one into columns (3) to (6), as a consequence, the Market size, the trading volume, and the degree of investibility were found to be highly significant with the expected negative coefficients. However, the coefficient relative to the volatility variable is significantly positive, which implies that the marketintegration has a positive effect between and on the informational efficiency. As reported in column (7), the INTEGRATE regressor has retained its negative sign and its statistical significance along with the SIZE and the degree of investibility, whereas the two other regressors have lost their predictive power.

The subprime- crisis period: During this period, the integration variable lost its predictive power whereas the volatility became positively significant. This result indicates that the financial crisis has negatively affected the positive relationship between the market integration and the informational efficiency.

The post sub-prime crisis period: The market integration and size as well the trading volume and the degree of investibility are all highly significant with the expected negative coefficients. On the other hand, the coefficient relative to the volatility variable is significantly positive. These variables remain important determinants of how fast stock prices adjust to common information at the country level.

During four sub-periods the variable degree of investibility are all highly significant with the expected negative coefficients.

Tableau 2: The relation between integration and informational efficiencyFor local and regional markets

Over the whole period

	Local market							Regional market						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Intercept	(0.2689) (0.000)	(0.3589) (0.000)	(2.1959) (0.000)	(0.6189) (0.000)	(0.7798) (0.000)	(0.8634) (0.000)	(2.9611) (0.000)	(0.0448) (0.000)	(0.0589) (0.000)	(0.365) (0.000)	(0.1035) (0.000)	(0.1299) (0.000)	(0.1439) (0.000)	(0.4935) (0.000)
Integration	(−0.2018) (0.000)	(−0.1989) (0.000)	(−0.073) (0.000)	(−0.1665) (0.000)	(−0.1178) (0.000)	(−0.0966) (0.000)	(−0.0432) (0.000)	(−0.0504) (0.000)	(−0.0497) (0.000)	(−0.0182) (0.000)	(−0.0416) (0.000)	(−0.0196) (0.000)	(−0.0016) (0.000)	(−0.0072) (0.000)
Size			(−0.0943) (0.000)				(−0.0632) (0.000)			(−0.015) (0.000)				(−0.0102) (0.000)
Trading Volume				(−0.0910) (0.000)			(0.0072) (0.8931)				(−0.015) (0.000)			(0.0012) (0.2931)
Investability					(−0.4901) (0.000)		−(0.234) (0.000)					(−0.081) (0.000)		−(0.058) (0.000)
Volatility						(1.967) (0.096)	(−0.987) (−0.392)						(0.567) (0.023)	(−0.1645) (0.000)
Trend		(−0.0198) (0.000)	(−0.0071) (0.000)	(−0.0165) (0.000)	(−0.0164) (0.000)	(−0.018) (0.000)	(−0.021) (0.000)		(−0.0033) (0.000)	(−0.0011) (0.000)	(−0.0025) (0.000)	(−0.0064) (0.000)	(−0.003) (0.000)	(−0.0035) (0.000)
Number of observations		**6960**	**6533**	**5983**	**5526**	**5983**	**5526**		**6960**	**6533**	**5983**	**5526**	**5983**	**5526**
Number of countries		**29**	**29**	**29**	**29**	**29**	**29**		**4**	**4**	**4**	**4**	**4**	**4**
Adjusted R	**0.0360**	**0.0915**	**0.4816**	**0.2481**	**0.5390**	**0.321**	**0.6129**	**0.0060**	**0.0015**	**0.0816**	**0.0411**	**0.0890**	**0.0532**	**0.1029**

The pre-crisis period

	Local market							Regional market						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Intercept	(2.9541) (0.000)	(0.04486) (0.000)	(2.7448) (0.000)	(0.7786) (0.000)	(0.9747) (0.000)	(1.7934) (0.000)	(3.361) (0.000)	(0.738) (0.000)	(0.0112) (0.000)	(0.457) (0.000)	(0.1297) (0.000)	(0.1624) (0.000)	(0.04659) (0.000)	(0.561) (0.000)
Integration	(−0.1917) (0.000)	(−0.1883) (0.000)	(−0.6735) (0.000)	(−0.1581) (0.000)	(−0.1297) (0.000)	(−0.0485) (0.000)	(−0.0732) (0.000)	(−0.04917) (0.000)	(−0.031) (0.000)	(−0.1112) (0.000)	(−0.026) (0.000)	(−0.0219) (0.000)	(−0.0085) (0.000)	(−0.0123) (0.000)
Size			(−0.0893) (0.000)				(−0.0652) (0.000)			(−0.024) (0.000)				(−0.0152) (0.000)
Trading Volume				(−0.8645) (0.000)			(0.0068) (0.8931)				(−0.1446) (0.000)			(0.0113) (0.201)
Investability					(−0.4651) (0.000)		(−0.2232) (0.000)					(−0.077) (0.000)		(−0.0372) (0.000)
Volatility						(0.967) (0.126)	(0.687) (0.392)						(0.465) (0.021)	(0.1645) (0.192)

Trend		(−0.0495) (0.000)	(−0.0067) (0.000)	(−0.0156) (0.000)	(−0.0141) (0.000)	(−0.0152) (0.000)	(−0.0027) (0.000)		(−0.0095) (0.000)	(−0.0011) (0.000)	(−0.0026) (0.000)	(−0.0234) (0.000)	(−0.0025) (0.000)	(−0.0004) (0.000)
Number of observations		**6960**	**6533**	**5983**	**5526**	**5983**	**5526**		**6960**	**6533**	**5983**	**5526**	**5983**	**5526**
Number of countries		**29**	**29**	**29**	**29**	**29**	**29**		**4**	**4**	**4**	**4**	**4**	**4**
Adjusted R	**0.0295**	**0.0743**	**0.40931**	**0.2387**	**0.5090**	**0.3081**	**0.5794**	**0.0049**	**0.0123**	**0.0680**	**0.0397**	**0.0854**	**0.0513**	**0.0967**
						The subprime crisis period								
			Local market								**Regional market**			
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Intercept	(0.1289) (0.000)	(0.2619) (0.000)	(4.1349) (0.000)	(0.5933) (0.000)	(0.8798) (0.000)	(1.5624) (0.000)	(1.9781) (0.000)	(0.0212) (0.000)	(0.0432) (0.000)	(0.6985) (0.000)	(0.0985) (0.000)	(0.1644) (0.000)	(0.26502) (0.000)	(0.3296) (0.000)
Integration	(−1.6018) (0.000)	(0.9890) (0.234)	(−0.673) (0.000)	(−0.1415) (0.000)	(−0.3178) (0.000)	(−0.1966) (0.000)	(0.0632) (0.102)	(−0.2669) (0.000)	(0.1648) (0.104)	(−0.1647) (0.000)	(−0.0235) (0.000)	(−0.0523) (0.000)	(−0.0321) (0.000)	(0.0105) (0.162)
Size			(−0.0643) (0.000)				(−0.1632) (0.000)			(−0.0128) (0.000)				(−0.1632) (0.000)
Trading Volume				(−0.1890) (0.000)			−(0.0272) (0.001)				(−0.031) (0.000)			−(0.0045) (0.000)
Investability					(−0.3935) (0.000)		(0.1834) (0.432)					(−0.0635) (0.000)		−(0.0308) (0.004)
Volatility						(3.632) (1.47)	(2.371) (0.063)						(1.977) (1.93)	(2.4) (2.470)
Trend		(−0.1123) (0.000)	(−0.0181) (0.000)	(−0.0177) (0.000)	(−0.0126) (0.000)	(−0.218) (0.000)	(−0.231) (0.000)		(−0.018) (0.000)	(−0.003) (0.000)	(−0.0029) (0.000)	(−0.0212) (0.000)	(−0.036) (0.000)	(−0.031) (0.000)
Number of observations	**6960**	**6960**	**6533**	**5983**	**5526**	**5983**	**5526**		**6960**	**6533**	**5983**	**5526**	**5983**	**5526**
Number of countries	**29**	**29**	**29**	**29**	**29**	**29**	**29**		**4**	**4**	**4**	**4**	**4**	**4**
Adjusted R	**0.0360**	**0.0915**	**0.2616**	**0.2881**	**0.4390**	**0.526**	**0.4129**	**0.0060**	**0.0015**	**0.043**	**0.0482**	**0.0743**	**0.1052**	**0.0684**
						The post subprime -crisis period								
			Local market								**Regional market**			
	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Intercept	(2.1553) (0.000)	(1.8603) (0.000)	(1.034) (0.000)	(0.8225) (0.000)	(0.7365) (0.000)	(0.9134) (0.000)	(0.9991) (0.000)	(0.3592) (0.000)	(0.3103) (0.000)	(0.172) (0.000)	(0.135) (0.000)	(0.1327) (0.000)	(0.1522) (0.000)	(0.1663) (0.000)
Integration	(−4.5652) (−3.57)	(−0.0351) (0.000)	(−0.0541) (0.001)	(−0.0369) (0.034)	(−0.0899) (0.000)	(−0.581) (0.019)	(−0.1985) (0.001)	(−0.760) (−0.015)	(−0.0058) (0.000)	(−0.009) (0.001)	(−0.0061) (0.001)	(−0.014) (0.000)	(−0.086) (0.010)	(−0.0335) (0.001)
Size			(−0.0743)				(−0.0027)			(−0.012)				(−0.0107)

			(0.000)				(0.000)			(0.000)				(0.000)
Trading				(−0.881)			−(0.0357)				(−0.168)			−(0.0052)
Volume				(0.04)			(0.001)				(0.01)			(0.000)
Investability					(−0.298)		−(0.198)					(−0.049)		−(0.033)
					(−15.80)		(0.000)					(−0.80)		(0.000)
Volatility						(1.863)	(2.687)						(0.314)	(0.477)
						(10.62)	(4.092)						(28.62)	(0.012)
Trend		(−0.0472)	(−0.2101)	(−0.014)	(−0.0154)	(−0.198)	(−0.0115)		(−0.0078)	(−0.301)	(−0.0024)	(−0.0025)	(−0.032)	(−0.0019)
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations		**6960**	**6533**	**5983**	**5526**	**5983**	**5526**		**6960**	**6533**	**5983**	**5526**	**5983**	**5526**
Number of countries		**29**	**29**	**29**	**29**	**29**	**29**		**4**	**4**	**4**	**4**	**4**	**4**
Adjusted R	**0.0632**	**0.1215**	**0.3616**	**0.3801**	**0.6390**	**0.426**	**0.88129**	**0.0105**	**0.223**	**0.2416**	**0.3681**	**0.1487**	**0.3873**	**0.5436**

4-3- Sub-sample analysis of the market integration and informational efficiency link

In this section, we investigate whether our results (the positive association between market integration and informational efficiency) are the same for both variables, using two sets of countries with different characteristics and environments. The sample is split into two subsamples consisting of developed and emerging markets. We re-estimate Eq (1) using the pooled OLS for the two sets of countries.

Table (3) presents the pooled OLS results with the two country groups with different characteristics and environments. The results show that the integration variable and degree of investibility have lost their predictive power in the developed markets, which implies that financial liberalization of these markets is not the main factor for the efficient functioning of the stock markets. Concerning the "volatility" variable becomes positively significant, indicating that the subprime- crisis has negatively affected the positive association between financial integration and informational efficiency and has generally made more volatile markets. The origin of this volatility already observed during the crisis period. These results establish a link between financial development and informational efficiency in industrial countries, in particular market size and liquidity

Table 3: Sub-sample analysis

	Developed markets	**Emerging markets**
Intercept	(1.98) (0.000)	(2.14) (0.000)
Integration	$-(0.0106)$ (0.542)	$-(0.021)$ (0.021)
Size	$-(0.073)$ (0.210)	$-(0.086)$ (0.0140)
Trading Volume	(0.057) (0.001)	$-(0.031)$ (0.0198)
Investability	$-(0.794)$ (0.276)	$-(0.459)$ (0.000)
Volatility	(1.73) (0.099)	$-(0.44)$ (0.035)
Trend	$-(0.005)$ (0.087)	$-(0.021)$ (0.012)
Number of countries	(10)	(20)
R^2	(0.38)	(0.32)
Adjusted R	(0.25)	(0.36)

Regarding the emerging markets the variable “integration”, “degree of investibility”, and «trading volume «and “taille”, they are always significant with the expected negative coefficients, indicating that these variables remain negatively and significantly associated with the price delay. This result indicates all developing countries had some forms of investment restrictions in place and only gradually began their liberalization process in the late 1980s

5 - Conclusion

This paper has explored the link between the market integration and informational efficiency. We have employed the adjusted pricing error from an equilibrium international asset pricing model as a proxy for the market integration. The informational efficiency is proxied by the country-level price delay measure which by design captures the relative speed at which the aggregate stock market reacts to global information. The empirical results are based on the data from 30 national stock markets (10 developed and 20 emerging) and 4 regions during the whole period, the pre-crisis period, the crisis period and the post-crisis period. Our empirical results showed that these markets are more integrated with the US market and also more efficient. Besides, there is a significant positive relationship between the developed and emerging markets. However, this relationship lost its significance during the financial crisis as the emerging markets appeared to be more volatile than their developed counterparts. This explains that the policy efforts made to extend financial integration complement this strategy which aims at promoting informational efficiency while globally integrated stock markets ignore faster global market information. In fact, such recommendation would be useful for the emerging market economies in which the efforts deployed to integrate them with the world are concentrated on the opening of their stock markets to foreign investors.

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