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Stock price synchronicity and firm's exposure to financial crisis: evidence from emerging markets

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THE AMERICAN UNIVERSITY IN CAIRO | SCHOOL OF BUSINESS

The American University in Cairo

School of Business

STOCK PRICE SYNCHRONICITY AND FIRM'S EXPOSURE TO FINANCIAL CRISIS: EVIDENCE FROM EMERGING MARKETS

A Thesis Submitted to

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by Ashraf Abdelnasser Heleka

Under the supervision of Dr. Omar Farooq

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DEDICATION

TO MY FAVORITE FATHER, MOTHER, SISTER AND WIFE…. I AM DRIVEN BY YOUR LOVE

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ABSTRACT

This paper uses pre-crisis stock price synchronicity to explain the cross-sectional variation in within-crisis synchronicity. Using a large dataset from 19 emerging markets, we show that firms with high pre-crisis synchronicity are affected less by financial crisis than firms with low pre-crisis synchronicity. We document an inverse parabolic relationship between pre-crisis synchronicity and within-crisis synchronicity. Our results show that the relationship between pre-crisis synchronicity and within-crisis synchronicity is positive until a turning point is reached. After that value, pre-crisis synchronicity has a negative impact on within-crisis synchronicity. We argue that firms with high pre-crisis synchronicity are, generally, associated with superior governance mechanisms (Chan and Hameed, 2006; Dasgupta et al., 2010). Better governance mechanisms lead to lower exposure of these firms to financial crisis (Mitton, 2002). Our results are also robust across different sub-samples.

JEL Classification: G32

Keywords: Stock Price Synchronicity; Financial Crisis; Emerging Markets; Corporate Governance.

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CHAPTER I

INTRODUCTION

Does stock price synchronicity affect firm's exposure to financial crisis? Are firms with high synchronicity affected more by crisis than firms with low synchronicity or vice versa? This paper aims to answer these questions by arguing that stock price synchronicity affects firm's exposure to financial crisis by effecting its information environment. Prior literature notes that high synchronicity is associated with better governance and information environment. Chan and Hameed (2006), for instance, document a positive relationship between analyst following – proxy for information environment of a firm – and stock price synchronicity. In another related study, Farooq and Ahmed (2014) also report similar findings by documenting a positive relationship between stock price synchronicity and governance mechanisms. Dasgupta et al. (2010) argue that improvement in governance and information environment leads to more accurate forecasts about future firm-specific events by investors. They posit that, in efficient markets, stock prices respond only to unexpected events. Therefore, when investors make accurate forecasts about future firm-specific events, it is more likely that prevailing stock prices have already factored in the occurrence of future events. Consequently, when events actually happen, stock prices do not react significantly to them. In other words, more informative stock prices today are associated with less firm-specific variation in stock prices in the future. Lower firm-specific variation in stock prices, essentially, leads to higher correlation between stock returns and market returns, thereby causing high stock price synchronicity.

Given the significant relationship between stock price synchronicity and information environment of a firm, it is very likely that synchronicity acts as an important determinant of a firm's exposure to financial crisis. Our assertion that stock price synchronicity effects firm's exposure to financial crisis is consistent with prior literature that documents lower impact of crisis on firms with better governance and information environment. Johnson et al. (2000), for example, note that a better governance

environment reduces firm's exposure to crisis by decreasing expropriation by controlling shareholders. Mitton (2002) also argues the same by documenting better performance of those firms that have governance and information environment during the crisis periods. Prior literature argues that firms with weak governance and information environment are ideal candidates for expropriation as they provide the means to controlling shareholders to hide their actions by misreporting information (Luez et al., 2003). Stock market participants recognize this and penalize these firms by exiting them during the crisis periods (Johnson et al., 2000; Mitton, 2002; Lemmon and Lins, 2003; Johnson and Mitton, 2003).

Consistent with our arguments, we document a parabolic relationship between pre-crisis synchronicity and within-crisis synchronicity in a sample of 19 emerging markets. Our results show that the relationship between pre-crisis synchronicity and within-crisis synchronicity is positive until a turning point is reached. After that point, pre-crisis synchronicity has a negative impact on within-crisis synchronicity. Our results indicate that the relative amount of market-specific information increases in the prices of firms with low pre-crisis synchronicity, thereby leading to a positive relationship between pre-crisis synchronicity and within-crisis synchronicity. This relationship inverts for firms with high pre-crisis synchronicity. Our results show that the relative amount of market-specific information decreases in the prices of firms with high pre-crisis synchronicity, thereby leading to a negative relationship between pre-crisis synchronicity and within-crisis synchronicity. This asymmetry in the incorporation of market-specific information in prices indicates that firms with low pre-crisis synchronicity are affected more by the crisis than firms with high pre-crisis synchronicity. Our results are robust across different sub-samples and different estimation procedures.

Furthermore, we complement the above mentioned findings by documenting the relationship between pre-crisis synchronicity and within-crisis stock price performance. As expected, we report a parabolic relationship between pre-crisis synchronicity and within-crisis performance. Our results show that the impact of pre-crisis synchronicity on within-crisis performance is negative until a turning point is reached. After that point, pre-crisis synchronicity has a positive impact on within-crisis performance. Our results are consistent with prior literature that document superior performance of firms with

better governance and information environment during the crisis period (Johnson et al., 2000; Mitton, 2002; Lemmon and Lins, 2003; Johnson and Mitton, 2003). We argue that high synchronicity is associated with better governance and information environment. Therefore, it is more likely to have a positive relationship between pre-crisis synchronicity and within-crisis performance for these firms – firms with high synchronicity. The opposite holds for firms with low pre-crisis synchronicity. These firms, usually, have weak governance and information environment, thereby increasing their exposure to crisis and adversely impacting stock price performance during the crisis period.

Our results have significant implications for investors in emerging markets. Our results indicate that investors can obtain value relevant information from stock price synchronicity. We argue that stock price synchronicity – a publicly available market-driven indicator – can help investors in these markets to mitigate some of the information asymmetries, especially during the times of crisis.

The paper is structured as follows: Chapter 2 briefly discusses the theoretical framework for this study. Chapter 3 discusses the data and Chapter 4 provides an assessment of our arguments. Chapter 5 documents robustness checks and Chapter 6 discusses our results. The paper concludes with Chapter 7.

CHAPTER II

MOTIVATION AND BACKGROUND

Stock price synchronicity measure the extent to which stock prices co-move with the market. This paper hypothesizes that firms with high pre-crisis synchronicity should be affected less by the crisis than firms with low pre-crisis synchronicity. Our arguments take their motivation from two strands of literature. The first strand of literature associates better governance and information environment with high synchronicity (Chan and Hameed, 2006; Dasgupta et al., 2010), while the second strand of literature documents lower exposure of firms to crisis if they are governed properly (Johnson et al., 2000; Mitton, 2002). Taking both strands of literature together would predict that firms with high stock price synchronicity should be affected less by the crisis.

Prior literature documents that the extent of co-movement between the stock returns and the market returns – stock price synchronicity – is an increasing function of governance and information environment of a firm (Chan and Hameed, 2006; Dasgupta et al., 2010; Claessens and Yafeh, 2011; Farooq and Ahmed, 2014).[1] Firms with better governance environment exhibit higher synchronicity than firms with poor governance environment. Chan and Hameed (2006) and Claessens and Yafeh (2011) document that stock price synchronicity increases as the extent of analyst coverage goes up.[2] Analyst coverage is considered as an important mechanism via which information disclosure and dissemination takes place (Michaely and Womack, 1999; Chen and Steiner, 2000). In another related study, Barberis et al. (2005) document that inclusion in the S&P 500 index – an event that improves firm's information environment – increases stock price

[1] We are aware of the fact that there is a stream of literature that argues the opposite. For example, Hutton et al. (2009) and Gul et al. (2010) find that synchronicity is negatively related to corporate governance mechanisms. Morck et al. (2000) argue that weak governance mechanisms discourage informed arbitrage activity based on private information. As a result, stock prices are driven less by firm-specific information and more by market-wide news (such as rumors). It, therefore, causes all stocks to react to the same set of information, thereby resulting in higher co-movement.

[2] In another related study, Chan and Chan (2014) find a significantly negative relationship between stock return synchronicity and seasoned equity offerings when an offering does not have analyst coverage. This relation declines for offerings that have analyst coverage. They argue that this relationship declines because analyst coverage improves the information environment.

synchronicity.[3] Kelly (2007) compliments the above findings by documenting that low stock price synchronicity is indicative of poor governance and information environment.

Dasgupta et al. (2010) argue that the positive relationship between synchronicity and governance environment of a firm is due to the fact that high quality governance mechanisms improve the accuracy of forecasts made by investors. They posit that, in efficient markets, stock prices respond only to unexpected events. Therefore, when disclosure and governance mechanisms improve, investors are able to accurately predict future firm-specific events. As a result, there is higher likelihood that prevailing stock prices have already factored in the occurrence of future events. Consequently, when events actually happen, stock prices do not react significantly to them. In other words, more informative stock prices today are associated with less firm-specific variation in stock prices in future. Lower firm-specific variation in stock prices, essentially, leads to higher correlation between stock returns and market returns, thereby causing high stock price synchronicity.

A secondary reasoning that follows Dasgupta et al. (2010) is that their arguments should be more relevant for investors that have required skills and sophistication to form accurate forecasts as information environment of a firm improves. Investors without such skills may not be able to benefit as much from the improvements in information environment. We argue that individual investors lack the skills and abilities to make the best use of available information. It is, usually, the institutional investors who have enough skills and sophistication to form accurate forecasts as the information environment of a firm improves. Therefore, it is very likely that firms with high synchronicity have high institutional ownership. Kelly (2007) also comes to the same conclusion and documents that firms with high synchronicity have dominant institutional holdings. One implication of attracting institutional investors is that, in most cases, these investors take the role of marginal investors.[4] Given that institutional investors are

[3] We argue that inclusion in the S&P 500 index improves governance and information environment of a firm via increased institutional ownership. Pruitt and Wei (1989) show that inclusion in the S&P 500 index is associated with increased institutional ownership and deletion is accompanied by decrease in institutional ownership. Chung and Zhang (2011) argue that institutional investors invest in firms with better governance mechanisms. Furthermore, inclusion in the S&P 500 index should also improve information environment of a firm via increased visibility of a firm.

[4] Marginal investors are investors who set the price of a stock.

probably the most diversified investors in the market, it is intuitive to argue that they experience relatively lower firm-specific (idiosyncratic) risk.[5] Therefore, the only risk priced by them is the market risk. As a result, most of the variation in stock returns will be explained by the variation in market returns, thereby causing high synchronicity between stock returns and market returns in firms where institutional holding is dominant.

We argue that both of the above factors (superior governance environment and institutions as marginal investors) associated with firms exhibiting high synchronicity have significant impact on how much exposed a firm will be to the crisis. We hypothesize that firms that have high synchronicity prior to crisis should be effected less by crisis relative to firms that have low synchronicity prior to crisis. Our hypothesis depends on the following arguments:

- Johnson et al. (2000) document that incentives to expropriate minority shareholders increase during the crisis period – period when stock prices experience sustained decline. They argue that a crisis can lead to greater expropriation because managers are led to expropriate more as the expected return on investment falls. Furthermore, declining fortunes in the stock market can force investors to recognize weaknesses in corporate governance mechanisms. Rajan and Zingales (1998) argue that investors usually ignore corporate governance mechanisms during the tranquil periods, but take notice of them as the crisis erupts and quickly pull out their capital. Furthermore, in the presence of weak governance mechanisms, it becomes hard to govern managerial discretion. Managers of these firms have more discretionary power over the disclosure of information. As a result, they do not always disclose true information about their firms (Leuz et al., 2003). Poor disclosure introduces increased information asymmetries for investors. Investors, generally, respond to this increased uncertainty by overreacting to the crisis. Mitton (2002) shows that firms with poor corporate governance mechanisms react more severely to financial crisis than firms with better governance mechanisms. Given that weak governance environment is associated with

[5] Institutional investors, generally, have huge sums of money which they can invest in large number of stocks (Aggarwal et al., 2005; McCahery et al., 2011). Therefore, institutional investors possess portfolios that are relatively more diversified than other investors (Schutte and Fu, 2009).

firms exhibiting low synchronicity, we expect that these firms should have higher exposure to crisis relative to firms with high synchronicity.

- An important implication of the above result is that investors with long investment horizon are less likely to exit a stock during the downturns. De Long et al. (1990) document that when stock prices fall, investors with short investment horizons are inclined or forced to sell to a larger extent than investors with longer investment horizons. Bernardo and Welch (2004) and Morris and Shin (2004) compliment the findings of De Long et al. (1990) by showing that a run on financial markets occurs because investors with short investment horizon sell in anticipation that other market participants will also sell. Since a short investment horizon implies that the investor will have to sell in immediate future, not selling right away may involve selling behind the rest of the market at even lower prices. Hence, for an investor with short investment horizon, the optimal strategy is to beat the rest of the market by selling immediately to avoid having to sell after a market run. However, this is not the case for investors with long investment horizon. These investors tend not to exit in haste during the downturns. Given that investors with long investment horizon do not react to downturns as much as other investors, it is very likely that stocks that had high synchronicity prior to the downturn should have low synchronicity during the downturn.[6]

[6] Investors having long horizon are, usually, institutional investors. These investors are well-diversified and perceive very little idiosyncratic risk. Consequently, market-specific risk explains much of the variation in returns of these socks, thereby causing high synchronicity.

CHAPTER III

DATA

This paper documents the effect of recent financial crisis on firms with high stock price synchronicity and firms with low stock price synchronicity. We define 2008 as the year of crisis. Our timeline of financial crisis is motivated by the Federal Reserve Board of St. Louis (2009) and the Bank for International Settlements (BIS, 2009). These studies characterize the initial part of 2008 as a period of "initial financial turmoil" and the later part of 2008 as a period of "sharp financial market deterioration". Visual inspection of the data also shows that stock markets in all countries included in our analysis experienced sustained decline during 2008. For the purpose of this study, our sample consists of firms listed in Argentina, Brazil, Mexico, China, Egypt, India, Indonesia, Jordan, Malaysia, Philippines, Taiwan, Thailand, Saudi Arabia, South Korea, United Arab Emirates, Vietnam, Greece, Russia and Turkey. The following sub-sections will explain data in greater details.

3.1 Stock price synchronicity

Our measure of stock price synchronicity uses the following regression equation with returns of stock 'i' during week 't' ($R_{i,t}$) as a dependent variable and returns of the corresponding market index 'm' for the same week ($R_{m,t}$) as an independent variable. Following prior literature, we estimate the following regression only for those firms for which we have at least 40 weekly observations of returns in a given year (Xing and Anderson, 2011; Chan and Hameed, 2006; Nguyen and Truong, 2013). The date required to estimate Equation (1) is obtained from the Datastream.

$$R_{i,t} = \alpha + \beta(R_{m,t}) + \varepsilon_{i,t} \quad (1)$$

R-square obtained from the estimation of Equation (1) is used as follows to compute stock price synchronicity (SYNCH).[7] A high value of SYNCH indicates high co-movement with the market and vice versa.

$$SYNCH = \left(\frac{R^2}{1 - R^2} \right) \quad (2)$$

Table 1 reports the average values of stock price synchronicity for our sample during the pre-crisis and the crisis periods. The results indicate that, in all countries, stock price synchronicity increased during the crisis period. This result is intuitive because all firms tend to decline together (move together) during the crisis period, thereby increasing synchronicity. Another interesting observation from Table 1 is low synchronicity for our sample firms across most of the countries. Table 1 shows that, in most of the countries, the value of synchronicity is below 1. It indicates that R-square obtained from estimation of Equation (1) is, on average, less than 50%. Low values of stock price synchronicity are in contrast with the arguments of Morck et al. (2000) and Jin and Myers (2006) who suggest high synchronicity in emerging markets. We argue that the main reason behind low synchronicity is the under diversification of marginal investors in these markets. Under diversification exposes marginal investors to excessive idiosyncratic risk, thereby allowing them to take into account firm-specific risks while pricing stocks. It will, therefore, reduce the relative amount of market-wide information in stock returns and result in low values of synchronicity.

[7] Prior literature uses log of the value obtained from Equation (2) as a measure of synchronicity (Jin and Myers, 2006; Farooq and Ahmed, 2014). This log transformation is performed because synchronicity is used as a dependent variable in the analysis. Log transformation converts a bounded variable into a continuous variable. We, however, are interested in using synchronicity as an independent variable. Therefore, we need not to perform the log transformation.

Table 1: Descriptive statistics for stock price synchronicity
Following table documents the descriptive statistics for stock price synchronicity. Our sample consists of firms listed in Argentina, Brazil, China, Egypt, Greece, India, Indonesia, Jordan, Malaysia, Mexico, Philippines, Russia, Taiwan, Thailand, Turkey, Saudi Arabia, South Korea, United Arab Emirates, and Vietnam. The pre-crisis period is 2007 and the crisis period is 2008.

Country	Pre-crisis Period	Crisis Period	Total Firms
Argentina	0.3694	0.9125	41
Brazil	0.3849	0.6866	93
China	0.5483	1.2308	1265
Egypt	0.1696	0.6041	90
Greece	0.2106	0.5439	194
India	0.1066	0.4796	2222
Indonesia	0.3004	0.8600	127
Jordan	0.1687	0.4909	98
Malaysia	0.2701	0.4386	499
Mexico	0.4581	0.5896	51
Philippines	0.4798	0.8712	84
Russia	0.4346	0.6455	59
Taiwan	0.4592	0.6491	693
Thailand	0.3377	0.6333	308
Turkey	0.4660	0.8817	246
Saudi Arabia	0.8471	1.2892	81
South Korea	0.1521	0.7701	1098
United Arab Emirates	0.5964	1.4520	49
Vietnam	0.2199	1.2047	31

3.2 Control variables

This paper uses a number of firm-specific characteristics as control variables. These variables are:

- **SIZE:** We define SIZE as the log of firm's market capitalization. The data for market capitalization is obtained from the Worldscope. Given that market indices are, usually, value-weighted indices, large firms dominate the index. Therefore, it is expected that large firms should have higher synchronicity (Chan and Hameed, 2006).
- **LEVERAGE:** This paper defines LEVERAGE as the total debt to total asset ratio. The data for total debt to total asset ratio is obtained from the Worldscope. High leverage exposes firms to greater risk and therefore increases information asymmetries. Press and Weintrop (1990) and Sweeney (1994) document information misreporting by firms with high leverage. Given that leverage is associated with information asymmetries, we expect significant impact of leverage on synchronicity.

Dasgupta et al. (2010) document a negative relationship between leverage and synchronicity.

- **EPS:** This paper defines EPS as earnings per share. The data for earnings per share is obtained from the Worldscope. High earnings per share are associated with increased interest of stock market participants. Therefore, it should also affect synchronicity. Dasgupta et al. (2010) document positive impact of profitability on synchronicity.
- **GROWTH:** We define GROWTH as the growth in total assets. The data for growth in total assets is obtained from the Worldscope. We consider growth as a proxy for investor interest in a firm. High investor interest improves information environment and, therefore should affect synchronicity.

CHAPTER IV

METHODOLOGY

In order to test whether firms exhibiting low (high) synchronicity during the pre-crisis period are more (less) sensitive to the crisis or not, we estimate the following regression equations with LOG($SYNCH_{Crisis}$) as a dependent variable and $SYNCH_{Pre\text{-}crisis}$ and $SYNCH_{Pre\text{-}crisis}$*$SYNCH_{Pre\text{-}crisis}$ as independent variables. As indicated above, we also include SIZE, LEVERAGE, GROWTH, and EPS as control variables. For the purpose of completeness, we also include industry dummies (IDUM) and country dummies (CDUM) in our analysis. Our basic regression equations are defined as follows:

$$\mathrm{LOG}(\mathrm{SYNCH}_{\mathrm{Crisis}}) = \alpha + \beta_1(\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}}) + \beta_2(\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}} * \mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}}) + \sum_{\mathrm{Ctry}} \beta^{\mathrm{Ctry}}(\mathrm{CDUM}) + \sum_{\mathrm{Ind}} \beta^{\mathrm{Ind}}(\mathrm{IDUM}) + \varepsilon_{\mathrm{Crisis}} \quad (3)$$

And

$$\mathrm{LOG}(\mathrm{SYNCH}_{\mathrm{Crisis}}) = \alpha + \beta_1(\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}}) + \beta_2(\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}} * \mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}}) + \beta_3(\mathrm{SIZE}_{\mathrm{Crisis}}) + \beta_4(\mathrm{LEVERAGE}_{\mathrm{Crisis}}) + \beta_5(\mathrm{EPS}_{\mathrm{Crisis}}) + \beta_6(\mathrm{GROWTH}_{\mathrm{Crisis}}) + \sum_{\mathrm{Ctry}} \beta^{\mathrm{Ctry}}(\mathrm{CDUM}) + \sum_{\mathrm{Ind}} \beta^{\mathrm{Ind}}(\mathrm{IDUM}) + \varepsilon_{\mathrm{Crisis}} \quad (4)$$

The results of our analysis are reported in Table 2. Our results show that the relationship between synchronicity during the pre-crisis period and synchronicity during the crisis period is parabolic. Our results from both equations show a significantly positive coefficient of $SYNCH_{Pre\text{-}crisis}$ and a significantly negative coefficient of $SYNCH_{Pre\text{-}crisis}$*$SYNCH_{Pre\text{-}crisis}$. Our results indicate that the relationship between synchronicity during the pre-crisis period and synchronicity during the crisis period is positive until a turning point is reached. After that value, synchronicity during the pre-crisis period has a negative impact on synchronicity during the crisis period. We argue that firms with low synchronicity have weak governance mechanisms. Consequently, these firms are affected more by the crisis, thereby increasing their co-movement with the

market during the crisis period. Furthermore, we also argue that it is possible that firms with low synchronicity have less sophisticated (or naïve) marginal investors. These investors, usually, have short-term investment horizons. They, therefore, tend to over-react to any negative shocks in the financial markets. Consequently, when a crisis erupts, these investors tend to sell their holding, thereby increasing the exposure of firms to the crisis and increasing synchronicity during the crisis period. It, therefore, results in a significantly positive coefficient of $SYNCH_{Pre\text{-}crisis}$. On the other hand, firms with high synchronicity have better governance. As a result, their co-movement with the market declines during the crisis period. It, therefore, results in a significantly negative coefficient of $SYNCH_{Pre\text{-}crisis}$*$SYNCH_{Pre\text{-}crisis}$.

Table 2: Stock price synchronicity and sensitivity to the financial crisis
Following table uses Equation (3) and Equation (4) to document the relationship between stock price synchronicity and sensitivity to financial crisis. Our sample consists of firms listed in Argentina, Brazil, China, Egypt, Greece, India, Indonesia, Jordan, Malaysia, Mexico, Philippines, Russia, Taiwan, Thailand, Turkey, Saudi Arabia, South Korea, United Arab Emirates, and Vietnam. The crisis period is 2008. The coefficients with 1% significance are followed by ***, coefficients with 5% by **, and coefficients with 10% by *.

	Equation (3)		**Equation (4)**	
SYNCH	2.5206***	2.2021***	1.3372***	1.0971***
SYNCH*SYNCH	-0.4405***	-0.3639***	-0.1918***	-0.1727***
SIZE			0.1455***	0.2488***
LEVERAGE			0.0020**	0.0017**
EPS			-0.0001	-0.0003
GROWTH			-0.0017***	-0.0027***
Industry Dummies	No	Yes	No	Yes
Country Dummies	No	Yes	No	Yes
No. of Observations	7329	7329	4131	4131
F-value	1046.35	101.75	212.99	53.78
Adjusted R-square	0.181	0.256	0.215	0.305

CHAPTER V

ROBUSTNESS OF RESULTS

5.1 Stock price synchronicity and sensitivity to financial crisis in different sub-samples

There may be concerns that our results are confined to certain stocks. In order to overcome this concern, we divided our sample into the following sub-groups: (1) Small firms vs. large firms, and (2) Less profitable firms vs. more profitable firms. We re-estimate Equation (4) for all sub-groups. The results of our analysis are reported in Table 3. Our results confirm our previous finding of parabolic relationship between synchronicity during the pre-crisis period and synchronicity during the crisis period. We report significantly positive coefficient of $SYNCH_{Pre\text{-}crisis}$ and a significantly negative coefficient of $SYNCH_{Pre\text{-}crisis}$*$SYNCH_{Pre\text{-}crisis}$ for all sub-groups.

Table 3: Stock price synchronicity and sensitivity to the financial crisis in different sub-samples
Following table uses Equation (4) to document the relationship between stock price synchronicity and sensitivity to the financial crisis in different sub-samples. Our sample consists of firms listed in Argentina, Brazil, China, Egypt, Greece, India, Indonesia, Jordan, Malaysia, Mexico, Philippines, Russia, Taiwan, Thailand, Turkey, Saudi Arabia, South Korea, United Arab Emirates, and Vietnam. The crisis period is 2008. The coefficients with 1% significance are followed by ***, coefficients with 5% by **, and coefficients with 10% by *.

	Small Firms	**Large Firms**	**Less Profitable Firms**	**More Profitable Firms**
SYNCH	2.0004***	1.1224***	0.8740***	1.4931***
SYNCH*SYNCH	-0.9946***	-0.1533***	-0.1521***	-0.2328***
SIZE	0.3477***	0.1394***	0.2848***	0.1931***
LEVERAGE	0.0006	0.0020**	0.0011	0.0032***
EPS	0.0015	-0.0001	0.0027	-0.0005
GROWTH	-0.0028***	-0.0026***	-0.0038***	-0.0023***
Industry Dummies	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes
No. of Observations	1975	2156	2135	1996
F-value	15.34	26.69	35.48	24.40
Adjusted R-square	0.252	0.283	0.359	0.278

5.2 Stock price synchronicity and sensitivity to financial crisis (quantile regression analysis)

Our analysis implies that no matter what point on the conditional distribution is analyzed, the estimates of the relationship between synchronicity during the pre-crisis period and synchronicity during the crisis period are the same. To test the empirical validity of this restrictive assumption and to document the relationship at different points of conditional distribution of synchronicity during the crisis period, a quantile regression is applied at five quantiles (namely 0.10, 0.30, 0.50, 0.70, and 0.90). The results of our analysis are reported in Table 4. As was documented before, we report significantly positive coefficient of $SYNCH_{Pre\text{-}crisis}$ and a significantly negative coefficient of $SYNCH_{Pre\text{-}crisis}$*$SYNCH_{Pre\text{-}crisis}$ for points of conditional distribution.

Table 4: Stock price synchronicity and sensitivity to the financial crisis (quantile regression)
Following table uses Equation (4) and quantile regression analysis to document the relationship between stock price synchronicity and sensitivity to the financial crisis. Our sample consists of firms listed in Argentina, Brazil, China, Egypt, Greece, India, Indonesia, Jordan, Malaysia, Mexico, Philippines, Russia, Taiwan, Thailand, Turkey, Saudi Arabia, South Korea, United Arab Emirates, and Vietnam. The crisis period is 2008. The coefficients with 1% significance are followed by ***, coefficients with 5% by **, and coefficients with 10% by *.

	0.10	**0.30**	**0.50**	**0.70**	**0.90**
SYNCH	2.0447***	1.0791***	0.9006***	0.6620***	0.5619***
SYNCH*SYNCH	-0.5907***	-0.1724***	-0.1451***	-0.0889***	-0.0655***
SIZE	0.2988***	0.2219***	0.1870***	0.1711***	0.1429***
LEVERAGE	0.0068***	0.0009	-0.0003	0.0001	-0.0001
EPS	-0.0005	-0.0004	-0.0001	-0.0001	0.0001
GROWTH	-0.0040***	-0.0029***	-0.0025***	-0.0023***	-0.0014***
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes
No. of Observations	4131	4131	4131	4131	4131
Pseudo R-square	0.231	0.193	0.177	0.173	0.188

5.3 Corporate governance mechanisms and the relationship between stock price synchronicity and sensitivity to financial crisis

Prior literature argues that firms with high synchronicity have better governance and information environment. Farooq and Ahmed (2014), for example, document a positive relationship between corporate governance mechanisms and stock price synchronicity. If firms with high synchronicity are associated with better governance mechanisms, it is possible that these firms should also be less affected by the crisis (Mitton, 2002). If this is true, results obtained above may be due to the governance and information environment of firms rather than synchronicity. In order to overcome these concerns, we control for the following variables. These variables can be used as proxies for various aspects of governance and information environment.

- **ANALYST:** Prior literature considers analyst coverage (ANALYST) as a mechanism via which information disclosure and dissemination takes place (Farooq and Satt, 2014). The greater the number of analysts covering a firm, the better is its information environment and the lower is its information asymmetry. This paper defines ANALYST as the maximum number of analysts issuing recommendations in a given year.
- **OWNERSHIP:** Prior literature considers ownership concentration (OWNERSHIP) as an important governance variable (Farooq and Kacemi, 2011). Concentration of ownership in the hands of few allows managers and controlling shareholders to evade effective disclosure of information (Leuz et al., 2003). Poor information disclosure exacerbates information asymmetries between insiders and outsiders and result in agency problems. It is also been argued that high ownership concentration creates an entrenchment problem that allows self-dealings by controlling shareholders to go unchallenged by boards of directors. This paper defines OWNERSHIP as the percentage of shares held by the insiders.

The modified regressions look like the following:

$$\begin{aligned}
&\mathrm{LOG}(\mathrm{SYNCH}_{\mathrm{Crisis}}) = \alpha + \beta_1(\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}}) + \beta_2(\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}} * \mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}}) \\
&+ \beta_3(\mathrm{GOV}_{\mathrm{Crisis}}) + \beta_4(\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}} * \mathrm{GOV}_{\mathrm{Crisis}}) \\
&+ \beta_5(\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}} * \mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}} * \mathrm{GOV}_{\mathrm{Crisis}}) \\
&+ \beta_6(\mathrm{SIZE}_{\mathrm{Crisis}}) + \beta_7(\mathrm{LEVERAGE}_{\mathrm{Crisis}}) + \beta_8(\mathrm{EPS}_{\mathrm{Crisis}}) + \beta_9(\mathrm{GROWTH}_{\mathrm{Crisis}}) \\
&+ \sum_{\mathrm{Ctry}} \beta^{\mathrm{Ctry}}(\mathrm{CDUM}) + \sum_{\mathrm{Ind}} \beta^{\mathrm{Ind}}(\mathrm{IDUM}) + \varepsilon_{\mathrm{Crisis}}
\end{aligned}$$

(5)

The results of our analysis are reported in Table 5. Our results show that coefficient estimates of $\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}}$ and $\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}}$*$\mathrm{SYNCH}_{\mathrm{Pre\text{-}crisis}}$ retain their significance and direction even after controlling for governance mechanisms. As was shown above, our results indicate parabolic relationship between pre-crisis synchronicity and within crisis synchronicity. Furthermore, we also show that the extent of analyst coverage and ownership concentration have significant impact on synchronicity. Our results show that analyst coverage increases stock price synchronicity, while ownership concentration decreases stock price synchronicity. These results are consistent with Chan and Hameed (2006) and Boubaker et al. (2014) who document similar findings as ours. Interestingly, our results also show that analyst coverage reduces within-crisis synchronicity – firm's exposure to crisis – for firms with low pre-crisis low synchronicity. We report significantly negative coefficient of SYNCH*GOV for analyst coverage. We argue that firms with low pre-crisis low synchronicity have poor information environment. Therefore, any mechanism – such as high analyst coverage – that can help reduce information asymmetries is valuable for stock market participants. We argue that stock market participants respond to higher analyst coverage by reducing firm's exposure to crisis. Similarly, we also show that ownership concentration reduces within-crisis synchronicity for firms with high pre-crisis synchronicity. We argue that controlling shareholders have less incentive to adopt poor disclosure policies when stock prices are more informative. Therefore, for firms with high pre-crisis synchronicity, ownership concentration reduces within-crisis synchronicity.

Table 5: Effect of corporate governance mechanisms on the relationship between stock price synchronicity and sensitivity to the financial crisis

Following table uses Equation (5) to document the effect of corporate governance mechanisms on the relationship between stock price synchronicity and sensitivity to the financial crisis. Our sample consists of firms listed in Argentina, Brazil, China, Egypt, Greece, India, Indonesia, Jordan, Malaysia, Mexico, Philippines, Russia, Taiwan, Thailand, Turkey, Saudi Arabia, South Korea, United Arab Emirates, and Vietnam. The crisis period is 2008. The coefficients with 1% significance are followed by ***, coefficients with 5% by **, and coefficients with 10% by *.

	Analyst Coverage	**Ownership Concentration**
SYNCH	1.4533***	0.8300***
SYNCH*SYNCH	-0.2010***	-0.0847**
GOV	0.0157**	-0.0045***
SYNCH*GOV	-0.0297***	0.0068**
SYNCH*SYNCH*GOV	0.0054	-0.0038***
SIZE	0.1489***	0.2519***
LEVERAGE	0.0020**	0.0017*
EPS	-0.0002	0.0005
GROWTH	-0.0017***	-0.0028***
Industry Dummies	Yes	Yes
Country Dummies	Yes	Yes
No. of Observations	4131	3586
F-value	81.39	43.77
Adjusted R-square	0.227	0.309

CHAPTER VI

DISCUSSION OF RESULTS

If the level of synchronicity affects the sensitivity to crisis, it should also affect firm performance during the crisis period. In order to test this conjecture, we estimate the following regression with firm performance during the crisis period (PER) as a dependent variable. We define PER by two variables: (1) Excess return and (2) Market value to book value ratio. Excess return is defined as the difference between gross stock returns and market returns. Our regression equation takes the following form:

$$\begin{aligned}\text{PER}_{\text{Crisis}} &= \alpha + \beta_1(\text{SYNCH}_{\text{Pre-crisis}}) + \beta_2(\text{SYNCH}_{\text{Pre-crisis}} * \text{SYNCH}_{\text{Pre-crisis}}) \\ &+ \sum_{\text{Ctry}} \beta^{\text{Ctry}}(\text{CDUM}) + \sum_{\text{Ind}} \beta^{\text{Ind}}(\text{IDUM}) + \varepsilon_{\text{Crisis}}\end{aligned}$$

(6)

$$\begin{aligned}\text{PER}_{\text{Crisis}} &= \alpha + \beta_1(\text{SYNCH}_{\text{Pre-crisis}}) + \beta_2(\text{SYNCH}_{\text{Pre-crisis}} * \text{SYNCH}_{\text{Pre-crisis}}) \\ &+ \beta_3(\text{SIZE}_{\text{Crisis}}) + \beta_4(\text{LEVERAGE}_{\text{Crisis}}) + \beta_5(\text{EPS}_{\text{Crisis}}) + \beta_6(\text{GROWTH}_{\text{Crisis}}) \\ &+ \sum_{\text{Ctry}} \beta^{\text{Ctry}}(\text{CDUM}) + \sum_{\text{Ind}} \beta^{\text{Ind}}(\text{IDUM}) + \varepsilon_{\text{Crisis}}\end{aligned}$$

(7)

And

$$\begin{aligned}\text{PER}_{\text{Crisis}} &= \alpha + \beta_1(\text{SYNCH}_{\text{Pre-crisis}}) + \beta_2(\text{SYNCH}_{\text{Pre-crisis}} * \text{SYNCH}_{\text{Pre-crisis}}) \\ &+ \beta_3(\text{PoR}_{\text{Crisis}}) + \beta_4(\text{ANALYST}_{\text{Crisis}}) + \beta_5(\text{OWNERSHIP}_{\text{Crisis}}) \\ &+ \beta_6(\text{SIZE}_{\text{Crisis}}) + \beta_7(\text{LEVERAGE}_{\text{Crisis}}) + \beta_8(\text{EPS}_{\text{Crisis}}) + \beta_9(\text{GROWTH}_{\text{Crisis}}) \\ &+ \sum_{\text{Ctry}} \beta^{\text{Ctry}}(\text{CDUM}) + \sum_{\text{Ind}} \beta^{\text{Ind}}(\text{IDUM}) + \varepsilon_{\text{Crisis}}\end{aligned}$$

(8)

The results of our analysis are reported in Table 6. As expected, our results from all equations show a significantly negative coefficient of $\text{SYNCH}_{\text{Pre-crisis}}$ and a significantly positive coefficient of $\text{SYNCH}_{\text{Pre-crisis}}*\text{SYNCH}_{\text{Pre-crisis}}$. The result complements our earlier findings because our results in Table 6 also indicate that firms with low synchronicity are more exposed to crisis than firms with high synchronicity. We show a negative relationship between pre-crisis synchronicity and within-crisis

performance for firms with low synchronicity and positive relationship between pre-crisis synchronicity and within-crisis performance for firms with high synchronicity.

Table 6: Stock price synchronicity and firm performance during the financial crisis
Following table uses Equation (8) and Equation (9) to document the relationship between stock price synchronicity and firm performance during the financial crisis. Our sample consists of firms listed in Argentina, Brazil, China, Egypt, Greece, India, Indonesia, Jordan, Malaysia, Mexico, Philippines, Russia, Taiwan, Thailand, Turkey, Saudi Arabia, South Korea, United Arab Emirates, and Vietnam. The crisis period is 2008. The coefficients with 1% significance are followed by ***, coefficients with 5% by **, and coefficients with 10% by *.

	Excess Returns			**Market Value to Book Value Ratio**		
	Equation (6)	**Equation (7)**	**Equation (8)**	**Equation (6)**	**Equation (7)**	**Equation (8)**
SYNCH	-0.1037***	-0.0979***	-0.0972***	-0.4140***	-1.1763***	-1.4131***
SYNCH*SYNCH	0.0182***	0.0170***	0.0183***	0.0533	0.1409***	0.1565***
PoR			0.0012***			0.0002
ANALYST			0.0012			0.0444**
OWNERSHIP			0.0006***			0.0011
SIZE		0.0090***	0.0033		0.4405***	0.4004***
LEVERAGE		-0.0011***	-0.0009***		0.0043	0.0057
EPS		0.0001*	0.0004**		-0.0019	-0.0029
GROWTH		0.0011***	0.0009***		0.0031***	0.0035***
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
No. of Observations	7329	4131	2801	6663	4015	2723
F-value	35.28	32.62	22.19	46.41	29.02	19.17
Adjusted R-square	0.098	0.226	0.229	0.137	0.141	0.133

CHAPTER VII

CONCULSION

This paper uses data from emerging markets to explain the cross-sectional variation in stock price synchronicity during the recent financial crisis. Our results show that firms with high stock price synchronicity during the pre-crisis period have less exposure to financial crisis than firms with low synchronicity during the pre-crisis period. We document parabolic relationship between stock price synchronicity during the pre-crisis period and stock price synchronicity during the crisis period. Consistent with prior literature, we argue that firms with high stock price synchronicity during the pre-crisis period are, generally, associated with superior governance mechanisms (Chan and Hameed, 2006; Dasgupta et al., 2010). Better governance mechanisms lead to lower exposure of these firms to financial crisis (Mitton, 2002). Our results are robust across different sub-samples.

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