

Transmission of the U.S. Subprime Crisis to Emerging Markets:
Evidence on the Decoupling-Recoupling Hypothesis*

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1. Introduction

In this paper we evaluate the transmission of the US subprime crisis to emerging markets. Our interest in this topic is partly related to the widespread view that prior to the current crisis many emerging market countries had undertaken reforms that were designed to, and would in fact, insulate them from adverse shocks from the rest of the world. These policies included substantial increases in reserve assets and substantial reductions in net government debt. Moreover the currency exposure of EM governments was reduced in some cases to long dollar positions, commercial bank net foreign exchange borrowings were strictly limited and nonfinancial firms foreign currency debt was monitored and in many cases strictly controlled. Finally, emerging markets were generally experiencing current account and primary fiscal surpluses.

As recently as last October the Mexican government argued forcefully that the Mexican economy was sufficiently insulated from the US to get through the crisis without a significant recession.¹ More generally, the view that the emerging financial markets would not be directly affected by the subprime crisis suggested that growth in China and other emerging markets would carry the world economy for several years while the United States and Europe recovered.² These hopes evaporated quickly by fall 2008 and the question is did something about the US crisis change or was the decoupling hypotheses too optimistic from the outset?

We address these questions empirically in several ways. First, in the next section, we analyze how U.S. shocks have transmitted to CDS spreads in emerging markets. We are interested in the types of “news” that moved CDS spreads, how common was the reaction across emerging markets, and in the magnitude of the response. We identify events that others have claimed were important sources of information about the nature and intensity of the crisis for US markets. We use one official data source (time line for important events published by the Federal Reserve Bank of Saint Louis) and one market source

¹ Carstins (2008)

² Bergsten (2008), IMF (2008).

(timeline for events published by Bloomberg) for these events. We distill these very detailed data sets into a set of 15 types of events that were thought to influence expectations in US markets. We then see if these U.S. events were important in the evolution of debt (CDS spreads) in 11 selected emerging markets, if there was a common reaction across emerging markets, and the size of the response.

Our event study finds that a range of financial and real economic news emanating from the U.S. has statistically and economically large impacts on emerging markets and several news events uniformly moved markets. However, it is not clear whether the structural linkages between the U.S. and emerging markets have changed or whether the frequency, importance and magnitude of the events emanating from the U.S. have changed. To address this “decoupling-recoupling” issue, in section 3, we review developments in selected equity, debt and foreign exchange markets for a sample of emerging market countries from the beginning of 2007 through February 2009. This qualitative analysis focuses on the timing of changes in these markets during the financial crisis for selected emerging markets relative to the U.S. and compares market dynamics. In section 4 we further address whether linkages changed or whether the frequency and magnitude of the shocks emanating from the U.S. changed. We focus on one emerging market with especially strong linkages with the U.S. economy—Mexico—and investigate the transmission of disturbances between equity markets and how they’ve changed. We conclude our discussion in section 5.

Our conclusion is that there is some support for the decoupling hypothesis through mid 2008. But as expectations for a severe downturn in economic activity in the US and Europe took hold, and early warnings about the effects on world trade volumes took center stage, financial markets recoupled dramatically. Looking forward there is some support for the idea that emerging markets remain better prepared for less violent shocks from the rest of the world. Moreover it seems to us likely that they will redouble their efforts to insure against shocks.

2. Transmission of U.S. Real and Financial Shocks to Emerging Markets

How have U.S. real and financial news announcements affected the perceived riskiness of investments in emerging markets? To address this issue we focus on daily CDS spreads (5-year sovereign bonds) in 11 selected emerging markets, and regress changes in these spreads on a host of financial, real and political news announcements that have emanated from the U.S. since the beginning of 2007 through early 2009. Our objective is to evaluate which types of announcements have most effect on emerging markets, evaluate the magnitude of these events, and identify those shocks which uniformly appear to move markets.

A. Data

CDS Spreads in Emerging Markets

Our objective is to evaluate how financial markets in emerging markets respond to U.S. news during a period of intense financial turmoil. To this end, we consider eleven emerging markets geographically distributed across the world: five emerging markets in Latin America (Argentina, Brazil, Chile, Colombia and Mexico), three in Asia (China, South Korea and Malaysia) and three from other regions (Russia, South Africa and Turkey). This group of countries provides a broad geographic representation of emerging markets, with a range of levels of economic development and financial depth.

We focus on 5-year CDS spreads on sovereign bonds over the sample period, January 1, 2007 – February 19, 2009. All of the countries in our sample have consistent CDS series over this time period. The CDS spreads (changes in the spreads) are shown in Graph 2 (Graph 3) and discussed further in Section 3.

U.S. Financial and Real “News” Events

Our other key data component is U.S. “news” events. For the purposes of this study it is important that we capture major news announcements emanating primarily from the U.S. market and test which of these events transmit to emerging markets. We want to cast our net widely over a broad set of news announcements but not so widely as to include events of marginally important information value.

We consider the Bloomberg news announcements on the U.S. economy and the financial crisis as well as the Federal Reserve Bank of St. Louis’s comprehensive time line on developments on the financial crisis. We code these news announcements into fifteen categories: bankruptcies (BR), write-downs (WD), credit events (CRD), Federal Reserve swaps with developed economies (FSD), Federal Reserve swaps with emerging markets (FSE), direct housing market policy actions (HD), Lehman Brother Bankruptcy (LEHMAN), major U.S. political developments (POL), recapitalization of financial institutions (REC), the initial rejection of the Troubled Asset Recovery Program by the U.S. Congress (TARP_CANCEL), events and programs substantially expanding the U.S. Treasury’s balance sheet (TBS), events and programs substantially expanding the Federal Reserve’s balance sheet (FBS), new regulatory actions (REG), positive economic developments in the U.S. (REALPLUS) and negative economic developments in the U.S. (REALMINUS).

Table 1 gives a more detailed explanation of the description and coding of the events as well as illustrative examples of events included in each category. Table 2 shows the number of events in each category for the full sample (total number of events) and for two sub-sample periods—the first phase of financial problems developing (January 1, 2007 – August 31, 2008) and the second phase of very intense financial problems (September 1, 2008 – February 19, 2009). Not surprisingly, the great majority of events occurred in the latter sample period.

B. Methodology and Results

The dependent variable that we wish to explain is the daily change in the CDS spread for each emerging market of our sample. Unit root tests suggest that the change in the CDS spread is a stationary variable. In addition to the “news” variables and a constant, we also include a lagged dependent variable to effectively absorb residual autocorrelation in the equation. The sample period was January 1, 2007 to January 19, 2009, giving a sample of 533 observations. A simple regression methodology (OLS) is employed.

Table 3 presents the results of the regression analysis. The adjusted R-square ranges from a low of 0.04 (Argentina) to a high of 0.41 (South Korea). The mean of the dependent variable (average daily increase in the CDS spread over the sample period) ranges from lows of around 0.34-0.35 (China and Chile, respectively) to highs of around 1.26-6.25 (Russia and Argentina, respectively).

Our sample consists of a very diverse set of emerging market economies with a variety of idiosyncratic economic and political developments influencing CDS spreads and with quite different degrees of financial linkages with U.S. markets. Nonetheless, the transmission of news announcements to these markets was rapid and there are several factors that affected CDS markets almost uniformly. One event that was common to all emerging markets in our sample were the four key announcements involving the Lehman Brothers bankruptcy (LEHMAN). Each of these four news announcements (on average) raised CDS immediately by between 7 basis points (China) to over 100 basis points (Argentina), with all countries being significantly affected. China and Chile were the least affected, and Argentina and Russia were the most affected.

The second event that significantly affected all countries except China were the two announcements of new Federal Reserve swap arrangements with emerging markets (FSE). Each of these announcements lowered CDS spreads across the board, ranging from a drop of 22 basis points in Chile to a drop of 183 basis points in South Korea.

Other important events that affected most countries across the board were write downs of equity in U.S. financial institutions (WRD). This news adversely affected CDS markets (rise in spreads) in every country and the effect was significant in 8 of the 11 cases. Two noteworthy positive developments were the change in the TARP and positive news on the real side of the U.S. economy.

Two types of news announcements in the U.S. which surprisingly did not uniformly play a role in emerging market CDS spreads were major policy actions taken by the U.S. Treasury and Federal Reserve to shore up the financial system (TBS and FBS). These events attracted much news attention but did not generally transmit to emerging markets. In particular, CDS spreads in only three of the eleven countries were significantly reduced by TBS announcements (Brazil, Mexico and Turkey). Surprisingly, CDS spreads rose significantly in response to FBS announcements in China and Malaysia-- presumably providing bad news to the market about the extent of the liquidity problems facing U.S. banks and credit markets rather than good news about the Fed program-- and were not significantly affected elsewhere.³

On balance, news about the financial crisis and real economic activity emanating from the U.S. have played a significant role in moving CDS spreads in emerging markets. A series of write-downs, reported losses and downgrades of U.S. financial institutions, as well as the Lehman bankruptcy announcement, caused significant jumps in the CDS spreads, while positive news announcements on real economic activity in the U.S. buoyed emerging markets and lowered spreads. The critical policy developments moving these spreads downward have been a series of news announcements of foreign exchange swap agreements with emerging markets. But the major program announcements by the Treasury, Federal Reserve and other U.S. government agencies, including announcements of the troubled asset relief program (TARP), increases in deposit insurance coverage, the Fed's commercial paper funding facility (CPFF), the FDIC's new

³ Taylor and Williams (2008a,b) also do not find robust evidence of a significant negative effect of the Fed's term auction facility (TAF) on term inter-bank lending rates.

Temporary Liquidity Guarantee Program and dozens of other announcements supporting the financial system, did little to reduce CDS spreads in emerging markets.

3. Market Dynamics: Emerging Markets in the Financial Crisis

The preceding section demonstrated that news events from the U.S. have had large impacts CDS spreads in emerging markets, effectively transmitting the financial crisis in the U.S. to markets abroad. It is not clear, however, whether the channels of transmission are stronger or whether the frequency, nature and import of the U.S. shocks has changed around mid-year 2008. Further insights on this issue may be gained by evaluating the dynamics of financial market changes in emerging markets, and the interaction amongst markets, in relation to several big news events in the U.S.

Equity Prices

Equity prices are a useful place to start our investigation for two reasons. First, they reflect expectations for future earnings and therefore on expected effects of a downturn in US economic activity. Second equity prices reflect the risk adjusted rate at which these future earnings are discounted. It follows that a financial crisis in the United States and other developed countries could have an immediate and direct effect on the risk premium and EM equity prices.

The behavior of levels of broad stock indices is shown in Graph 1. National stock indices are shown in each panel together with the U.S. Standard and Poor's 500 index. The indices are reported in dollar values (by deflating the local currency value of the index by the dollar exchange rate) and normalized so each series starts at a base equal to one on January 1, 2007. To provide perspective on the timing of some key events in the U.S., we mark three dates in the graph (denoted by vertical lines) representing the intensification of financial market pressures, indicated by diminished liquidity in the interbank market

(11/1/07); the Lehman bankruptcy (9/15/08); and the report that U.S. Retail Sales decline was the largest in 3 years and a new job loss report (10/15/08).

Three features of this data stand out to us. First, the start of the subprime crisis in mid 2007 is also the start of a long but gentle decline in US equities through September 2008. A spectacular decline in September is then followed by extreme volatility since then but no clear trend. In contrast most of the emerging markets had recovered by August 2007 and continued to perform quite well for another 12-14 months. This is true across regions and for emerging markets that are quite different in terms of economic structure. If there was a time when decoupling seemed a reasonable idea it was during this year-long interval.

An interesting exception is Argentina. Argentina depends on foreign trade but is largely closed to international capita flows. Yet of all the countries in our sample it moved most closely with the United States. An intriguing possibility is that countries are linked through trade but open capital markets allow or generate different dynamics across countries.

Second, in late May 2008, the equity markets again start to move together. In the next section we will show that this was associated with increasing expectations that the decline in economic activity would be much larger than had been anticipated. This close relationship is even more pronounced in mid September when the Lehman crisis proceeds a spectacular fall in all the markets through mid October. In the next section we will look for news associated with these broad trends but for now it seems clear that something important occurred in June-July 2008 and again in September 2008.

Finally in the first three months of this year extreme volatility continues and markets have moved together but with no clear trend as of this writing.

In terms of the net move over the whole time period there does not seem to be any pattern. If we look at the whole sample Brazil and China outperform the US by

substantial margins. The volatility of equity prices is much higher for Brazil and China as compared to the US and, as we discuss in more detail below, the day-to-day correlation for Brazil is quite high for China quite low. Can we draw any conclusions about the interdependence of these markets? It could be argued that the Brazil and China are completely integrated with the US market and subject to the same shocks but are more volatile. Clearly if this pattern was reliable it would be trivial to mimic any market by another by adjusting the leverage to increase or reduce volatility.

In contrast Russia is also much more volatile than the WE but it underperforms the US by a considerable margin.

One additional summary statistic useful for shedding light on this issue are correlations between price movements (percentage changes) in these markets, and how they've changed over time. Table 4 presents correlations between (percent changes) in the U.S. SP500 and (percentage changes) in national equity markets for selected emerging markets for the full sample (January 1, 2007 to January 19, 2009) and two sub-sample periods: January 1, 2007 to August 31, 2008 and September 1, 2008 to January 19, 2009. The second column of the table presents the full sample correlations, the third column presents the early sub-sample correlations, the fourth column presents the later sub-sample correlation, the fifth (sixth) column shows the difference (percentage change) in the correlation between the early and late sub-sample periods.

The correlations are generally quite high between the U.S. equity market and emerging markets in Latin America for the full sample, ranging from 0.41 for Colombia to 0.78 for Mexico. The correlations between equity markets in selected emerging markets in the U.S. are also moderately high, ranging from 0.29 (Russia) to 0.41 (Malaysia), with the exception of China (correlation of 0.18).

Correlations increased markedly after September 2008 for most emerging markets (9 of 11), indicating stronger linkages between the markets or more common shocks. For example, the correlation with Colombia and South Africa jumped 74% and 75%,

respectively, at the high end of the spectrum. China, Turkey and Russia also rose by 40% or higher. Surprisingly, the correlations with Korea and Malaysia fell by over 20% between the first and second sub-samples. Overall, however, the changes in the correlations confirm our observations from the graphs that the linkages generally increased substantially after summer 2008.

Credit markets

Credit markets are presumably less sensitive to small shocks to the outlook for economic activity because they are paid before equity. In this section we see if the pattern we saw in equity markets also is apparent in credit markets. The panels in Graph 2 show daily credit default spreads for the US and selected emerging markets. The similarity of the changes and timing in the CDS spreads across emerging markets over the period is remarkable. Also there was almost no movement in CDS spreads until the Lehman failure.

Only in a very tough environment would governments be expected to default. Clearly the Lehman bankruptcy was a different kind of problem and it was transmitted across all kind of countries in remarkably similar ways.

Volatility in CDS spreads is highlighted in Graph 3, which shows the change in the CDS spread for selected emerging markets. Volatility appeared to take a distinct shift upwards starting around early October 2008. Again, the same pattern of initial decoupling from the bad financial news emanating from the U.S. is evident until summer 2008. However, hopes that emerging markets were decoupled from the financial crisis and that their economies would be insulated were dashed by fall 2008.

Exchange rates

Exchange rate developments for selected emerging markets (Mexico, Argentina and Russia) are shown in Graph 4. Exchange rates follow a similar general pattern to equity

prices in that they generally appreciated relative to the dollar, at times rapidly, until summer 2008 and then depreciated very sharply. Emerging markets on balance appeared to be initially decoupled from the U.S. financial crisis and then experienced large depreciations that greatly exceeded the initial appreciations of their currencies from early 2007 though mid-2008. Russia, for example, started 2007 trading at above 26 rubles per dollar, appreciated to 23 rubles per dollar by June 2008 and then started to depreciate, reaching almost 34 rubles per dollar by February 2009. Mexico followed a very similar pattern to Russia: peso appreciation from January 2007 to August 2008, followed by a sharp depreciation from September 2008 to February 2009. Argentina was trading between 3.1-3.2 pesos per dollar from May 2007 to May 2008, followed by several months of strong appreciation and then a sharp depreciation beginning in September 2008. By February 2009 the Argentine currency had depreciated markedly and was trading close to 3.5 pesos per dollar.

4. Linkages: More News or Decoupling-Recoupling?

The preceding empirical analysis demonstrates that some U.S. news significantly moved CDS spreads in selected emerging markets. How does this empirical finding fit with the graphical analysis indicating that emerging markets were seemingly decoupled for a number of months from the adverse developments in the U.S. market, and suddenly were moving in tandem with U.S. markets from late summer 2008 to early 2009? Two candidate explanations are (1) the decoupling-recoupling linkage explanation, suggesting that market forces were moving these markets apart for the early part of the sample and then linkages reemerged in the latter part of the sample; or (2) news announcements emanating from the U.S. were more frequent, and were more important for emerging markets, in the later sample compared to the early sample.

These are not necessarily competing hypotheses. Clearly, the worst financial and economic news emanating from the U.S. was concentrated in the period from late summer 2008 onwards. However, it also appears that emerging markets were more sensitive to U.S. news announcements in the latter part of the sample. To shed further

light on the decoupling hypothesis, we investigate the linkage between the U.S. equity market and the Mexican equity market.⁴ We investigate how these markets are linked using a simple VAR model, Granger-causality tests and impulse response functions for the two sub-sample periods. Differences in the estimates between the two periods, 1/1/07 to 8/31/08 for the early period and 9/1/08 to 2/19/09 for the late period, should highlight differences in the responsiveness of Mexican equity prices and U.S. equity prices.

We employ a simple bivariate VAR model with U.S. and Mexican equity prices and three lagged values. Equity prices are in log first differences to ensure that stationary series are employed in the VAR model. Three lags are indicated by most of the lag length statistical tests shown in Table 5. Table 6 shows part of the Granger causality tests for each sample period, namely the effect of lagged percent changes in U.S. equity prices (SP500) on percent changes in Mexican equity prices. The upper panel shows the full sample period, the middle panel shows the early sample period and the lower panel shows the late sample period.

The Granger causality results for the full sample (upper panel) indicate a strong linkage between the U.S. equity market and the Mexican equity market. The null hypothesis that U.S. equity prices do not “Granger cause” Mexican equity prices is rejected at the 1% level. This simply means that lagged values of the U.S. equity prices are a good leading indicator of Mexican equity prices (in percentage changes) over the full sample. In the early sample period, by contrast, U.S. equity prices add no (statistically significant) information in predicting Mexican equity prices. The late sample period suggests that U.S. equity prices are marginally significant (12% level of significance) predictors of Mexican equity prices. There appears to be more information available over the full sample period to make the judgment that U.S. equities are good leading indicator of Mexican equities, but this information appears to be derived mainly from the late sample period. This again provides some evidence of the “decoupling” hypothesis for the early period with linkages reemerging in the late sample period.

⁴ One empirical approach would be to divide our sample into two parts and test for structural change in the responsiveness of emerging market to news emanating from the U.S. We can not follow this approach, however, due to the relative paucity of news announcements in the first sub-sample period.

This observation is supported by impulse response functions derived from the 3-lag bivariate VAR model which underlie the Granger causality results of Table 6. The impulse response functions are reported in Graph 5. These are based on a Choleski decomposition of the VAR residuals and a shock of one standard deviation. The dashed lines represent confidence intervals (± 2 standard errors) around the impulse response. A 10-day period is investigated and the accumulated response is reported since the model is estimated in percent changes. The accumulated response give the accumulated percent change in Mexican equity prices from a shock in U.S. equity prices. The upper panel shows the impulse response from the full sample period, the middle panel shows the impulse response from the early sample period, and the lower panel shows the impulse response from the late sample period.

Not surprisingly, the impulse responses derived from estimating the model over the three sample periods are consistent with the Granger causality results. The impulse response from the full sample shows a significant positive response from U.S. equity prices to the Mexican market. A 2 percent positive shock (one standard deviation) in the U.S. market cause an impact effect of about 1.5 percent in the Mexican market, falling off to about 1.3 percent after a few days. In the early sample period, by contrast, the impact effect is much less and stabilizes at about 0.9 percent. The response is largest in the late sample period with an impact effect of 2.5 percent, stabilizing at about 2.0 percent after a few days.

In sum, the Granger causality results and the impulse response functions indicate that Mexico has been more closely linked with the U.S. market since fall 2008 than previously. The Mexican equity market is closely linked with the U.S. market and integrated with the U.S. economy and may not be representative of the broader group of emerging markets. Nonetheless, the results are suggestive and provide support for the “recoupling” hypothesis.

5. Conclusion

Our review of the financial indicators lends support to the view that markets were decoupled from the U.S. for a period of time, but linkages dramatically reemerged (“recoupled”) by late summer or early fall 2008, with a remarkably uniform timing across most emerging markets. Volatility also rose dramatically starting in fall 2008. Simple correlations between (percent) price changes in the U.S. equity market (SP500) and those in emerging markets also show an increase after August 2008, oftentimes substantially so, in 9 of the 11 selected emerging markets investigated.

It is clear that U.S. financial and real news transmitted strongly to emerging markets over the whole sample period, as reflected in 5-year CDS spreads on sovereign bonds. We identified a wide set of U.S. news announcements such as write-downs of financial institutions and news on the U.S. real economy that systemically moved CDS spreads in most emerging markets. We also identified several types of news announcements, such as the Lehman bankruptcy and swap arrangements, that had uniformly large effects across all of the emerging markets in our sample. By contrast, major news announcements by the Federal Reserve and U.S. Treasury on plans to stabilize the U.S. financial system had little effect on emerging market CDS spreads.

But has this responsiveness changed since fall 2008? We can not investigate this issue using news announcements since there is a relative paucity of news in the early part of the sample. Rather, we consider the linkages between U.S. equity markets and the equity market in one emerging market—Mexico—with close financial and economic ties with the U.S. Using VAR methods, we find that the linkages between these two equity markets have become much stronger since fall 2008 when the U.S. financial crisis grew to critical proportions.

On balance, we find evidence for the decoupling-recoupling hypothesis. Using several approaches to investigate this issue, we find that emerging markets appeared to be largely insulated and decoupled from developments in U.S. financial markets from early 2007 to

summer 2008. From that point on, however, emerging markets responded very strongly to the deteriorating situation in the U.S. financial system and real economy. Policy measures taken in emerging markets to insulate themselves from global financial developments proved inadequate in the face of strong international recoupling of the international financial system.

References

Bergsten (2008) <http://blogs.ft.com/economistsforum/2008/07/trade-has-saved-america-from-recession/>

Carstins (2008) http://www.bloomberg.com/apps/news?pid=20601086&sid=aiKO7Y7_6phE&refer=latin_america

IMF (2008). *World Economic Outlook October 2008*.
<http://www.imf.org/external/pubs/ft/weo/2008/02/pdf/text.pdf>

Taylor, John B. and John C. Williams (2008a), “A Black Swan in the Money Market,” Federal Reserve Bank of San Francisco Working Paper 2008-4, April 2.

Taylor, John B. and John C. Williams (2008b). “Further Results on a Black Swan in the Money Market” Federal Reserve Bank of San Francisco mimeo May 23, 2008.

Table1 : Variable Definitions and Example of Events

Event Variable	Definition of Event	Event Example: Date and Description
REG	Important changes in US financial regulations	3-Dec-08 SEC approves measures to increase transparency and accountability at credit rating agencies.
TBS	Policy announcements that will affect the US Treasury's balance sheet	5-Dec-08 Treasury purchases \$4 billion in preferred stock in US banks under the Capital Purchase Program.
REALMINUS	Negative news about US growth	11-Dec-08 NBER announces that the economic activity peaked in December 2007 and that the economy has since been in recession.
REALPLUS	Positive news about US growth	11-Dec-08 House approves \$14 billion automaker bailout.
FBS	Policy announcements that will expand the Federal Reserve's balance sheet	25-Nov-08 Fed to buy \$600 billion of GSE debt, set up ABS program.
HD	Policy announcements directly affecting US residential housing market	20-Nov-09 Fannie Mae and Freddie Mac announce that they suspend mortgage foreclosures until January 2010.
CRD	Adverse news from US credit markets	9-Jan-09 US consumer borrowing falls by record \$7.9 billion; credit freeze deepens.
REC	Announcement of recapitalization of US financial institutions	10-Oct-08 GE raises \$15 billion; Buffett invests \$5 billion in preferred shares and warrants.
BR	Bankruptcy or forced merger of US financial institutions	25-Sep-08 Washington Mutual seized by FDIC, JPMorgan buys its deposits.
WD	Announcements of write downs of US financial institutions assets	6-May-08 Fannie May reports Q1 loss of \$2.19 billion.
FSD	Expansion of Federal Reserve Swap lines to industrial countries	13-Oct-08 Fed lets European Central banks offer unlimited dollars, removes swap limits.
FSE	Expansion of Federal Reserve Swap lines with emerging markets	29-Oct-08 The FOMC establishes swap lines with Banco Central do Brazil, Banco de Mexico Bank of Korea, and the Monetary Authority of Singapore for up to \$30 billion each.
POL	Political developments in US	29-Sep-08 Rescue plan rejected.
LEHMAN	Lehman Brothers	15-Sep-08 Lehman Brothers declares bankruptcy.
TARP_CANCEL	Troubled Assets Relief Program	12-Nov-08 Treasury Secretary Paulson announces that the Treasury has decided not to use TARP funds to buy mortgage related assets.

Table 2: Number of “News” Events Emanating from the U.S.

Event	Number of Events in Each Period		
	Early Sample	Late Sample	Full Sample (Total Events)
	January 1, 2007– Aug 31, 2008	Sept 1, 2008– Feb 19, 2009	January 1, 2007– Feb 19, 2009
REG	4	12	16
TBS	5	25	30
REALMINUS	1	28	29
REALPLUS	2	6	8
FBS	11	13	24
HD	0	4	4
CRD	0	5	5
REC	13	18	31
BR	16	14	30
WD	34	12	46
FSD	0	8	8
FSE	0	2	2
POL	0	2	2
LEHMAN	0	4	4
TARP_CANCEL	0	1	1

Table 3: Response of Emerging Market CDS Spreads to U.S. Events

Variable	Argentina	Brazil	Chile	Colombia	Mexico
C	2.74	0.05	0.18	0.24	0.31
D(CDS5Y(-1))	0.12***	0.29***	0.25***	0.24***	0.29***
BR	-18.56	-0.77	-0.97	-2.44	-2.98
WD	15.41	6.63***	2.04**	6.12***	7.41***
CRD	75.72**	11.19*	-7.82**	5.91	7.15
FSD	-44.33	-31.62***	-4.29	-32.37***	-29.65***
FSE	112.01*	-57.78***	-22.48***	-33.78**	-44.31***
HD	101.80**	11.4	12.58***	12.06	14.21
LEHMAN	100.99***	32.73***	8.11**	25.62***	29.09***
POL	-3.16	19.65**	-6.15	15.75	14.19
REC	8.07	2.05	-0.01	1.66	-1.036
TARP_CANCEL	-126.32*	63.47***	13.80*	63.76***	66.43***
TBS	2.047	-8.48***	0.28	-3.22	-8.07**
FBS	19.94	1.57	0.44	-0.93	0.31
REG	-26.69	-1	-3.81**	-3.14	1.52
REALPLUS	38.73	-11.04**	-8.28***	-15.83***	-13.04**
REALMINUS	0.42	1.74	3.87***	2.1	2.78
Observations	533	533	534	533	533
Adjusted R-squared	0.043	0.258	0.13	0.16	0.2
S.E. of regression	67.035	14.87	7.18	14.6	13.95
Mean depend. Var	6.245	0.43	0.35	0.41	0.54
Log likelihood	-2989	-2106	-1763	-2176	-2152
Durbin-Watson stat	2.08	2.07	1.99	2.09	2.04

Notes: * denotes significance at 90%; ** denotes significance at 95%; *** denotes significance at 99%. Values noted in bold are statistically significant at the 90% level or higher. Sample: January 1, 2007 – February 19, 2009

Table 3 (continued): Response of Emerging Market CDS Spreads to U.S. Events

Variable	China	Korea	Malaysia	Russia	So. Africa	Turkey
C	0.05	-0.3	-0.02	0.38	0.2	-0.04
D(CDS5Y(-1))	0.13***	0.19***	0.37***	0.34***	0.29***	0.27***
BR	-1.17	-2.54	-3.18*	-4.88	-2.32	-3.81
WD	1.80**	5.56***	4.27***	2.11	1.54	5.46**
CRD	-0.49	4.88	3.15	-1.76	0.6	4.23
FSD	-2.96***	-9.16*	0.01	-34.08***	-27.38***	-22.00***
FSE	-66.82	-183.16***	-106.51***	-66.49***	-46.14***	-73.76***
HD	7.04*	15.87*	1.64	63.40***	10.16	35.26***
LEHMAN	7.30***	25.68***	11.78***	38.64***	26.29***	34.83***
POL	10.47**	23.11***	21.90***	-22.41	9.24	2.66
REC	-0.6	-2.49	-4.20**	2.96	4.31*	4.09
TARP_CANCEL	7.42	26.15**	8.91	158.09***	95.32***	34.66**
TBS	1.97	8.70***	-0.53	-1.04	0.5	-6.83**
FBS	3.21**	4.2	5.93***	-8	-3.14	-2.46
REG	1.791	6.63**	2.77	17.93***	7.17**	8.84**
REALPLUS	-3.04	-5.99	-2.41	-16.37**	-14.87***	-10.31*
REALMINUS	0.13	-1.6	0.65	6.41	1.95	2.9
Observations	533	533	533	533		
Adjusted R-squared	0.24	0.412	0.37	0.32	0.28	0.23
S.E. of regression	5.86	11.32	8.61	20.49	11.47	14.43
Mean depend. Var	0.34	0.54	0.37	1.26	0.62	0.46
Log likelihood	-1690	-2040	-1895	-2357	-2048	-2162
Durbin-Watson stat	1.89	1.83	1.875	2.09	2.02	2.1

Notes: Dependent variable: change in CDS spread. * denotes significance at 90%; ** denotes significance at 95%; *** denotes significance at 99%. Values noted in bold are statistically significant at the 90% level or higher. For China, Korea and Malaysia: all independent variables are lagged one day to take into time differences between U.S. and Asian markets. Sample: January 1, 2007 – February 19, 2009

Table 4:

Correlations of USA SP500 with Stock Index in:	Sample Period			Change in Correlation	% Change Correlation
	Full 1/1/2007 to 1/19/2009	Early 1/1/2007 to 8/31/2008	Late 9/1/2008 to 1/19/2009		
ARGENTINA	0.62	0.50	0.68	0.17	34%
BRAZIL	0.75	0.64	0.81	0.17	27%
CHILE	0.56	0.49	0.64	0.14	29%
COLOMBIA	0.41	0.28	0.49	0.21	74%
MEXICO	0.78	0.72	0.82	0.1	14%
CHINA	0.18	0.17	0.24	0.07	42%
KOREA	0.37	0.47	0.33	-0.14	-29%
MALAYSIA	0.41	0.52	0.4	-0.12	-24%
RUSSIA	0.29	0.21	0.3	0.09	42%
SOUTH AFRICA	0.39	0.25	0.44	0.19	75%
TURKEY	0.38	0.28	0.43	0.15	51%

Correlations are daily percent change in US SP500 index with percent change in representative national stock price index. China, Korea and Malaysia are one-day ahead.

Table 5: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1748.27	NA	6.90e-08	-10.81	-10.79	-10.80
1	1770.17	43.38	6.18e-08	-10.92	-10.85*	-10.90
2	1778.39	16.19	6.02e-08	-10.95	-10.83	-10.90
3	1790.67	24.04	5.72e-08*	-11.00*	-10.84	-10.94*
4	1792.62	3.79	5.79e-08	-10.99	-10.78	-10.90
5	1795.54	5.64	5.83e-08	-10.98	-10.72	-10.88
6	1798.09	4.89	5.88e-08	-10.97	-10.67	-10.85
7	1804.02	11.32*	5.81e-08	-10.98	-10.63	-10.84
8	1807.58	6.73	5.83e-08	-10.98	-10.58	-10.82
9	1809.24	3.14	5.92e-08	-10.97	-10.52	-10.79
10	1811.55	4.31	5.98e-08	-10.96	-10.47	-10.76

* indicates lag order selected by the criterion.

Endogenous variables: DLOG(SP500INDEX) and DLOG(STOCKINDX_MEXICO),

Sample: 1/01/2007 to 1/19/2009, Included observations: 323

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

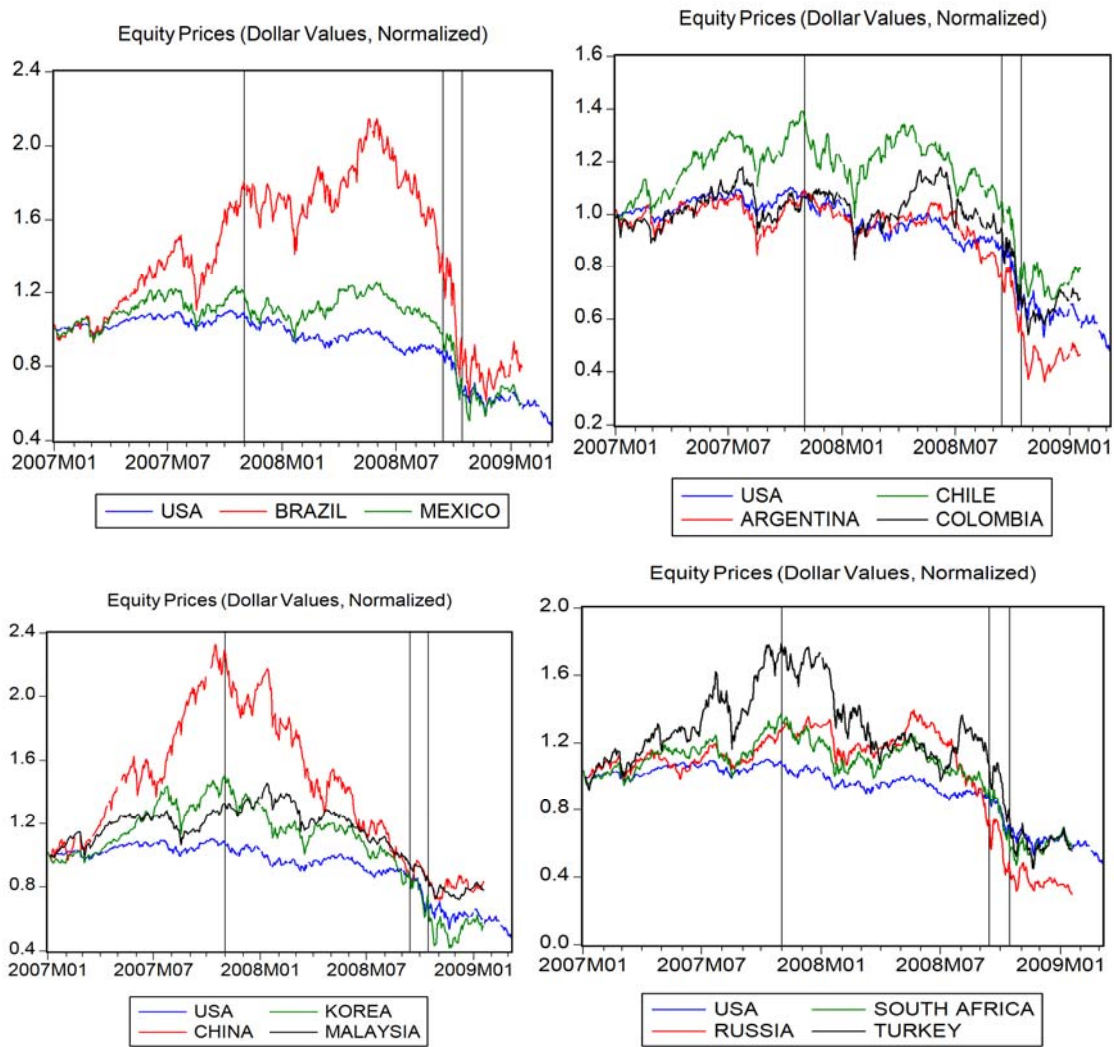
HQ: Hannan-Quinn information criterion

Table 6: VAR Granger Causality Tests

Excluded	Chi-sq	df	Prob.
<i>a. Full Sample (1/1/07–2/19/08)</i>			
DLOG(SP500INDEX)	10.572	3	0.014
<i>b. Early Sample (1/1/07–8/31/08)</i>			
DLOG(SP500INDEX)	2.221	3	0.528
<i>c. Late Sample (9/1/08–2/19/09)</i>			
DLOG(SP500INDEX)	5.767	3	0.124

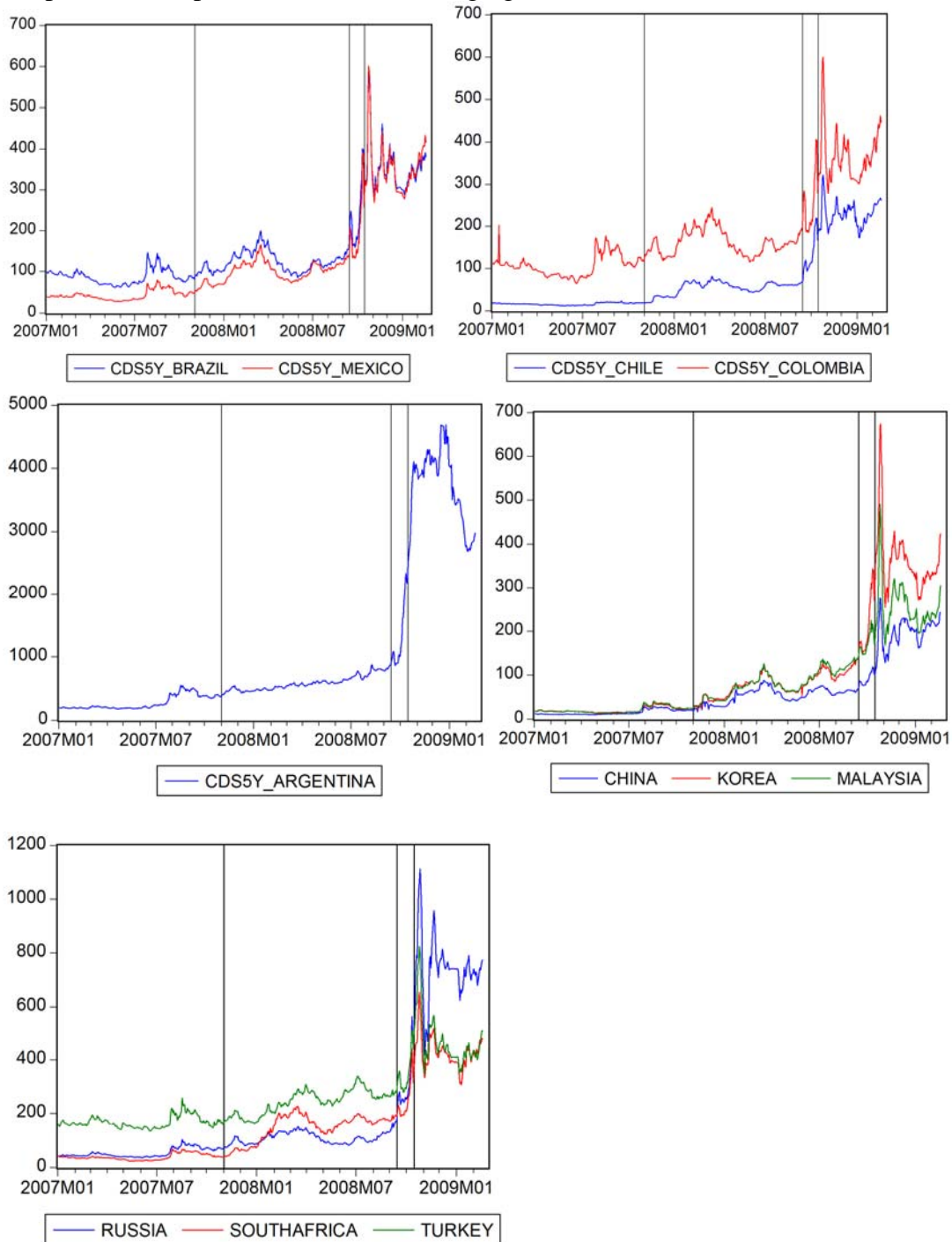
Dependent variable: DLOG(STOCKINDX_MEXICO)

Graph 1 Equity Markets in the U.S. and Selected Emerging Markets



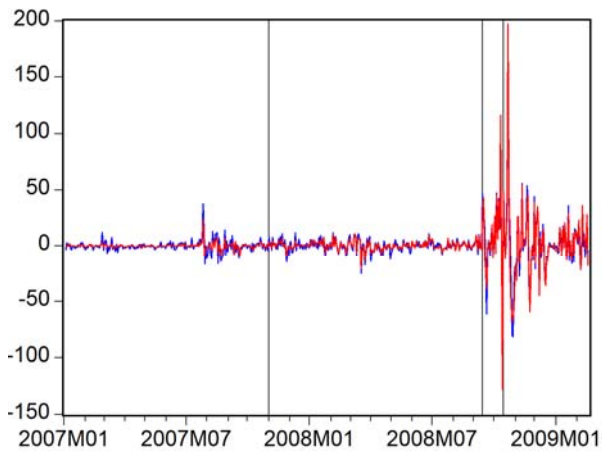
Note: the first vertical line in the graphs represents intensification of financial market pressures, indicated by diminished liquidity in the interbank market (11/1/07); the second represents the Lehman bankruptcy (9/15/08); and the third represents the news report of U.S. Retail Sales decline (largest in 3 years on job losses, 10/15/08).

Graph 2 CDS Spreads in Selected Emerging Markets

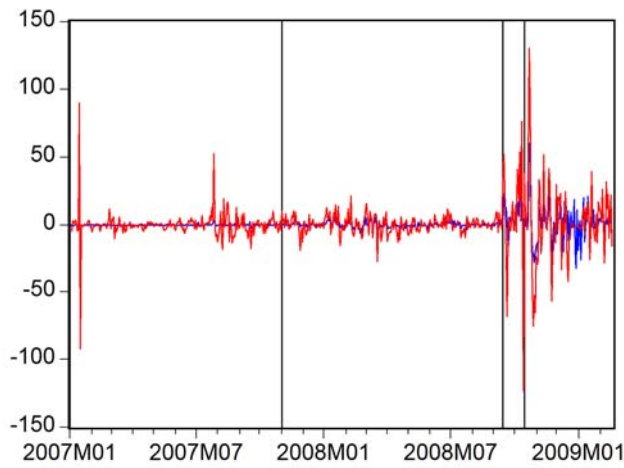


Note: the first vertical line in the graphs represents intensification of financial market pressures, indicated by diminished liquidity in the interbank market (11/1/07); the second represents the Lehman bankruptcy (9/15/08); and the third represents the news report of U.S. Retail Sales decline (largest in 3 years on job losses, 10/15/08).

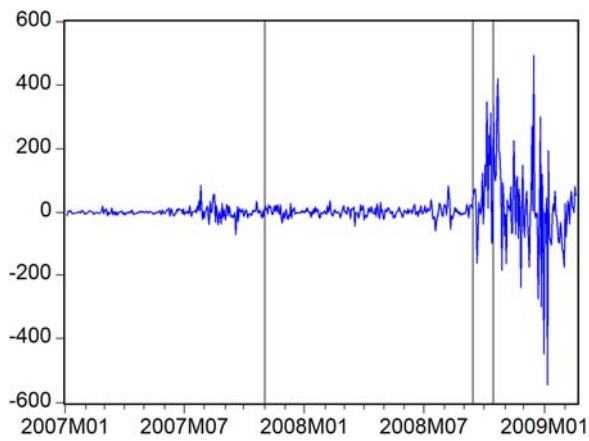
Graph 3 Change in CDS Spreads in Selected Emerging Markets



— DCDS_BRAZIL — DCDS_MEXICO



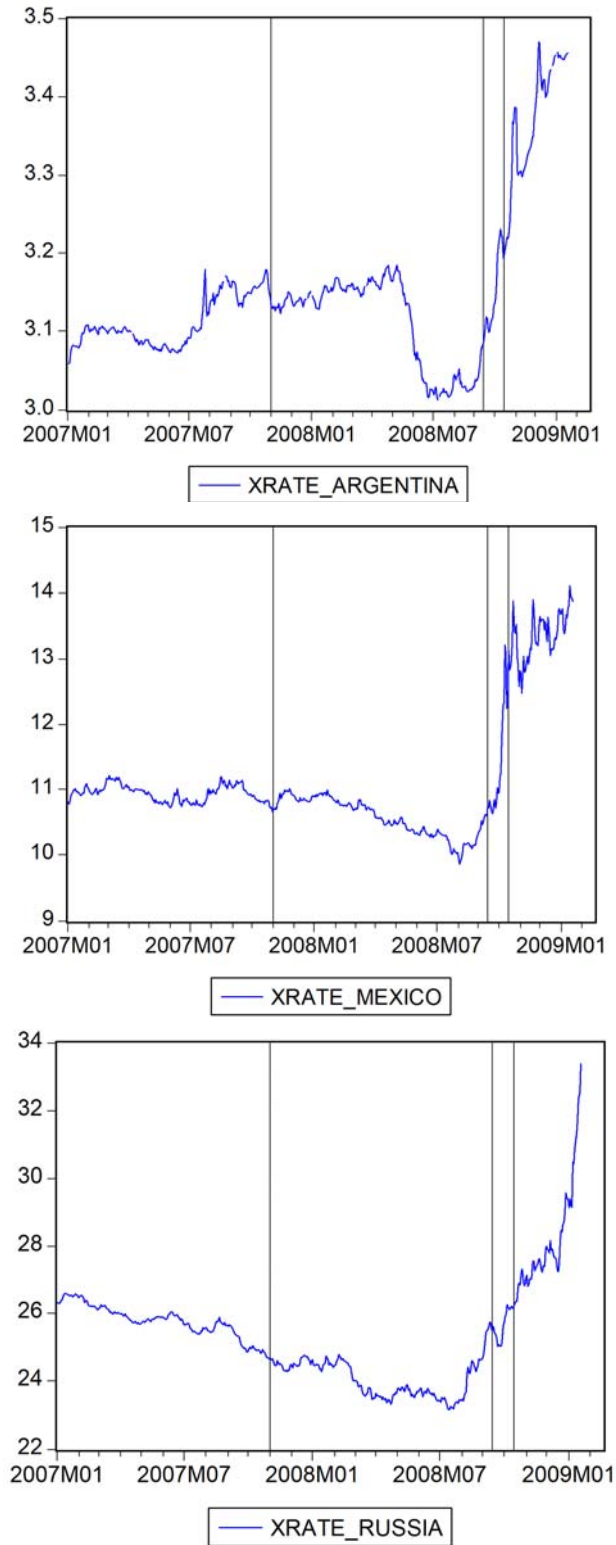
— DCDS_CHILE — DCDS_COLOMBIA



— DCDS_ARGENTINA

Note: the first vertical line in the graphs represents intensification of financial market pressures, indicated by diminished liquidity in the interbank market (11/1/07); the second represents the Lehman bankruptcy (9/15/08); and the third represents the news report of U.S. Retail Sales decline (largest in 3 years on job losses, 10/15/08).

Graph 4 Exchange Rates in Selected Emerging Markets



Note: the first vertical line in the graphs represents intensification of financial market pressures, indicated by diminished liquidity in the interbank market (11/1/07); the second represents the Lehman bankruptcy (9/15/08); and the third represents the news report of U.S. Retail Sales decline (largest in 3 years on job losses, 10/15/08).

Graph 5 VAR Model Impulse Responses (One standard deviation shock)

