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Ahmed M. Khalid and Gulasekaran Rajaguru

Global Impact of Russian Financial Crisis

Evidence Using Grange Causality and Impulse Reponses in a VAR Model

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by

Ahmed M. Khalid
and
Gulasekaran Rajaguru

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Abstract

This study attempts to investigate the financial market contagion in a global perspective. We use a large sample of 26 countries representing different regions in the world and focus on the spillover effects of the 1998 Russian crisis. We use daily observations on three financial market indicators namely, the exchange rates, stock prices and interest rates. We construct a VAR to test the interlinkages among different market and different regions using the Granger causality. Later, we perform impulse response analysis by introducing a shock in each of the Russian market and observe the impact and duration of this shock on other global markets. The evidence suggests that most of the exchange rates and stock prices within and across the regions are strongly linked and may have had provided a channel for contagion during the 1998 Russian crisis. However, the evidence for interest rate linkages is less supportive.

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Key words: Russian Crisis, Global Market Linkages, VAR, Granger Causality, Impulse Responses

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Correspondence to: Ahmed M. Khalid, Globalisation and Development Centre, Bond University, Gold Coast, QLD 4229, Australia, Fax: (617) 5595-1160, E-mail: akhalid@bond.edu.au

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1. Introduction

The increased episodes of financial crises during the 1990s in various regions around the globe prompted academics and policy makers to identify the source(s) and spillover effects of such crises. The crises in Latin America (1994), Asia (1997) and Russia (1998) are examples of such shocks spreading from one country to another. It is argued that inappropriate and hasty financial sector reforms in many parts of the developing world in the 1990s left the markets unstable and vulnerable to even minor shocks. The increased financial and trade sectors interdependence within a region further aggravated the problem.[1] In the literature, this is labeled as *contagion*. As a result, there is a growing concern among researchers and policy makers to investigate the cause and effect of such crises. Many economists, in the recent past, have studied this phenomenon both theoretically and empirically. Recently, some studies have focused on the issue of currency contagion using data from Latin American and Asian countries. However, the existing research has several limitations. This study attempts to extend the scope of existing research and looks into the issue of contagion in a global perspective.

Specifically, we investigate the spread of contagion as the main cause of trouble across different markets, both regional and global. This paper studies the co-movements of three market indicators namely the exchange rates, stock price indices, and interest rates during the 1998 Russian crisis. We use a comprehensive sample of 26 representative countries from six regions, namely, East Asia, South Asia, Latin America, Eastern Europe, Africa and the Middle-East. We look at several scenarios including cross-country contagion in a single market and within and across regions in a selected sample of countries from all above stated regions. We use daily observations and focus on the 1998 Russian financial crisis. We construct a VAR (vector autoregression) model

suitable for our analysis and use Granger causality tests to investigate inter-linkages. We also study impulse responses by introducing shocks to each of three markets in Russia and observe the impact, timing, and duration of these shocks to the countries in the region as well as across the regions.

This study is organized in the following manner. Section 2 provides a historical perspective of the crises in Russia (1998). Section 3 reviews the theoretical and empirical literature on contagion. Data and estimation techniques are discussed in section 4. Section 5 reports the results of causality tests as well as impulse responses analysis. Finally, the conclusions are drawn in section 6.

2. Russian Financial Crisis: A Historical Perspective

Basically, the 1998 financial crisis in Russia was originated by Russia's decision to default on external debt payment. Before moving towards any empirical analysis to investigate he impact of the 1998 Russian crisis on markets within the Eastern European region and across regions, it is imperative to have a close to at the historical facts unleashed before and during the Russian crisis. We first look at some major economic indicators during the late 1990s in Russia and a sample of countries in the Eastern Europe region. A quick look at the macroeconomic/financial indicators provided in Table 1 reveals substantial variations across countries. During the period covered in this Table 1, some countries experienced negative growth while others had a marginal to reasonable positive growth rates. Russia, Romania and Yugoslavia experienced large devaluation in 1998 and 1999. All regional countries seem to suffer with fiscal deficits prior to the crisis. It is believed that Russian government failed to curtail these persistent deficits. The absence of a well-developed and efficient money, capital and bond markets further aggravated the problem and exerted a huge burden to the limited resources and eventually led to the financial crisis in 1998.

INSERT TABLE 1 AROUND HERE

[1] See Ariff and Khalid (2005) for further details.

A chronology of financial crisis in Russia suggests that the crisis was the result of overall macroeconomic mismanagement, specifically inadequate and inefficient management of the fiscal sector as well as a deteriorating balance of payments. The main cause of the Russian crisis was the imbalances in state finances, which resulted into a declining trend in major macroeconomic indicators as early as 1995.[2] Domestic debt, which started to rise in 1995 due to increased borrowings in the securities market rose to about 26 percent of GDP by mid-1998. The borrowings in the foreign financial market increased at the same time. However, the domestic borrowing was more of short-term maturity while foreign borrowings were of long-term nature.

The first attack on the rouble was felt in November 1997, partly a result of problems in tax collecting mechanism and high domestic debt[3] and partly due to a contagion (or spillovers) from Asia (the 997 Asian crisis).[4] It is argued that the damaging effects of the collapse of Hong Kong equity prices in October 1997 were not restricted to Asia but were also felt in emerging economies in Eastern Europe and Russia. Arkhipov et.al (1999) also attributes the downfall of Dow Jones Industrial Index which dropped to a record low of 554 points on October 1997 as the beginning of Russian economic problems. The Russian stock market followed the trend and dropped by 328.5 points during October-November 1997. This resulted into a lack of confidence and an attack on the Russian rouble. In an effort to defend the currency, the central bank of Russia (CBR) intervened in the foreign exchange market loosing US$6 billion (later reached to a level of about US$17 billion) of foreign reserves between October and November 1997. The second blow to the Russian economy and financial market came when the crisis in Asia worsened in late 1997 and early 1998. The Russian market was severely affected by this global trend and the stock market index (RTS-1) dropped by about 51 percent between October 1997 and January 1998. In the absence of any

[2] See Arkhipov et.al. (1999)

[3] See Buchs (1999) for details.

immediate response by the Russian government and policy makers to deal with the crisis, the situation continued worsening and by mid-May RTS-1 dropped by another 40 percent while international reserves went down to US$ 1.4 billion. In May 1998 the collapse of Russian rouble was very much imminent. The Russian government's ability to sovereign its debt and maintain stable currency became questionable.

As compared to the experiences in Latin America and Asia[5], the reaction of the government to overcome the crisis was very slow and created more lack of confidence among investors. Eventually, in June 1998, the International Monetary Fund, The International Bank for Reconstruction and Development and the government of Japan agreed to extend an assistance of US$22.6 billion to Russia with US$5.6 billion to be granted immediately. This, however, did not help improve the situation due to internal political turmoil and by August 1998, the country faced a full fledged crisis including the collapse of currency and stock markets and the domestic banking sector. On August 17, the Russian Central Bank announced that the rouble would be allowed to float within a wider band, between 6.0 to 9.5 roubles to the US dollar. All trading in T-bills was suspended and complete capital controls were imposed. The government also declared a 90-day moratorium on foreign commercial debt.

The spillover effects of Russian crises were much larger than what was believed at the time of crisis. The impact was felt on currencies in many emerging economies as well as equity prices in both emerging and developed markets. For example, equity markets in the United States bottomed out, in late August 1998, by about 20 percent below their high. Between August and mid-October 1998, stock prices in the European markets fell by about 35 percent. This shows that the negative impact of Russian crisis was not restricted to Russia but was spread to the global economy. It is also supported by an IMF study which reveals that the Russian crises, which

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[4] Khalid and Rajaguru (2006b) found evidence of this spillover from Asian countries to other parts of the world including Russia.

[5] See Khalid and Rajaguru and Kawai (2006a) for a discussion on the 1994 Mexican crisis. For a discussion of the 1997 Asian crisis, see Khalid and Kawai (2003).

dropped stock prices in Russia by over 30 percent, left the global markets down by at least 10 percent.[6] The above discussion and the summary of events unfolded during the 1998 Russian crisis lead us to believe certain cross-market and cross-country linkages that may have contributed to the spread of the crises. This aim of this paper is to empirically test this hypothesis.

3. Financial Market Contagion: Literature Survey

The repeated episodes of financial crisis in various parts of the world during the 1990s could be attributed to several factors including close financial market integration, regional similarities and most importantly, the financial market contagion which is the focus of this paper. Financial contagion may be defined as a systematic effect on the likelihood of speculative activity in one country's financial (such as foreign exchange, stock and/or money) markets arising from similar activity in another country's financial markets.

Theoretical literature provides a variety of explanations for the channels of contagion. A financial crisis may spread from one country to another due to some *Common shocks*, factors that may affect exchange rates or stock markets of several countries simultaneously. This could be a reaction of either a sharp decline in world aggregate demand or significant changes in commodity prices or large changes in exchange rates between major currencies. One of the important causes of currency crises is argued to be due to strong *trade linkages*. In such a case, currency (or foreign exchange market) contagion starts by a real depreciation of country A's currency due to speculative attacks. Such depreciation enhances its export competitiveness and produces a trade deficit for its competitor country B. This results into a depletion of foreign exchange reserves of country B and increases the probability of speculative attacks on the country B's currency. A pressure on domestic currency may expose the strength of the financial market and may increase the volatility of stock market returns and interest rates.

[6] See IMF-World Economic Outlook (1999) for details.

Similar to trade linkages, strong *financial linkages* are also considered as a major cause of contagion. In this case, if market in country A suffers a negative shock that is expected to increase risk exposure to financial assets, the investors in Country B may need a portfolio readjustment and risk management to avoid losses. However, if financial markets in a group of countries are closely linked, then a crisis in one country will increase the probability of crisis in the region as a whole. This will force investors to change their portfolio. As a result some countries may experience capital outflows even if their macroeconomic fundamentals have not changed.

Shifts in investor's sentiments[7].is another channel through witch the crisis spreads from one country to another. Accordingly, a country with weak financial market fundamentals is more likely to suffer from shocks elsewhere. Any speculative attack in another country will make this country more vulnerable to similar attacks. This could also be due to herd mentality where investors respond to a shock in one country in a similar pattern based on certain expectation on the movement of the market variables in the whole region.

Empirical literature, in general, has found evidence of a currency contagion. For example, a group of economists detected contagion in case of Tequila crisis in Latin America initiated by a crash of Mexican peso in 1994[8]. Eichengreen, Rose and Wyplosz (1996) used thirty years panel data for 20 industrialized countries and argue that currency contagion spread more easily to countries which were closely tied by international trade linkages than to countries in similar macroeconomics conditions. Using data from emerging markets, Glick and Rose (1999) concluded that trade was the important channel for contagion. Using a time-varying transition probability Markov-switching model, Cerra and Saxena (2000) found empirical evidence suggesting contagion (pressures on exchange rate emerging from Thailand) as one source of crisis in Indonesia along with other factors such as domestic financial conditions and political instability. Ahluwalia (2000) twisted the argument of common macroeconomic weaknesses to important similarities between

[7] Rijckeghem and Weder (1999) also define "pure contagion" as spread of crisis from one country to another (or the region) due to factors not termed as changes in fundamentals or any spillovers.

[8] Calvo and Reinhart (1995) and Sachs, Tornell and Velasco (1996) are among few of these studies.

countries as a channel for contagion and found support for contagion in a sample of 19 countries Asia and Latin America.

Rijckeghem and Weder (1999) argue that financial market linkages are an important source of spillovers from shock-originating country to other countries in the region. Using Mexico, Thailand and Russia as the crisis originating countries, they found support for financial market linkages as the source of spillovers. There is also an argument based on common creditor problem, which may lead to unexpected capital outflows independent of macroeconomic fundamentals. Later empirical research using data from Asian crisis period found support for the case of regional currency market contagion.[9]

It is evident from above discussion that most of the existing research is restricted to currency market only and investigates spillover effects within a region ignoring the possibility of an impact across regions and across markets. The issue of contagion, as such, has not been explored using all three financial market indicators namely, the exchange rate, stock prices and interest rates. Furthermore, not much attention is paid to the 1998 Russian crisis and its spillover effects within and across regions. The objective of this paper is to extend the existing research by incorporating all of these factors with a focus on the 1998 Russian crisis. We use daily observations to study the financial market contagion. We construct a VAR and apply Granger causality tests to identify the cross-country-cross market contagion during the above crises period. Later, we extend the analysis to investigate the impact of a shock introduced in each of the Russian market by using impulse responses. This study, in this respect, is much more comprehensive than the earlier research on the issue and could offer some important policy implications.

[9] Barrell, Ray, et.al. (1998), Biag and Goldfajn (1998), Fratzscher (1998), Perry and Lederman (1998), Masih and Masih (1999), Chan and Felmingham (2003), Min, McDonald and Choung (2003), and Sander and Kleimeier (2003) are among few of these studies.

4. Data and Estimation Techniques

This paper attempts to study the interlinkage between three important financial market indicators, namely, exchange rates, stock price indices and the interest rates with a focus on the 1998 Russian crisis. We investigate both cross-country and cross-market contagion within and across regions using a representative sample of countries from East-Asia, South Asia, Latin America, Eastern Europe, East Africa and the Middle-East. Daily observations on exchange rates, stock prices and interest rates for each country are used for empirical estimation.

Spot exchange rates are probably not the best reflector of exchange rate movements if the country has fixed or managed exchange rate regimes. Forward market rates should help to isolate the central bank intervention in the foreign exchange market and reflects the true movements of the exchange rate. However, forward rates are not available for most of the sample countries. We, therefore, use data for each country's domestic currency against the US$ (WMR; Reuters). Some of the countries report exchange rate against the UK pound sterling only. In such a case, these rates are then converted to domestic currency against the US dollar using UK pound/US dollar cross rate.

Morgan Stanley Capital International (MSCI) is the main source used for stock price indices. IFC index is used as a proxy in cases where MSCI index is not available. Noruma index is the third source and finally we use any domestic country average index (in cases where no other index is available). Interest rates are the most difficult to obtain especially if it is on a daily basis. Firstly, such data are not reported for most of the developing countries. Secondly, even if some data are reported they are not the common interest rates across countries. As a result, we have no choice but to use close proxy of a short term money market rate such as a three-month interbank rate. Depending of data availability, we use a variety of interest rates such as three-month deposit rate, three-month T-bill rate, 90-day CD, 3-month interbank rate, 7-15 days repo, etc. All these data details are provided in Appendix Table A1. All data on exchange rates, stock prices and interest rates are obtained from *DataStream*.[10]

[10] Details of the data and data sources are provided in Appendix Table A1.

For empirical estimation, we cover the 1998 Russian crisis period ranging from 1 August 1998 to 31 March 1999.

Estimation Techniques

Mean reversal property for variables used in this study is important prior to any empirical estimation. Standard ADF and Phillip-Perron unit root tests are used to identify the order of integration for each sample period corresponding to a particular crisis. The results of this exercise will help us to construct the specification of the vector autoregression (VAR) model.

The vector autoregression (VAR) is commonly used for analyzing the dynamic impact of random disturbances on the system of variables. The VAR approach models every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system and can be specified as:

$$y_t = A_1 y_{t-1} + \ldots.. + A_p y_{t-p} + \varepsilon_t \qquad (1)$$

Where y_t is a k vector of endogenous variables, A_1, …, A_p are matrices of coefficients to be estimated, and ε_t is a vector of innovations that may be contemporaneously correlated with each other but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables. It is very essential to determine the optimal lag length before estimating a VAR. It is common practice to choose a lag length arbitrarily allowing just enough lags to ensure that the residuals are white noise but maintaining the precision of estimates. There are also some procedures used to determine an appropriate lag length such as Akaike information criteria (AIC), Schwartz information criteria (SIC) and likelihood ratio (LR) test. We used all three methods to determine a lag length. Surprisingly, both the AIC and SIC suggest lag length of one while LR is inclusive. We, therefore, choose one lag for all VARs in this study. Since we have same lag length, each equation in the system could be estimated using OLS.

The main objective of estimating a VAR in this study is to identify any causal relationship among different markets across countries. For example, we are interested to see what causes the

disturbance in Thai foreign exchange market? This is accomplished by testing Granger causality by running a VAR on the system of equations and testing for zero restrictions on the VAR coefficients.

Next, we analyze the impulse responses. An impulse response function traces the effect of a one standard deviation shock to one of the innovations on current and future values of the endogenous variables. A shock to *i*-th variable directly affects the *i*-th variable, and is also transmitted to all of the endogenous variables through the dynamic structure of the VAR. Since innovations are usually contemporaneously correlated, they have common factors, which cannot be associated or isolated with a specific variable. As such, the ordering of variables becomes very important in this analysis.

The dynamic analysis of the VARs is usually carried out using the orthogonalized impulse responses' as suggested by Sims (1980). Accordingly, Cholesky decomposition is normally used in the literature where errors are orthogonalized in such a way that the covariance matrix of the resulting innovations is diagonal. However, as stated above, this method is rather arbitrary and the impulse responses are very sensitive to ordering of variables in the VAR. Pesaran and Shin (1997) proposed an alternative procedure called, the generalized impulse response (GIR) analysis, which is invariant to the ordering of variables in the VARs. Since ordering of variables in a rather large VAR as used in this paper may be difficult and complicated to identify an appropriate order of the variables. We, therefore, use the generalized impulse response analysis in this study. We concentrate on three regions and three markets. First, we introduce independent shocks to Russian exchange rates and analyze the impact within and across the regions. We repeat the same in other two markets namely, stock market and interest rates. We, finally, repeat the analysis using the full sample.

5. Empirical Results

As discussed earlier, we first perform the diagnostic tests on all the variables using DF/ADF and PP procedures. The results in differenced series are reported in Tables 2[11]. The results suggest that all the variables used in this study are integrated of order one I(1). These results help us construct a VAR as specified in equation (1) using variables in first difference and then perform the causality tests and impulse response analysis. We discuss these results in the following sub-sections.

Granger Causality Tests

This section examines the cross-country-cross-market linkages in the above sample countries. The analysis is, therefore, comprehensive, using a large sample of 3 markets of 26 countries. As a result, the coefficient matrix in the VAR is a 78x78 matrix. This means that any causality result, say between exchange rate of Argentina and stock prices for Russia does account for the whole VAR (78x78). For analytical purposes, the coefficient matrix is divided into 9 sub-matrices. Due to space constraint, we have only reported the summarized results in this paper in Table 3. The detailed results are included as Appendix Table B1-B9.

The results show that within exchange rate markets, changes in Russian rouble has major impact in a couple of Eastern-European markets only. Specifically, Russian currency cause changes in currencies in Czech Republic and Poland. However, the empirical tests suggest that changes in Russian rouble did cause changes in stock markets in Brazil and Malaysia and money market in Thailand. The results on stock market linkages are rather much stronger. The results in column 6 of Table 3 the changes in Russian stock market create movement in stock markets in Columbia, Indonesia, Japan, Thailand and Czech republic. We also find evidence of a causal relationship between Russian stock market and currency market in Czech Republic and Poland as well as Russian stock market and money market in Valenzuela, Israel and Zimbabwe. The empirical estimates of this paper do not support strong links between money market in Russia and

the three markets in the sample countries. The only evidence of a money market linkage is between interest rates in Russian and South Korea. Interest rate changes in Russian also influence stocks in Ecuador and exchange rates in Israel.

Another interesting finding revealed through these results is the feedback effect. For example, the results in column 1 of Table 3 show that Russian rouble cause changes in currencies in Czech Republic and Poland. It is interesting to note that Polish currency influences changes in Malaysian ringgit and Indian rupee while Czech currency causes changes in Indian rupee. Similarly we find that changes in stock market in Russia cause changes in stock market in Columbia (column 6) which then influences changes in currency markets in Malaysia and the Philippines (column 5). It is also evident from row 23 (RUS) of Table 3 that all three Russian markets are influenced by changes in market in Latin American countries (Argentina, Brazil, Chile, Columbia, and Mexico), Asian countries (Hong Kong, Malaysia, and India), and other regions (Morocco, Hungry, and Czech Republic). There are very clear evidences of the fact that contagion should be looked in a global perspective and any spill over effects should be studied across markets and across countries. These are important findings of this paper.

Impulse Responses

The above causality tests results, in general, do support that the spillover effects of turmoil in Russian financial market during August 1990 were felt in markets in Asia and Europe. In this section, we again test the global impact of Russian crisis using impulse response. To achieve this, we introduce a shock in each of the Russian financial market (currency, stock or money market) and see its impact within Eastern Europe region and across regions. Since, large part of our sample covers East Asian countries, for analytical purposes, we spilt the sample into two regions; East Asia (EA) and non-East Asia (NEA), which includes countries in Latin American region and all

[11] ADF and PP tests on level series suggest the presence of unit roots in all series. For brevity, these results are not reported in this paper. It is available from authors upon request.

remaining countries from South Asia, Middle-East, Africa and Eastern Europe. First, we introduce a 1 percent shock to Russian rouble and observe its impact on currency, stock and money markets in EA and NEA regions.[12] The results are reported in Figures 1-3.[13] First we introduce a shock to Russian rouble and examine the impact on all three markets in NEA and EA countries. This is provided in Figure 1 (a-f). Here we have two interesting observations. First, a disturbance in Russian rouble did not have any significant impact on currency market in NEA regions (Figure 1a). This is consistent with the results of Granger causality tests discussed earlier in this section. Second, though, the shock to Russian rouble does create some jitters in currency markets in EA region and takes about 10 days to disappear (see Figure 1(b)), the magnitude of these impacts is extremely small.[14] Figures 1(c) and 1(d) show the impact of a shock to Mexican peso in stock market. Here we observe that stock markets in NEA region show substantial movements but are short lived and the markets settle within 5 days. Stock markets in Brazil and Mexico show major losses within a day of rouble's collapse. EA stock markets are also disturbed with a shock to Russian rouble and takes longer time to settle (about 10 days). Stock market in Malaysia seems to feel the major impact of this. Finally, we look into money market and Figures 1(e) and 1(f) show that both NEA and EA markets were disturbed with a shock to Russian rouble. However, these disturbances disappear within 5 days in NEA region while money market in EA region takes about 10 days to settle, Singapore, Indonesia, Hong Kong and the Philippines being the major target of these disturbances.

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[12] We basically introduce a one unit shock to Russian rouble. Since the data is used in the first-difference log of exchange rate for each country, this one unit shock can be interpreted as a depreciation of Russian currency by 1%.

[13] It is important to note that Granger causality test examines overall significance of causal relation among the variables for given optimal lag structure. However, it does not explain the duration (time-length) and degree of impact a shock in one variable on other variables. The impulse responses overcome these problems. Interestingly, even if the Granger causality results do not support a significant causal relationship among the regional markets, impulse responses can still identify the impact of a shock to Russian markets on other markets (even though the magnitude could be very small). Moreover, by splitting the impulse responses for EA and NEA countries, we could identify how severely EA counties were hit by a shock in the Russian markets.

INSERT FIGURE 1 AROUND HERE

Figure 2 (a-f) demonstrates the impact of introducing a shock to stock market in Russia. Figure 2(a-b) shows the impact of a shock to Russian stock market in currency market in EA and NEA regions. We found a very strong link between the currency and stock market in Russia. Poland and Brazil are the only NEA countries where currency markets show some disturbance as a result of a shock to the Russian stock market with markets settling in within 5 days. On the contrary, most of the markets in EA region get a major upset. These include Indonesia, Malaysia and Thailand. These markets also take a longer time (about 8 days) to settle. The impact of stock market shock within NEA and EA stock market is observed is Figures 2(c-d). We do not find any evidence of a disturbance within stock markets of NEA region. However, all of the stock markets in EA region get a major beating as a result of a disturbance in the Russian stock market. Finally, Figure 2(e-f) shows that shocks in Russian stock markets do increase movements in money markets in both the NEA and the EA regions and takes about 8 days to settle.

INSERT FIGURE 2 AROUND HERE

Figure 3 depicts the impact of a shock to interest rates in Russia in NEA and EA regions. The evidence does suggest that the currency markets in both EA and NEA regions are affected by this shock and takes about 10 days to disappear. Similarly, a shock to money market in Russia leaves a major upset in the stock markets in NEA and EA regions with Brazil, Poland, Hungary and South Korea being the major target. The same shock, however, does not have any influence on the money market with NEA region. The money markets in Indonesia and Hong Kong are disturbed but settle within 4 days.

INSERT FIGURE 3 AROUND HERE

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[14] Since exchange rate for each country is measured against US$, an upward movement implies a depreciation of the currency. Similarly, currency depreciation has a negative impact on stock market and can be seen as a downward

In general, the results if the impulse response analysis are consistent with the causality test results and do confirm that the spillover effects of the collapse of Russian rouble were not only restricted within the region and within currency market but were felt in other market and other regional countries especially, most of the East Asian countries.[15]

6. Conclusions:

This study investigates the spread of contagion in global financial markets during the 1998 Russian crisis. We made an attempt to identify the patterns of linkages among regional and global foreign exchange markets, stock markets and money markets using national currencies, stock prices and interest rates and an indicator of each of these markets. We used high frequency data (daily observations) and a variety of econometric test procedures including Granger causality and impulse responses.

The analysis tends to indicate that the currency and stock markets are strongly linked within and across regions. The evidence for interest rates are, however, not very strong. This may due to data limitation on interest rates and the fact interest rates are still regulated in most of the developing countries. The evidence from impulse response analysis suggests that impact of shocks in Russian markets will take about 4-9 days to die down in the regional as well as global markets. These results, therefore, highlight an interesting feature in this area of research where previous efforts were restricted only to investigate regional linkages or contagion. The study provides an insight into the linkages that may be observed and are supported empirically across regions. These finding will help- policy makers to design appropriate policies in case an adverse shock is observed in a linked market.

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movement in stock market. Finally, currency depreciation is expected to put upward pressure on the interest rates.

[15] These findings are consistent with IMF (1999).

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TABLE 1: Selected Economic and Financial Indicators: Eastern Europe

Countries/Period	GDP Growth (%)	CA/GDP (%)	Fiscal Balance/GDP (%)	Exchange Rate (Local $/US$)	FX/Imports (%)	FX/Short-term Debt (%)	Total Debt/Exports (%)	Short-term debt/Total Debt (%)	Change in stock price index (%)
Bulgaria									
1997	-6.9	4.20	-3.1	1.68	41.98	284.09	185.20	7.83	???
1998	3.5	-2.06	1.4	1.76	55.30				
1999				1.84					
Czech Republic									
1997	0.3	-6.17	-0.9	31.70	34.11	137.72	94.33	32.94	-13.08
1998	-2.3	-1.97	-1.6	32.28	41.45				-7.99
1999				34.57					-16.28
Hungary									
1997	4.6	-11.50	-4.0	186.79	40.31	248.20	130.84	13.77	110.10
1998	5		-5.4	214.40	36.09				84.03
1999				237.15	38.34				-12.60
Romania									
1997	-6.9	-6.11	-3.6	7,167.90	32.80	389.83	123.85	9.09	???
1998	-5.4	-6.95	-1.2	8,875.60	24.25				
1999				15,333.00	25.83				
Russia									
1997	0.8	753.05	-7.0	5.78	17.34	130.32	161.85	6.86	202.56
1998	-4.6		-5.0	9.71	13.20				1.59
1999				24.62	20.68				-57.11
Yugoslavia									
1997	7.4	-1.46	???	15.20	???	???	637.96	27.2	???
1998	2.6			69.71					
1999									

Source: IMF-International Financial Statistics, CD-ROM.

TABLE 2
UNIT ROOT TESTS
Russian Crisis (August 01, 1998 – March 31, 1999)

Countries	Exchange Rates		Stock Prices		Interest Rates	
	First Differences		First Differences		First Differences	
	ADF	PP	ADF	PP	ADF	PP
Argentina	-20.22*	-37.91*	-12.12*	-12.08*	-13.81*	-13.86*
Brazil	-10.31*	-10.64*	-12.36*	-12.35*	-15.51*	-16.19*
Chile	-12.65*	-12.65*	-10.08*	-10.22*	-13.00*	-13.15*
Colombia	-11.41*	-11.39*	-9.67*	-9.96*	-13.42*	-13.44*
Ecuador	-13.00*	-13.01*	-13.20*	-13.20*	-13.35*	-13.35*
Mexico	-13.33*	-13.34*	-11.73*	-11.71*	-13.12*	-13.12*
Venezuela	-9.27*	-9.26*	-10.54*	-10.30*	-15.51*	-15.63*
Hong Kong	-17.75*	-19.63*	-12.03*	-12.00*	-12.65*	-12.64*
Indonesia	-12.19*	-12.19*	-11.10*	-11.16*	-13.18*	-13.18*
Japan	-11.36*	-11.35*	-13.50*	-13.50*	-10.77*	-10.97*
Malaysia	-12.15*	-12.15*	-15.61*	-15.63*	-13.22*	-13.22*
Philippines	-12.60*	-12.59*	-10.92*	-10.83*	-13.24	-13.25*
Singapore	-14.40*	-14.52*	-11.65*	-11.61*	-12.91*	-12.91*
South Korea	-10.58*	-10.57*	-12.55*	-12.57*	-7.36*	-7.34*
Taiwan	-10.62*	-10.81*	-12.97*	-12.97*	-13.67*	-13.71*
Thailand	-12.71*	-12.73*	-11.93*	-11.97*	-14.75*	-14.71*
India	-12.71*	-12.70*	-13.26*	-13.26*	-21.31*	-27.38*
Pakistan	-14.28*	-14.55*	-12.15*	-12.19*	-13.69*	-13.71*
Sri Lanka	-14.00*	-13.98*	-9.46*	-9.46*	-13.12*	-13.13*
Czech Rep.	-11.52*	-11.60*	-12.34*	-12.51*	-13.06*	-13.09*
Hungary	-13.09*	-13.09*	-12.33*	-12.32*	-15.25*	-15.55*
Morocco	-14.30*	-14.29*	-11.06*	-11.07*	-13.23*	-13.23*
Poland	-11.91*	-11.84*	-10.98*	-10.96*	-17.63*	-18.51*
Russia	-8.65*	-8.50*	-11.30*	-11.34*	-11.77	-11.79*
Israel	-12.64*	-12.64*	-11.54*	-11.59*	-13.10*	-13.10*
Zimbabwe	-12.63*	-12.72*	-10.21	-10.26*	-13.27*	-13.27*

Note: *, **, *** indicate that the null of a unit root is rejected at 1%, 5% and 10% levels respectively.

TABLE 3

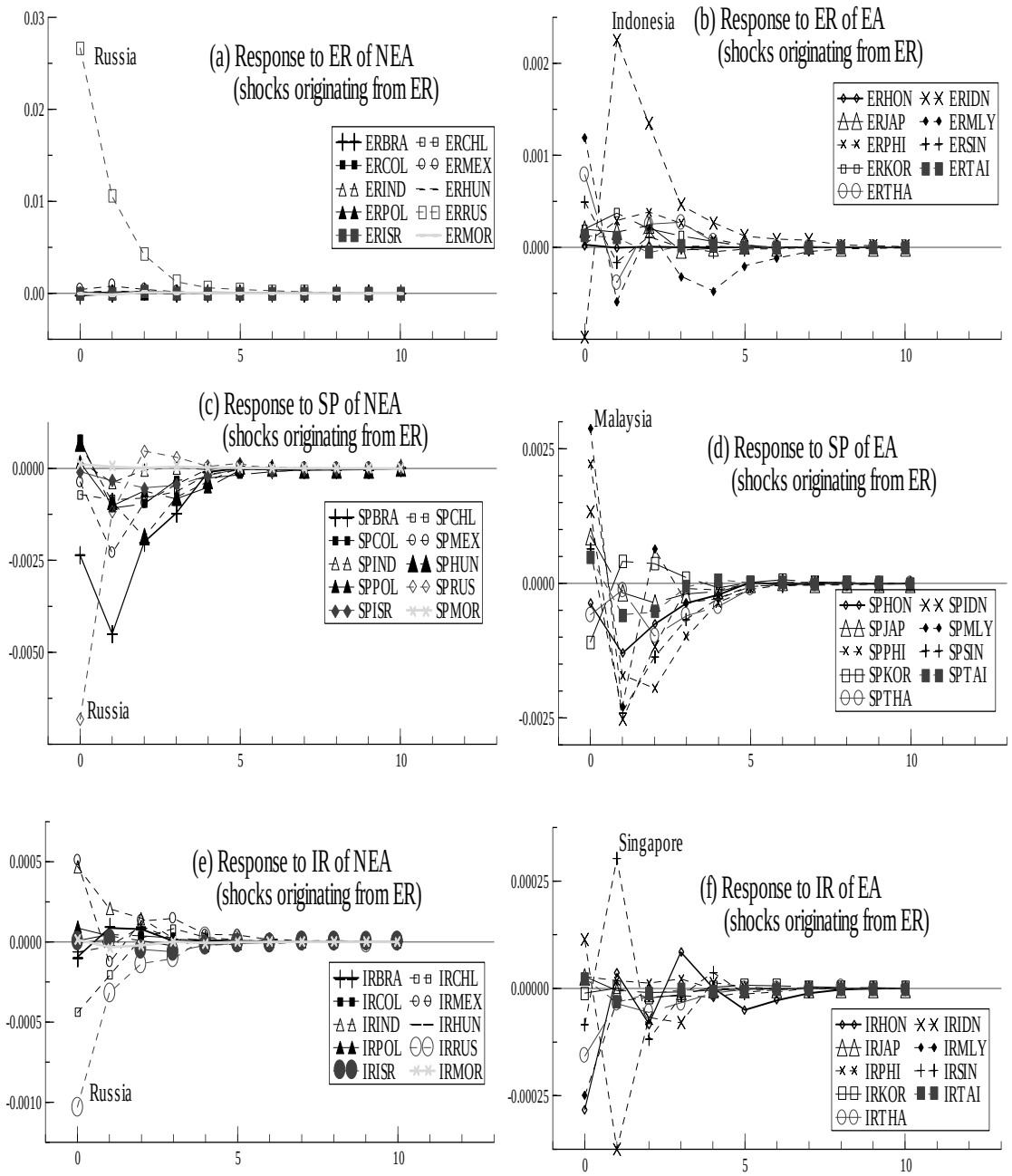
Summary Results of Causality Tests: Cross Market

Russian Crises Period: August 01 1998 to March 31 1999

	CAUSE								
EFFECT	**ER vs ER**	**SP vs ER**	**IR vs ER**	**ER vs SP**	**SP vs SP**	**IR vs SP**	**ER vs IR**	**SP vs IR**	**IR vs IR**
ARG	ARG, IDN	MOR	IND	-	SIN	ECU, HON, POL	PAK	-	ZIM
BRA	BRA, ECU	BRA, **RUS**	-	ECU, MEX, JAP, POL	ARG, JAP, SIN, POL	MLY, TAI	COL, SIN	SIN	-
CHL	-	POL	-	ARG, POL	ARG	VEN, PHI, PAK	IND	THA	ARG
COL	-	VEN, HON, POL	CHL, VEN, PHI, THA	THA, ZIM	VEN, **RUS**	JAP, ZIM	HON	-	BRA
ECU	-	VEN, SIN, THA, ZIM	-	KOR	KOR, PAK, SRI	THA	JAP	JAP, PAK, **RUS**	VEN
MEX	IND, MOR	-	MEX, THA, HUN, ISR	ARG, MEX	ARG	JAP	JAP	MEX	VEN
VEN	IDN, MLY	VEN	THA	VEN	VEN, MLY	JAP, PHI, **RUS**	-	MEX, TAI, ZIM	CHL, KOR, THA
HON	CHL, MEX, JAP, PHI, SIN	HON, JAP, KOR	HON, PHI, KOR, THA, SRI, HUN	-	MEX	RUS	IND, MOR	PAK, CZE, POL	ARG, VEN, MLY, POL, MOR
IDN	-	KOR	-	PHI	CHL, VEN, HON, KOR, **RUS**	BRA, MEX, POL	SIN, MOR	VEN	-
JAP	IDN, IND	-	COL	-	CHL, **RUS**	-	-	-	JAP
MLY	POL	COL, HON, PHI, CZE, **RUS**	HON	COL, KOR	CHL, MLY, SRI, ZIM	COL, MLY, TAI, HUM	POL, ISR	SIN, HUN, ZIM	ZIM
PHI	KOR, IND	COL, HON, KOR	-	COL	MOR	-	ECU, PHI, TAI, SRI, ZIM	-	SRI
SIN	IND	HON	JAP	PAK, HUN	-	-	ZIM	-	PAK
KOR	MOR	HUN	CHL, SIN, CZE, ZIM	-	MEX, JAP, PHI, SIN, ZIM	ECU	TAI, POL	ECU, THA, PAK, CZE, POL	KOR, THA, **RUS**
TAI	-	-	**RUS**	SIN	MEX, TAI, **RUS**	CHL, KOR, TAI, POL	-	CZE	COL, VEN
THA	IND, MOR	HON, KOR	-	-	-	-	ZIM	ECU	KOR
IND	CZE, POL	MOR	-	HUN	JAP	CHL, HUN	SIN	ARG, SRI	VEN, IND, HUN
PAK	-	KOR	VEN, MLY, CZE	-	PHI, TAI	-	-	ECU, MLY, SRI	-
SRI	SRI	PHI	ARG	BRA, ZIM	SRI, MOR	BRA	-	TAI, HUN, ISR, ZIM	-
CZE	COL, VEN, **RUS**	CZE, HUN	KOR, THA, CZE	PAK, **RUS**	**RUS**	ECU, SIN	ARG, BRA, CHL, JAP, PAK, HUN,	MLY, KOR	-
HUN	POL	CHL	MLY, TAI, THA	KOR, THA	MEX	IDN	SRI	VEN, HON	MEX, HUN
POL	**RUS**	CHL, CZE,	MLY, IND, POL	IND, **RUS**	ARG	-	-	ZIM	ARG, VEN, JAP POL
RUS	COL, MEX, HON **RUS**, MOR	HUN	-	BRA, MLY, HUN, MOR	CHL, IND, **RUS**	ARG	COL, HON, MLY, CZE	-	-
ISR	BRA, MLY, THA	COL	ARG, BRA, SRI, ZIM	PHI	KOR	BRA, **RUS**	**RUS**	-	HON, KOR, MOR
MOR	ECU, PHI	CHL	MEX, IDN, KOR, THA, IND	-	SRI	BRA, HUN	THA	-	IND
ZIM	-	TAI	ARG, IDN, CZE, HUN, ZIM	THA	IDN, SIN, MOR	**RUS**	ZIM	-	BRA, HON, CZE

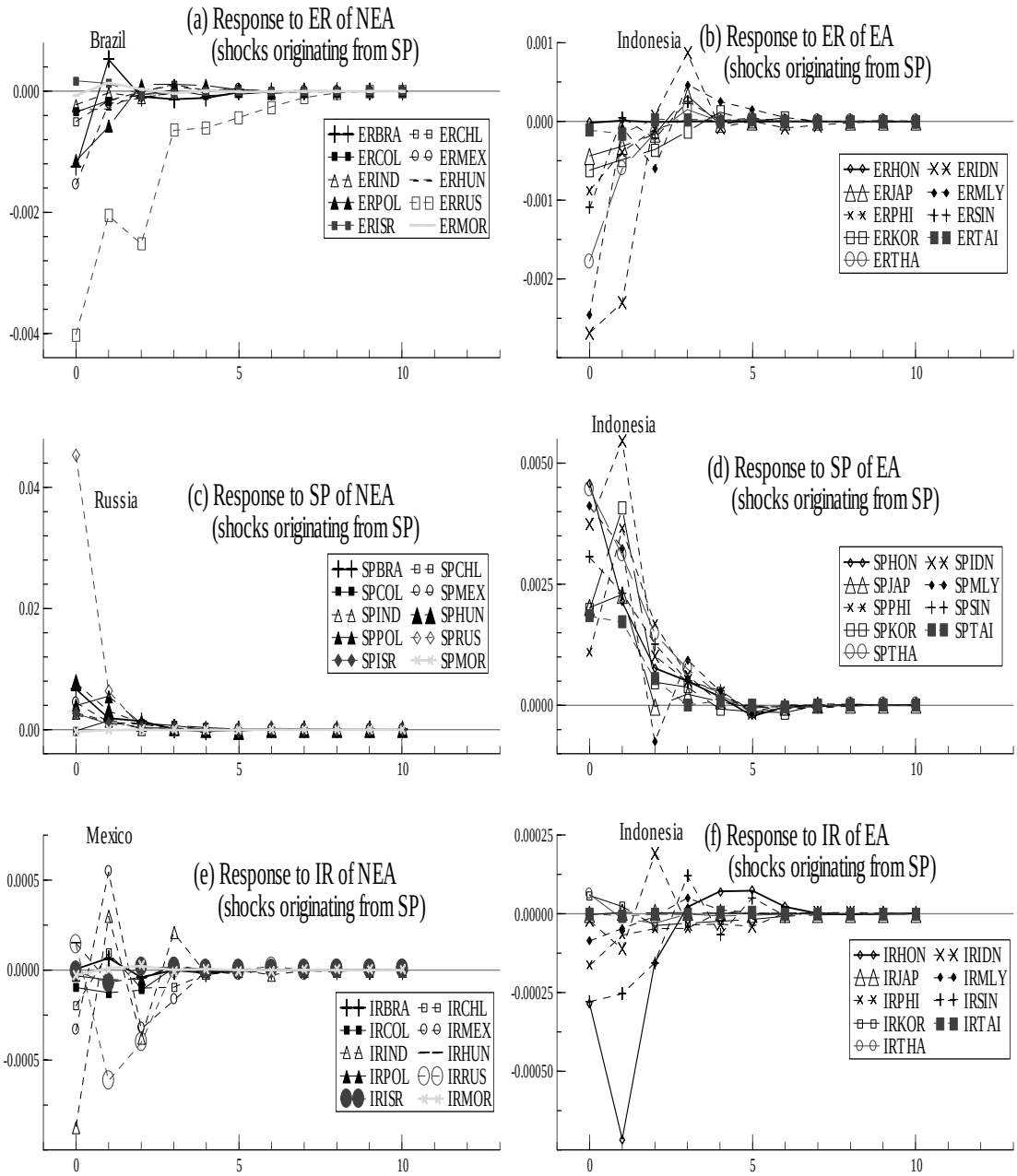
Note: At least 5% significance based on F-test.

Figure 1: Generalized Impulse Response Functions



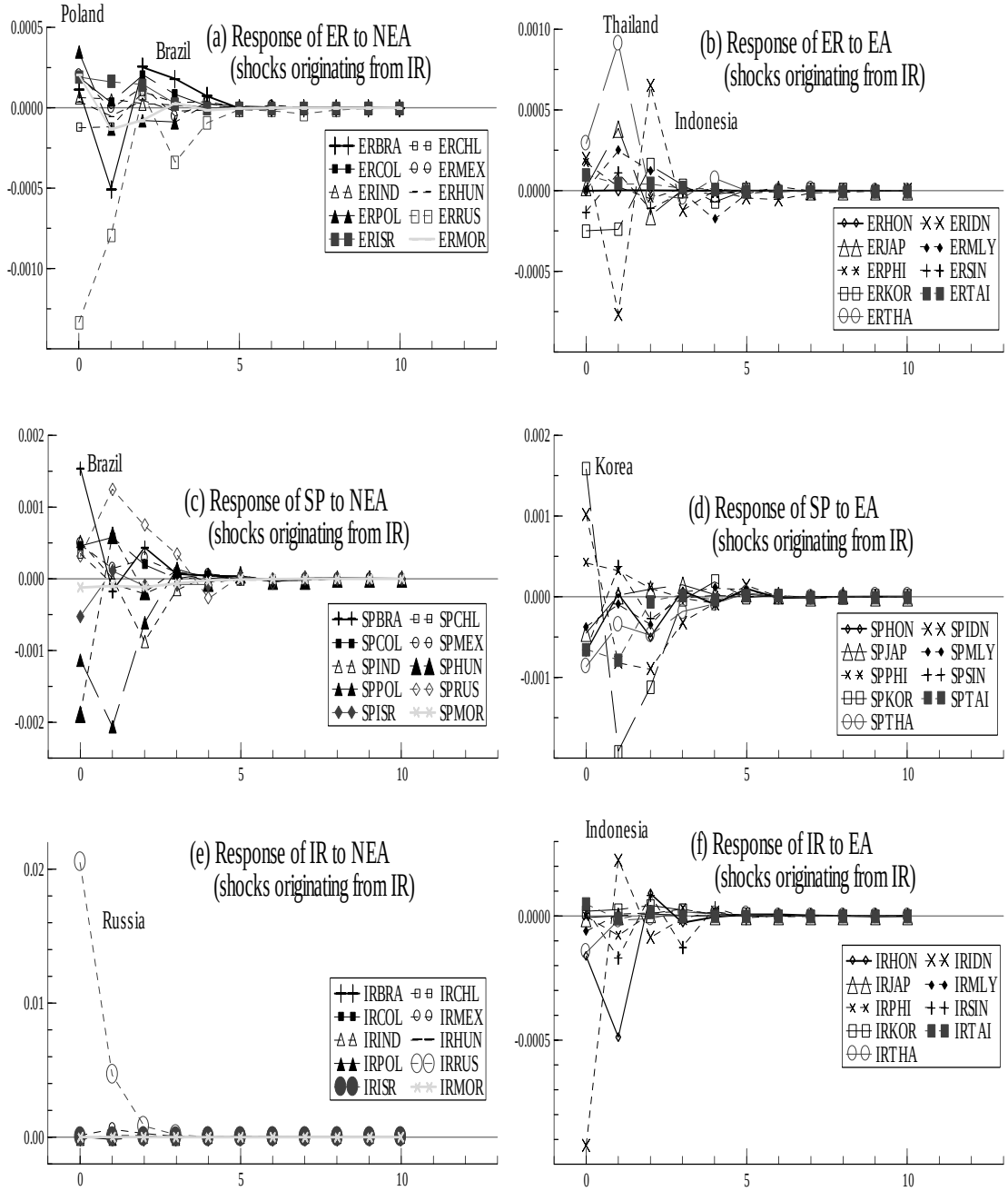
Notes:
i) ER = Exchange Rate; SP = Stock Price; IR = Interest Rate
ii) EA = East Asian Countries; NEA = Non-East Asian Countries

Figure 2: Generalized Impulse Response Functions



Notes:
i) ER = Exchange Rate; SP = Stock Price; IR = Interest Rate
ii) EA = East Asian Countries; NEA = Non-East Asian Countries

Figure 3: Generalized Impulse Response Functions



Notes:
i) ER = Exchange Rate; SP = Stock Price; IR = Interest Rate
ii) EA = East Asian Countries; NEA = Non-East Asian Countries

Appendix Table A1: Data Descriptions

	INTEREST RATES
	Interbank/Other
ASIA	
China	na
Hong Kong	3m Interbank: 1/1/92-12/31/99
Indonesia	90 Day Deposit: 1/1/92-12/31/99
Japan	3m Interbank: 1/1/92-12/31/99
Malaysia	3m Interbank: 8/10/93-12/31/99
Philippines	3m Tbill: 1/92-12/31/99
Singapore	3m Interbank: 1/1/92-12/31/99
South Korea	90day CD: 1/3/92-12/31/99
Taiwan	90 Day Deposit: 1/6/92-12/31/99
Thailand	3m Interbank: 1/7/92-12/31/99
SOUTH ASIA	
India	90 Day Deposit: 1/1/92-12/31/99
Pakistan	Repo 7day: 2/18/92-12/31/99
Sri Lanka	3m Tbill: 10/7/94-12/31/99
LATIN AMERICA	
Argentina	90day deposit: 1/1/92-12/31/99
Brazil	Savings a/c: 10/10/94-12/31/99
Chile	90day CD: 1/3/94-12/31/99
Colombia	Fixed Term Dep: 1/1/92-12/31/99
Ecuador	Av. Bank Lending: 1/25/93-12/31/99
Mexico	90day CP: 1/20/93-12/31/99
Peru	na
Venezuela	Repo: 6/19/92-12/31/99
EASTERN EUROPE & NIS	
Czech Republic	3m Interbank: 4/22/92-12/31/99
Hungary	3m Interbank: 9/7/95-12/31/99
Poland	3m Interbank: 6/4/93-12/31/99
Russia	3m Interbank: 9/1/94-12/31/99
Yugoslavia	na

E. AFRICA & MIDDLE EAST	
Egypt	na
Israel	3m Tbill: 5/30/95-12/31/99
Kenya	3m Tbill: 1/31/95-12/31/-99
EASTERN EUROPE & NIS	
Czech Republic	3m Interbank: 4/22/92-12/31/99
Hungary	3m Interbank: 9/7/95-12/31/99
Poland	3m Interbank: 6/4/93-12/31/99
Russia	3m Interbank: 9/1/94-12/31/99
Yugoslavia	na
E. AFRICA & MIDDLE EAST	
Egypt	na
Israel	3m Tbill: 5/30/95-12/31/99
Kenya	3m Tbill: 1/31/95-12/31/-99

Appendix Table: B1
Test Results of Cross-Market Causality: Exchange Rates
(VARs with One lag and constant)
Russian Crises Period: August 01 1998 – March 31, 1999

	ERARG	ERBRA	ERCHL	ERCOL	ERECU	ERMEX	ERVEN	ERHON	ERIDN	ERJAP	ERMLY	ERPHI	ERSIN	ERKOR	ERTAI	ERTHA	ERIND	ERPAK	ERSRI	ERCZE	ERHUN	ERPOL	ERRUS	ERISR	ERMOR	ERZIM
ERARG	-0.367*	+0.002	+0.011	-0.001	+0.001	-0.001	+0.000	-0.147	-0.003#	+0.003	-0.000	+0.006	+0.005	-0.003	+0.000	-0.002	+0.006	-0.004	+0.002	-0.001	-0.001	-0.001	+0.000	-0.011	-0.002	+0.004
ERBRA	+6.578	+0.361*	+0.270	-0.192	-0.107#	-0.279	+0.333	+3.570	+0.110	+0.149	+0.036	-0.074	+0.260	+0.064	+0.939	+0.270	-0.409	+0.384	+0.006	+0.203	-0.579	-0.296	-0.050	+0.957	+0.202	-0.359
ERCHL	+0.800	+0.026	-0.060	-0.000	-0.007	-0.029	-0.005	+0.622	+0.003	-0.025	-0.004	-0.014	-0.012	-0.030	+0.136	-0.000	-0.198	+0.007	+0.261	+0.053	-0.019	+0.017	+0.008	+0.182	-0.021	-0.070
ERCOL	-0.376	-0.016	-0.067	+0.112	-0.005	+0.014	+0.278	+1.701	+0.010	+0.073	-0.027	-0.047	+0.152	-0.025	+0.051	-0.28@	-0.193	+0.008	-0.010	-0.095	+0.082	+0.097	+0.002	+0.247	+0.050	+0.196
ERECU	+11.440	+0.177	-1.204	-0.384	+0.040	-0.378	-0.814	-1.185	+0.30@	-0.411	+0.124	-0.606	+0.735	-0.761	+1.332	+0.829	-0.804	-0.365	+1.555	-0.682	+0.133	+1.228@	+0.019	+0.527	-1.185	+1.895
ERMEX	-5.215	-0.053	-0.358	+0.137	-0.005	-0.342*	+0.338	+0.035	+0.024	+0.033	+0.023	+0.102	-0.043	+0.014	-0.091	+0.045	-0.963#	+0.084	+0.581	+0.038	-0.040	+0.255@	+0.019	+0.100	+0.442#	+0.500
ERVEN	-0.821	-0.001	+0.024	-0.038	+0.005	-0.033	+0.17@	-0.211	+0.023#	-0.024	-0.022*	+0.008	+0.049	+0.007	-0.082	-0.024	+0.069	+0.034	-0.092	-0.031	+0.107@	-0.015	-0.006	-0.072	-0.034	+0.069
ERHON	-0.026	-0.000	+0.015#	+0.001	+0.000	-0.006#	+0.009	-0.165	-0.000	+0.005#	-0.000	+0.007#	-0.013#	-0.001	-0.002	-0.001	-0.008	+0.001	-0.011	-0.001	+0.005	-0.006@	-0.000	+0.007	-0.006	+0.001
ERIDN	-11.724	+0.176	-0.175	-0.241	-0.059	-0.099	+0.869	+29.71@	+0.143	+0.160	+0.046	-0.065	-0.298	+0.102	+0.466	+0.069	-0.760	-0.157	+1.689	+0.147	-0.068	-0.547	+0.115#	+1.406	-0.283	-1.333
ERJAP	+3.056	+0.095	+0.355	-0.191	-0.033	+0.036	-0.115	+3.075	+0.117#	+0.041	-0.033	-0.221	+0.091	-0.019	+0.217	-0.225	-1.610#	-0.065	-0.854	-0.029	+0.218	-0.071	+0.006	+0.682	+0.221	-0.319
ERMLY	-2.597	+0.160	-0.215	-0.366	-0.044	-0.010	-0.608	-11.531	+0.101	-0.392	+0.003	+0.305	+0.950	-0.102	-0.902	-0.356	+0.219	+0.296	-2.063	+0.118	-0.366	+0.932#	-0.053	+0.733	+0.108	+0.694
ERPHI	-0.281	+0.019	-0.160	+0.029	-0.002	-0.066	-0.409	+3.032	+0.015	+0.106	-0.018	-0.150	+0.224	+0.254#	+0.121	-0.196	-1.042*	-0.103	-0.605	+0.170	-0.012	-0.094	+0.012	+0.172	+0.265	-0.081
ERSIN	-1.906	+0.006	+0.27@	-0.058	-0.014	-0.054	+0.066	+2.972	+0.035	-0.072	-0.011	-0.092	+0.201	-0.043	-0.037	-0.015	-0.841*	-0.064	-0.015	-0.105	+0.056	-0.088	-0.008	-0.026	+0.152	+0.284
ERKOR	-6.69@	+0.005	+0.010	-0.054	+0.011	-0.106	-0.180	+5.111	-0.020	+0.16@	+0.006	+0.007	-0.365	+0.156	-0.113	+0.185	-0.032	+0.010	+0.516	+0.037	-0.030	+0.089	+0.021	-0.159	+0.510#	-0.009
ERTAI	-0.794	+0.007	+0.093	-0.052	+0.000	-0.008	+0.053	+2.029	+0.018	+0.033	+0.006	-0.008	+0.047	+0.061	+0.014	+0.022	-0.203	-0.016	+0.245	+0.026	+0.044	-0.028	+0.003	+0.037	+0.113	+0.070
ERTHA	+1.521	+0.010	+0.066	+0.015	-0.007	-0.046	+0.116	-1.099	+0.022	-0.076	-0.017	+0.022	+0.309	+0.107	-0.002	-0.218	-1.009*	-0.182@	-0.067	-0.004	+0.145	-0.100	-0.005	-0.056	+0.379#	+0.091
ERIND	+0.357	+0.02@	+0.025	+0.016	-0.001	-0.005	+0.001	+0.909	+0.014	-0.029	-0.001	+0.07@	+0.057	+0.011	-0.093	-0.057	+0.028	-0.011	+0.25@	+0.065#	-0.006	-0.113*	+0.001	-0.030	-0.027	+0.082
ERPAK	+5.81@	-0.044	+0.365	-0.005	-0.007	-0.050	+0.239	-1.060	-0.031	-0.038	-0.005	-0.018	+0.178	+0.045	+0.078	+0.064	-0.293	+0.033	-0.135	-0.048	+0.189	+0.018	-0.009	-0.046	+0.050	-0.055
ERSRI	-0.799	+0.008	+0.039	+0.008	+0.003	-0.009	-0.063	+0.431	+0.006	+0.03@	+0.004	-0.016	-0.005	+0.002	+0.030	-0.026	-0.16@	+0.010	-0.251#	-0.008	+0.033	+0.003	-0.003	+0.025	-0.001	-0.041
ERCZE	+3.183	+0.054	+0.023	-0.257#	-0.029	-0.050	+0.830*	+6.573	+0.017	-0.040	-0.026	+0.121	+0.222	+0.084	+0.112	-0.156	-0.530	+0.035	-1.10@	-0.027	+0.232	+0.108	-0.047*	+0.410	+0.178	-0.390
ERHUN	+0.967	+0.035	-0.041	-0.14@	-0.017	+0.131@	+0.150	+1.880	-0.008	-0.057	-0.009	-0.010	+0.219	-0.001	+0.001	-0.085	-0.064	-0.061	+0.013	-0.053	+0.031	+0.240*	-0.009	+0.245	+0.098	-0.002
ERPOL	+1.951	+0.059	-0.036	-0.049	-0.04@	-0.117	+0.389	+8.229@	-0.019	-0.030	-0.011	+0.056	+0.109	+0.135	+0.069	-0.093	+0.394	-0.072	-0.95@	-0.002	+0.253	+0.035	-0.031#	+0.182	+0.135	+0.168
ERRUS	-37.4@	+0.208	-1.014	+1.678#	-0.089	-2.536*	+1.141	-96.558*	-0.047	+0.028	-0.101	-0.987	+1.056	-0.410	+0.007	+0.847	-1.743	-1.183	+5.348	-0.613	-1.231	-0.355	+0.441*	+0.022	+2.961#	+2.335
ERISR	-0.332	+0.025#	+0.087	+0.012	-0.001	+0.013	-0.077	+1.633	-0.002	-0.048	-0.024*	+0.033	-0.003	-0.067@	-0.132	+0.148#	-0.170	+0.025	+0.008	+0.019	+0.038	-0.091#	+0.002	-0.046	-0.054	+0.136
ERMOR	+0.722	-0.002	+0.100	-0.043	+0.029*	-0.081	+0.080	+0.451	+0.017	-0.023	-0.006	+0.142#	-0.072	-0.103@	-0.053	+0.139	-0.198	+0.017	-0.057	-0.001	-0.103	-0.100	-0.003	+0.203	-0.211@	+0.080
ERZIM	-0.258	-0.002	+0.026	-0.036	-0.001	+0.002	+0.063	-0.932	-0.020	-0.026	-0.006	-0.008	+0.043	-0.028	-0.052	+0.027	-0.086	+0.042	+0.158	-0.010	+0.049	+0.046	+0.010@	-0.042	+0.025	-0.005

Note: The value in each cell is the coefficient estimate for each parameter while a superscript indicates the significance of F-test. *, # and @ indicate significance at 1%, 5% and 10% respectively

Appendix Table: B2
Test Results of Cross-Market Causality: Exchange Rates vs Stock Prices
(VARs with One lag and constant)
Russian Crises Period: August 01 1998 – March 31, 1999

	SPARG	SPBRA	SPCHL	SPCOL	SPECU	SPMEX	SPVEN	SPHON	SPIDN	SPJAP	SPMLY	SPPHI	SPSIN	SPKOR	SPTAI	SPTHA	SPIND	SPPAK	SPSRI	SPCZE	SPHUN	SPPOL	SPRUS	SPISR	ERMOR	SPZIM
ERARG	+0.001	-0.001	+0.001	-0.000	-0.003@	-0.001	+0.001	-0.000	-0.001@	+0.000	-0.001	-0.002	+0.002	-0.000	+0.000	+0.000	-0.000	-0.001	+0.001	+0.000	-0.001	+0.001	-0.000	+0.002	-0.001	-0.000
ERBRA	+0.086	-0.102	-0.246	-0.170@	+0.287#	+0.250#	-0.014	+0.054	+0.012	+0.379*	-0.037	+0.101	-0.105	+0.020	+0.059	+0.101	+0.067	-0.001	-0.096	+0.047	+0.139@	-0.356*	-0.016	-0.248	-0.216	-0.186
ERCHL	-0.058#	+0.025	+0.026	-0.004	+0.013	-0.018	+0.006	+0.010	+0.010	-0.007	-0.011	-0.020	+0.006	+0.007	+0.017	+0.02@	+0.006	+0.010	-0.016	-0.000	+0.011	-0.033#	-0.003	+0.015	-0.018	-0.026
ERCOL	+0.08@	-0.011	-0.071	-0.051	-0.005	-0.025	-0.021	-0.042	-0.006	+0.028	-0.029	-0.004	+0.033	-0.040	-0.056	+0.057#	+0.004	+0.042@	-0.010	+0.020	+0.024	-0.029	-0.006	-0.058	-0.161	-0.123#
ERECU	+0.389	-0.020	-0.269	+0.121	+0.109	-0.284	-0.022	-0.101	+0.050	-0.081	+0.011	+0.344	-0.154	-0.304#	+0.178	-0.031	+0.341	-0.125	-0.024	+0.262	-0.133	+0.027	+0.053	+0.249	+1.090	-0.288
ERMEX	-0.146*	+0.017	-0.084	-0.008	-0.014	-0.103#	+0.04@	+0.014	-0.009	+0.046	-0.020	+0.045	+0.025	-0.007	-0.036	+0.041	+0.024	+0.035	-0.016	-0.002	+0.018	-0.042	+0.001	+0.069	+0.119	-0.038
ERVEN	+0.001	+0.003	-0.015	-0.008	-0.012	-0.001	-0.039*	+0.007	+0.003	+0.006	+0.008	-0.013	+0.003	-0.018@	+0.012	-0.002	+0.007	+0.002	+0.015	+0.001	+0.004	+0.006	-0.002	+0.023	-0.013	-0.007
ERHON	+0.002	-0.001@	-0.001	-0.002@	+0.001	-0.002@	+0.001	-0.001	-0.000	-0.000	+0.001	-0.000	+0.001	-0.001	+0.001	-0.000	+0.002	+0.000	+0.000	+0.002	+0.000	+0.000	-0.000	+0.001	+0.005	+0.002
ERIDN	+0.35@	-0.120	-0.223	-0.127	+0.047	-0.044	+0.072	+0.000	+0.016	+0.149	+0.030	+0.355#	-0.072	-0.002	-0.032	-0.095	+0.135	+0.125	-0.089	-0.012	-0.047	-0.119	-0.015	-0.280	-0.196	-0.248
ERJAP	+0.13@	-0.055	+0.141	+0.028	+0.16@	+0.017	-0.060@	+0.033	+0.016	-0.001	-0.046	+0.069	-0.093	+0.000	+0.047	+0.015	+0.017	+0.054	+0.001	+0.073	-0.083	+0.019	-0.035@	+0.146	+0.112	-0.105
ERMLY	+0.016	-0.067	+0.109	+0.266#	+0.27@	-0.100	-0.001	+0.083	-0.014	-0.030	+0.043	+0.133	+0.083	-0.166#	-0.088	-0.111	-0.065	-0.043	-0.183	-0.011	+0.061	+0.002	-0.008	+0.287	+0.111	-0.246
ERPHI	+0.060	-0.033	-0.047	-0.077#	-0.002	+0.004	-0.041@	-0.034	+0.011	+0.012	-0.019	-0.043	+0.005	+0.013	-0.021	+0.031	-0.010	+0.028	+0.040	+0.017	-0.023	-0.017	-0.002	-0.044	+0.101	-0.022
ERSIN	+0.019	-0.006	+0.021	+0.001	+0.031	-0.021	-0.021	-0.011	-0.008	-0.005	-0.022	+0.017	+0.000	-0.022	+0.030	+0.000	-0.010	+0.042#	-0.028	+0.047	-0.045#	+0.021	-0.007	+0.08@	+0.16@	-0.030
ERKOR	-0.058	-0.022	-0.020	-0.001	+0.064	+0.032	+0.005	+0.07@	-0.003	+0.005	-0.015	+0.073	-0.007	-0.004	-0.035	-0.048	+0.022	+0.028	+0.021	-0.055	-0.024	+0.030	+0.019	-0.030	+0.121	-0.020
ERTAI	+0.023	-0.016	-0.010	+0.008	+0.025	+0.010	+0.002	-0.018	+0.007	+0.000	-0.004	+0.020	+0.041#	+0.014	-0.03@	-0.010	-0.003	+0.000	-0.016	-0.006	-0.024@	+0.012	+0.009@	-0.018	+0.070	+0.009
ERTHA	-0.012	-0.006	+0.023	-0.020	+0.034	-0.047	-0.012	-0.005	-0.002	-0.031	-0.023	+0.038	+0.023	-0.009	-0.031	-0.013	+0.001	+0.035	-0.004	+0.024	-0.051@	+0.018	+0.003	+0.043	+0.111	-0.010
ERIND	+0.016	-0.013	-0.004	+0.001	+0.005	+0.001	+0.001	+0.008	+0.006	+0.005	-0.006	-0.009	+0.009	-0.012	-0.012	-0.003	-0.005	-0.004	+0.000	-0.010	-0.024*	+0.010	-0.001	+0.03@	-0.043	-0.017
ERPAK	-0.080@	+0.047	+0.11@	-0.034	-0.004	-0.054	+0.009	+0.06@	-0.035	-0.016	-0.007	-0.016	-0.006	-0.003	+0.008	+0.014	-0.017	+0.000	+0.010	+0.023	+0.004	-0.007	+0.011	-0.034	-0.095	+0.027
ERSRI	+0.014	-0.015#	+0.003	+0.002	+0.002	+0.012	+0.003	-0.008	+0.001	-0.014	+0.003	+0.006	+0.001	-0.002	+0.009	-0.006	-0.001	-0.003	+0.010	+0.012	+0.002	+0.003	+0.002	+0.003	+0.030	-0.028#
ERCZE	+0.062	-0.020	+0.019	-0.029	+0.079	-0.076	-0.004	-0.023	+0.035	+0.043	+0.013	+0.021	-0.036	-0.006	+0.022	+0.024	+0.041	+0.062#	-0.060	-0.035	+0.026	+0.021	-0.031#	+0.050	+0.003	-0.025
ERHUN	+0.040	-0.032	+0.026	-0.001	+0.06@	-0.014	-0.004	+0.040	+0.018	-0.032	-0.023	-0.013	-0.018	-0.039#	+0.005	+0.038#	+0.004	+0.022	-0.015	-0.001	+0.011	-0.002	-0.004	+0.08@	+0.006	+0.036
ERPOL	-0.004	-0.030	+0.014	-0.030	+0.014	-0.046	-0.015	+0.032	+0.015	+0.041	+0.015	+0.002	-0.033	-0.005	-0.016	+0.033	+0.088#	+0.044@	-0.068	+0.012	+0.025	+0.036	-0.034#	+0.011	+0.018	-0.09@
ERRUS	+0.131	-0.562#	+0.358	-0.354	+0.005	+0.088	+0.064	+0.235	-0.085	-0.265	-0.520*	+0.025	+0.399	+0.065	+0.062	+0.043	-0.151	-0.142	+0.260	+0.231	-0.593*	-0.056	-0.010	+0.175	+1.923#	-0.085
ERISR	+0.024	-0.014	+0.003	+0.002	-0.004	-0.007	+0.005	+0.000	-0.007	+0.028	+0.005	+0.043*	-0.027	+0.001	+0.005	-0.007	-0.03@	+0.000	+0.001	+0.003	+0.014	-0.014	-0.003	+0.035	-0.008	-0.014
ERMOR	+0.018	+0.004	-0.038	-0.020	-0.007	-0.014	-0.004	+0.000	+0.004	+0.014	+0.007	-0.011	-0.031	-0.003	-0.015	+0.006	-0.000	+0.003	+0.004	-0.000	+0.013	+0.000	-0.009	+0.038	-0.015	-0.027
ERZIM	-0.020	+0.012	+0.035	+0.001	-0.009	-0.023	+0.001	+0.005	-0.007	-0.002	-0.016@	+0.007	-0.004	-0.004	+0.003	+0.021#	-0.002	-0.012	+0.030	-0.013	+0.015	-0.020	+0.006	+0.010	-0.025	+0.000

Note: The value in each cell is the coefficient estimate for each parameter while a superscript indicates the significance of F-test. *, # and @ indicate significance at 1%, 5% and 10% respectively

Appendix Table: B3
Test Results of Cross-Market Causality: Exchange Rates vs Interest Rates
(VARs with One lag and constant)
Russian Crises Period: August 01 1998 – March 31, 1999

	IRARG	IRBRA	IRCHL	IRCOL	IRECU	IRMEX	IRVEN	IRHON	IRIDN	IRJAP	IRMLY	IRPHI	IRSIN	IRKOR	IRTAI	IRTHA	IRIND	IRPAK	IRSRI	IRCZE	IRHUN	IRPOL	IRRUS	IRISR	ERMOR	IRZIM
ERARG	+0.002	-0.008	-0.002	-0.017@	+0.008	+0.000	-0.009	+0.003	+0.000	-0.078	-0.022	-0.023	-0.04@	+0.033	-0.031	+0.010	+0.001	+0.003#	-0.076	+0.006	+0.011	-0.012	+0.002	+0.010	+0.017	+0.017
ERBRA	-0.294	+1.918	-0.351	+1.831*	+0.101	-0.307	-0.291	+0.091	+0.192	+7.802	+0.594	+2.179	+2.860#	+2.363	+4.556	-1.141	+0.029	+0.078	-5.232	-1.437	-0.369	-1.189@	-0.014	+0.410	-0.528	-0.220
ERCHL	-0.044	-0.108	+0.029	+0.107	+0.026	-0.021	+0.016	-0.086	-0.028	+2.255	+0.013	-0.118	+0.141	+0.365	-0.337	+0.171	-0.065#	-0.009	+0.171	+0.154	-0.201@	+0.089	-0.033@	-0.081	-0.044	+0.072
ERCOL	+0.21@	+0.591	+0.023	+0.226	+0.337	+0.033	-0.055	-0.407#	+0.088	+3.422	-0.029	-0.98@	+0.032	+0.866	+1.600	+0.210	-0.053	+0.028	+0.202	-0.037	-0.329	+0.064	+0.001	-0.270	+0.350	-0.031
ERECU	+1.036	+3.877	+0.025	+0.585	-0.319	+0.016	+0.194	-0.694	+0.633	-44.05#	+0.325	+2.187	+2.473	-1.302	-1.006	+0.104	-0.053	+0.077	+8.101	+4.358	+0.492	-1.611	-0.093	-1.088	-1.447	-0.099
ERMEX	-0.112	-0.055	+0.28@	+0.207	+0.198	-0.055	+0.217	-0.339@	+0.122	+8.620#	-0.819	-0.361	-1.04@	-0.334	+0.490	+0.62@	-0.080	+0.020	-1.565	+0.038	-0.050	-0.491@	-0.033	-0.072	+0.114	-0.045
ERVEN	-0.000	+0.098	-0.049	-0.052	-0.099	-0.005	+0.014	-0.050	+0.003	+1.083	+0.098	-0.047	-0.105	+0.238	+0.645	-0.087	+0.010	+0.004	+0.339	+0.168	-0.037	+0.014	+0.018	-0.108	+0.045	+0.107
ERHON	+0.004	-0.002	-0.001	-0.007	-0.004	+0.002	-0.007	-0.001	+0.001	+0.094	-0.001	-0.008	-0.001	-0.042@	+0.008	-0.002	+0.003#	-0.001	+0.046	+0.017	+0.005	-0.003	+0.001	+0.005	+0.062#	-0.012
ERIDN	-0.241	-0.428	+0.936	-0.058	-0.029	-0.276	-0.311	+0.380	+0.252	-15.765	+0.546	-1.552	-4.932#	+3.827	-3.544	+0.626	-0.069	+0.038	+1.334	-0.918	-1.096	+0.101	-0.090	-0.404	+9.077#	-1.89@
ERJAP	+0.057	+0.291	-0.061	+0.549	+0.320	-0.085	+0.319	+0.205	+0.024	-0.821	+0.520	-1.52@	+0.022	+0.949	+3.6@	-0.106	-0.053	+0.036	+5.18@	+0.744	-0.945*	+0.040	-0.002	-0.84@	+0.264	-0.504
ERMLY	-0.119	+1.436	-0.232	+0.539	-0.049	+0.128	+0.336	+0.175	+0.45@	-5.161	-1.271	+0.676	+0.028	-1.230	-1.028	-0.989	-0.065	-0.019	+1.815	-1.274	-0.589	+1.650#	-0.023	+9.020*	-1.355	-1.427
ERPHI	-0.136	-0.247	-0.098	+0.139	+0.485#	-0.040	+0.050	-0.016	+0.001	+3.778	-0.179	-1.088#	-0.763	+0.263	+4.255*	-0.101	-0.030	+0.038	+4.436#	-0.612	-0.137	+0.068	-0.047	-0.082	+0.088	-0.598#
ERSIN	+0.033	+0.114	-0.029	+0.037	-0.005	-0.032	+0.23@	-0.115	-0.040	+3.910	+0.114	-0.367	-0.172	+0.388	+1.259	+0.003	-0.010	-0.011	+1.561	+0.483	-0.258@	-0.028	+0.011	-0.315	+0.350	-0.707*
ERKOR	+0.048	+0.140	+0.247	-0.119	+0.277	+0.078	+0.007	+0.059	+0.078	-1.661	+0.030	+0.120	+0.594	-0.987	-3.021#	+0.037	+0.001	+0.023	+1.142	+0.582	-0.083	-0.655#	+0.008	+0.389	+0.246	+0.070
ERTAI	+0.038	-0.011	+0.067	-0.076	+0.055	+0.026	+0.012	-0.025	+0.046	-0.719	+0.021	-0.078	+0.143	+0.427	+0.042	+0.044	+0.006	-0.008	+0.181	-0.016	+0.019	-0.116	-0.003	-0.132	+0.238	-0.120
ERTHA	-0.031	+0.014	+0.003	-0.018	+0.202	-0.019	+0.158	-0.157	-0.110	+2.557	-0.350	-0.488	-0.83@	-0.182	-0.006	+0.014	+0.004	+0.020	+2.150	+0.130	-0.138	-0.213	-0.000	-0.50@	+1.61@	-1.070*
ERIND	-0.008	-0.109	+0.009	-0.088	+0.058	-0.006	+0.011	+0.067	+0.014	+0.207	+0.005	-0.162	-0.295#	+0.446@	-0.443	+0.029	-0.002	+0.008	-0.065	-0.099	-0.062	-0.094	-0.001	-0.081	+0.47@	-0.020
ERPAK	-0.005	+0.253	-0.099	+0.47@	-0.015	+0.048	-0.061	+0.009	-0.094	+0.976	-0.320	+0.472	-0.230	-0.591	+0.514	-0.160	-0.014	-0.043	-3.36@	+0.655	+0.041	+0.142	-0.007	+0.001	+0.641	+0.355
ERSRI	-0.046@	+0.011	-0.028	-0.010	+0.030	-0.034@	+0.018	+0.059	-0.003	-0.368	+0.021	-0.016	-0.067	-0.231	+0.110	+0.107	+0.002	+0.009	+0.67@	-0.058	-0.067	-0.054	+0.002	+0.010	+0.127	+0.057
ERCZE	-0.342#	-1.277*	-0.348#	+0.198	-0.089	-0.041	+0.219	-0.220	+0.012	+9.214#	+0.200	-0.747	-0.123	+1.207	+1.249	+0.181	-0.070	-0.114*	+1.271	+0.204	-0.591*	-0.356	-0.052	-0.028	-0.684	-0.703#
ERHUN	-0.059	-0.341	-0.087	+0.190	+0.234	-0.003	+0.180	-0.171	+0.016	-0.712	-0.125	+0.286	+0.034	+0.670	+0.016	+0.41@	-0.06@	+0.002	+2.654#	+0.017	-0.371#	-0.069	-0.032	-0.326	-0.512	+0.102
ERPOL	-0.258#	-0.689	-0.235	+0.43@	-0.237	-0.046	+0.203	-0.068	-0.003	+0.359	+0.683	-0.694	-0.264	+1.303	+1.860	+0.262	-0.029	-0.011	+0.315	-0.226	-0.174	+0.079	-0.056	-0.194	-0.444	-0.301
ERRUS	-0.668	-5.193	+0.182	-3.878#	-0.087	+0.235	-0.705	-3.261#	-0.348	+44.493	-8.491#	-4.547	+1.341	+2.208	-4.424	+0.778	+0.312	-0.159	-1.840	+10.26#	+1.279	+0.282	-0.100	+1.979	+1.735	-0.801
ERISR	-0.046	+0.153	+0.044	+0.064	+0.054	-0.051	-0.056	+0.13@	+0.044	-3.405#	+0.173	-0.055	+0.064	+0.405	-0.606	-0.154	+0.006	-0.009	-0.688	+0.239	-0.055	-0.073	+0.025#	-0.014	-0.206	+0.032
ERMOR	+0.007	+0.081	-0.115	-0.040	+0.092	-0.012	-0.121	+0.045	+0.006	-2.463	+0.070	-0.396	+0.350	+0.215	+0.598	-0.382#	+0.024	-0.014	-0.869	-0.110	-0.001	-0.125	+0.006	+0.054	+0.200	-0.087
ERZIM	+0.079	+0.185	+0.062	-0.010	+0.042	+0.001	-0.000	-0.083	+0.029	-0.121	-0.131	-0.068	+0.300	-0.043	-0.104	+0.133	-0.013	+0.007	-0.633	+0.144	-0.107	+0.016	-0.004	-0.096	-0.488	+0.447*

Note: The value in each cell is the coefficient estimate for each parameter while a superscript indicates the significance of F-test. *, # and @ indicate significance at 1%, 5% and 10% respectively

Appendix Table: B4
Test Results of Cross-Market Causality: Stock Prices vs Exchange Rates
(VARs with One lag and constant)
Russian Crises Period: August 01 1998 – March 31, 1999

	ERARG	ERBRA	ERCHL	ERCOL	ERECU	ERMEX	ERVEN	ERHON	ERIDN	ERJAP	ERMLY	ERPHI	ERSIN	ERKOR	ERTAI	ERTHA	ERIND	ERPAK	ERSRI	ERCZE	ERHUN	ERPOL	ERRUS	ERISR	ERMOR	ERZIM
SPARG	+18.197	+0.133	+0.917	-0.480	+0.049	-0.026	-0.741	-16.133	-0.061	-0.269	+0.008	-0.542	-0.604	-0.028	+0.333	+0.362	+0.092	+0.454	-2.318	+0.707	-0.225	-0.919	-0.082	+1.284	-1.827#	-0.495
SPBRA	+29.6@	+0.382#	+2.29@	-0.525	+0.031	-0.110	+1.215	+6.336	-0.218	-0.085	-0.110	-0.744	-0.644	+0.162	-0.165	+0.268	-2.354	+0.472	-4.021	+0.965	-1.539	-1.226@	-0.177#	+1.856	-1.512	-2.487
SPCHL	+13.7@	+0.137	+0.628	-0.193	+0.013	-0.228	-0.285	-12.381	-0.030	+0.095	+0.004	-0.018	-0.410	-0.142	-0.484	+0.128	-1.108	+0.195	+0.670	+0.397	-0.322	-0.661#	+0.015	+0.016	-0.85@	-0.920
SPCOL	-9.108	+0.098	+0.943	-0.289	+0.001	-0.024	-1.503#	+25.67#	+0.050	+0.169	+0.065	-0.052	-0.546	+0.334	+0.033	-0.198	+1.091	-0.165	-1.728	+0.102	+0.712	-0.649#	+0.003	-0.639	-0.87@	+0.354
SPECU	-6.843	+0.016	+0.027	+0.141	-0.022	-0.141	+1.373#	-4.189	+0.14@	-0.261	-0.021	+0.043	+1.353*	+0.117	-0.500	-0.896#	+0.606	-0.121	+1.599	-0.059	-0.276	+0.309	+0.033	-0.661	-0.439	+1.326#
SPMEX	+6.905	+0.003	+0.916	+0.357	+0.012	-0.211	-1.179	-21.082	-0.015	+0.061	+0.002	-0.685	-0.277	+0.089	+0.759	-0.219	-1.233	+0.159	-1.360	+0.080	+0.247	-0.661	-0.062	+1.405	-0.936	-1.194
SPVEN	+5.051	-0.028	-1.034	-0.280	-0.089	+0.340	+3.429#	-16.548	-0.046	+0.736	+0.004	-0.330	-1.559	-0.145	-0.183	-0.022	-0.493	-0.187	+2.503	-0.206	-1.218	-0.254	+0.018	-0.409	+0.830	-1.389
SPHON	+5.876	-0.095	+0.174	+0.135	-0.003	+0.454	+0.629	-41.823*	-0.122	-0.527#	+0.020	-0.277	-0.131	-0.988*	-0.494	+0.612	-0.259	-0.057	+0.672	-0.035	+0.625	+0.225	-0.022	+0.666	-0.310	-1.263
SPIDN	-13.331	+0.039	-0.098	-0.052	-0.095	+0.449	+2.28@	-30.193	+0.059	-0.694@	+0.024	+0.216	-0.741	-1.453*	-1.955	+1.39@	+0.740	+0.126	+1.283	+0.138	-0.011	-0.743	+0.048	-0.413	+0.613	+0.097
SPJAP	+8.206	-0.000	+0.454	+0.194	-0.007	-0.043	+0.932	-10.914	-0.036	+0.016	+0.017	+0.065	-0.284	-0.016	-0.645	+0.401	-0.316	-0.188	+1.824	-0.083	+0.669@	-0.171	+0.041	+0.281	+0.027	+0.071
SPMLY	-6.877	-0.246@	-0.089	+1.434*	+0.046	-0.082	-0.353	-136.67*	+0.109	-0.464	-0.114	-1.367*	+1.022	-0.330	-1.107	+0.705	+0.707	-0.758	+3.379	-1.148#	+0.109	+0.134	+0.129#	+0.811	+0.449	-0.154
SPPHI	-2.211	-0.037	-0.320	+0.806*	+0.015	-0.128	-0.300	-27.39#	-0.153@	-0.182	+0.10@	-0.018	+0.075	-0.876*	+0.322	+0.098	-1.066	+0.059	+0.862	-0.017	-0.139	-0.300	-0.031	+0.183	+0.406	-0.792
SPSIN	-7.122	+0.017	-0.611	+0.043	-0.007	+0.130	+0.156	-28.78#	-0.123	-0.205	+0.052	-0.237	-0.280	-0.412	-0.510	+0.650	-0.086	+0.074	-0.542	-0.041	+0.704	+0.055	-0.058	+0.568	+0.805	-0.806
SPKOR	+5.520	+0.019	+1.216	-0.720@	-0.082	+0.114	+0.134	+11.475	+0.064	-0.364	+0.013	+0.502	+0.008	-0.069	-0.742	-0.708	-0.238	+0.120	-2.691	-0.608	+1.544#	+0.067	+0.071	+1.038	-0.916	-1.296
SPTAI	-7.071	+0.101	-0.548	-0.331	-0.004	+0.085	+0.406	-14.453	+0.030	-0.275	-0.014	+0.148	-0.890	+0.475	-0.988	+0.297	+1.625	-0.364	-1.973	+0.170	+0.431	+0.086	+0.031	+0.096	+0.147	-0.354
SPTHA	+2.133	+0.097	-0.904	+0.088	-0.004	+0.397	+1.509	-70.550*	-0.179	-0.616@	+0.17@	-0.382	-0.576	-0.940#	-0.276	+1.30@	-1.552	+0.745	+1.396	+0.135	-0.591	-0.004	+0.102@	+0.458	-1.362	-0.380
SPIND	-3.692	-0.130	+0.421	+0.009	+0.067	+0.032	-0.634	-0.004	-0.042	+0.027	-0.021	-0.065	+0.546	+0.119	+0.562	-0.332	+0.690	+0.119	+0.311	+0.005	-0.422	+0.207	+0.027	-0.144	+1.040#	-0.408
SPPAK	-9.042	-0.152	+0.708	-0.077	+0.084	+0.476	-1.851@	-27.001	-0.122	+0.293	+0.103	-0.414	+0.679	+0.879#	+1.79@	-0.152	-0.991	-0.785@	+0.545	+0.171	-0.750	-0.391	+0.016	-1.090	+0.758	+0.372
SPSRI	-9.186	-0.066	+0.040	+0.342	-0.084@	-0.122	-1.033@	-12.129	+0.082	-0.226	+0.026	-0.682#	+0.533	+0.114	-1.02@	+0.328	+0.403	-0.108	+0.828	+0.076	-0.253	+0.184	-0.007	+0.355	-0.209	-0.365
SPCZE	+4.345	+0.086	+0.439	-0.324	-0.058	+0.422	+0.414	-12.182	-0.051	-0.299	+0.070	-0.109	-0.019	-0.206	-1.079	+0.711	-0.886	-0.286	+1.600	-0.871*	+1.287*	-0.068	+0.001	+0.490	-0.436	-1.004
SPHUN	-9.652	+0.148	+2.452#	-0.365	+0.013	-0.350	+0.089	-11.632	+0.049	+0.134	-0.002	+0.099	-1.024	-0.287	-1.620	+0.373	+0.432	+0.317	-0.312	-0.95@	+0.843	+0.014	-0.030	-0.544	-0.498	-1.915
SPPOL	-1.002	+0.087	+1.852#	+0.095	+0.025	-0.174	+0.763	-17.510	-0.003	-0.540@	-0.002	-0.008	+1.039	-0.408	-0.334	-0.108	-2.33@	-0.360	+2.125	-0.974#	+1.082@	-0.399	+0.059	-0.280	+0.324	-1.98@
SPRUS	-7.865	+0.174	+1.023	-1.575@	-0.109	+1.343	+0.525	-45.523	-0.307	-0.828	-0.002	-0.047	+0.270	-0.315	-2.493	+0.684	-3.330	+0.040	+3.898	-1.032	+4.146#	-1.591	+0.087	+0.740	+0.089	-1.868
SPISR	-10.117	+0.114	+0.627	-0.511#	+0.006	-0.226	+0.079	+4.817	-0.083	+0.014	+0.016	-0.144	-0.160	+0.103	+0.362	+0.136	-0.235	-0.127	+0.484	-0.173	+0.539	-0.236	+0.009	-0.064	+0.288	-0.888
SPMOR	+1.388	+0.004	+0.426#	+0.086	-0.008	-0.073	-0.003	+4.968	+0.006	-0.011	+0.007	+0.041	-0.111	+0.003	+0.297	-0.030	+0.303	+0.151@	-0.494	+0.082	-0.107	+0.048	-0.016	-0.025	+0.191	+0.123
SPZIM	-3.414	+0.044	-0.405	-0.291	-0.009	-0.124	+0.184	-12.442	+0.051	-0.094	+0.037	-0.326	+0.213	+0.206	-1.075#	+0.355	-0.713	-0.060	+0.266	-0.078	+0.013	+0.177	-0.022	+0.584	-0.406	-0.284

Note: The value in each cell is the coefficient estimate for each parameter while a superscript indicates the significance of F-test. *, # and @ indicate significance at 1%, 5% and 10% respectively

Appendix Table: B5
Test Results of Cross-Market Causality: Stock Prices
(VARs with One lag and constant)
Russian Crises Period: August 01 1998 – March 31, 1999

	SPARG	SPBRA	SPCHL	SPCOL	SPECU	SPMEX	SPVEN	SPHON	SPIDN	SPJAP	SPMLY	SPPHI	SPSIN	SPKOR	SPTAI	SPTHA	SPIND	SPPAK	SPSRI	SPCZE	SPHUN	SPPOL	SPRUS	SPISR	ERMOR	SPZIM
SPARG	+0.296	-0.196	+0.188	-0.188	+0.218	+0.312	-0.160	+0.124	+0.109	-0.025	+0.046	-0.038	-0.454#	-0.027	+0.218	+0.045	+0.151	-0.049	+0.111	+0.164	-0.100	-0.064	+0.009	+0.006	-0.788	+0.096
SPBRA	+0.509#	-0.248	-0.067	-0.180	+0.408	+0.295	-0.190	-0.098	+0.152	+0.659#	+0.015	-0.124	-0.517#	-0.010	+0.37@	+0.126	+0.118	-0.025	+0.078	+0.41@	+0.061	-0.398#	-0.050	+0.176	-0.756	+0.290
SPCHL	+0.248#	-0.143@	+0.209	-0.020	+0.093	+0.095	-0.064	-0.010	+0.09@	+0.123	-0.047	+0.071	-0.24@	-0.063	+0.113	-0.038	+0.024	-0.035	+0.099	+0.103	-0.108	+0.024	+0.008	-0.068	-0.332	+0.163
SPCOL	+0.22@	-0.135	+0.210	+0.066	-0.044	+0.012	-0.113#	+0.013	+0.11@	-0.148	+0.054	+0.104	+0.088	-0.074	+0.076	-0.13@	+0.048	+0.102	+0.145	+0.033	-0.055	+0.064	+0.070#	-0.26@	-0.312	-0.151
SPECU	-0.039	+0.001	+0.077	+0.054	-0.096	+0.090	-0.011	-0.045	-0.025	+0.020	+0.013	-0.062	+0.059	-0.129#	+0.035	+0.084	+0.17@	-0.115#	+0.225#	+0.100	-0.055	+0.038	+0.007	+0.003	-0.098	-0.036
SPMEX	+0.328#	-0.106	-0.000	-0.179	+0.33@	+0.062	-0.143@	-0.021	+0.025	+0.215	+0.003	+0.094	-0.259	-0.051	+0.21@	+0.037	+0.088	+0.009	-0.041	+0.138	-0.088	-0.046	-0.023	-0.087	-0.423	+0.220
SPVEN	+0.48@	-0.131	-0.043	-0.053	+0.51@	-0.107	+0.286#	+0.113	+0.098	+0.133	-0.267#	-0.022	-0.247	+0.023	+0.146	+0.102	+0.001	-0.123	-0.114	-0.318	-0.091	+0.110	-0.026	-0.177	-0.556	+0.134
SPHON	+0.085	+0.004	+0.046	-0.025	+0.086	+0.312#	-0.031	-0.095	+0.005	-0.157	-0.027	-0.051	-0.013	+0.019	+0.059	+0.066	-0.062	+0.107	-0.096	+0.024	+0.001	-0.009	-0.009	+0.097	-0.456	-0.046
SPIDN	-0.035	-0.072	+0.904*	-0.091	-0.091	+0.071	+0.229#	-0.503*	+0.110	+0.116	-0.078	-0.167	+0.193	+0.330#	-0.119	+0.151	+0.140	+0.134	+0.098	-0.058	-0.286@	-0.130	+0.176*	+0.223	+0.615	-0.080
SPJAP	-0.008	-0.011	+0.287#	-0.054	+0.128	+0.105	+0.046	+0.043	-0.020	-0.018	+0.029	-0.025	-0.010	+0.105@	-0.018	+0.038	-0.050	+0.042	-0.076	-0.091	-0.056	-0.097	+0.060#	+0.020	-0.353	+0.050
SPMLY	-0.350@	+0.110	+0.644*	-0.166	+0.342	+0.287	-0.045	-0.049	+0.053	-0.161	-0.277*	+0.073	-0.106	-0.029	+0.010	+0.025	-0.250	-0.045	+0.525*	+0.146	-0.227@	+0.023	+0.082	-0.045	-0.073	-0.460#
SPPHI	+0.21@	-0.100	+0.135	-0.086	-0.070	-0.082	+0.050	-0.058	-0.017	-0.022	-0.079	+0.047	+0.168	+0.049	+0.148	+0.070	-0.19@	+0.099	+0.117	+0.147	+0.001	-0.016	+0.034	+0.010	+0.780#	+0.179
SPSIN	+0.107	-0.124	+0.194	-0.040	+0.28@	+0.123	+0.10@	+0.005	+0.022	-0.017	-0.074	+0.080	-0.109	+0.125	+0.017	-0.052	+0.013	+0.088	+0.25@	-0.095	+0.006	+0.031	+0.041	+0.116	-0.323	-0.068
SPKOR	+0.219	-0.073	+0.072	-0.068	+0.058	+0.410#	+0.047	+0.142	+0.012	-0.498#	+0.118	-0.378#	+0.375#	-0.009	-0.065	+0.044	+0.145	-0.058	-0.251	+0.027	+0.147	-0.083	+0.004	-0.106	-0.723	-0.423#
SPTAI	-0.034	-0.138	+0.091	+0.067	+0.069	+0.325#	-0.081	-0.021	+0.020	+0.037	+0.044	-0.104	+0.082	+0.096	-0.217#	+0.12@	+0.125	-0.083	+0.121	-0.191	-0.052	-0.044	+0.072#	+0.184	-0.112	-0.081
SPTHA	-0.061	+0.024	+0.43@	+0.138	+0.095	+0.35@	+0.106	-0.231	+0.093	+0.099	-0.149	-0.059	+0.071	+0.161	-0.046	-0.076	-0.114	-0.088	+0.209	-0.096	-0.069	+0.087	+0.027	+0.020	-0.605	-0.021
SPIND	-0.067	+0.053	+0.102	-0.079	-0.129	-0.040	+0.008	+0.029	+0.041	-0.421*	+0.029	-0.032	+0.051	+0.039	+0.119	+0.034	-0.062	-0.030	+0.143	+0.044	+0.018	+0.102	+0.038	-0.218	-0.191	+0.073
SPPAK	-0.088	+0.009	+0.37@	-0.002	-0.202	+0.043	-0.074	-0.126	-0.069	+0.121	-0.064	-0.352#	-0.010	+0.056	+0.279#	+0.075	+0.053	+0.045	+0.133	+0.247	-0.115	+0.178	-0.080@	-0.39@	-0.237	-0.154
SPSRI	-0.082	+0.112	+0.164	+0.070	+0.22@	-0.075	+0.005	-0.046	+0.051	-0.012	+0.050	+0.064	-0.105	-0.030	+0.105	-0.010	+0.041	+0.038	+0.267*	-0.048	+0.075	-0.059	+0.019	+0.25@	-0.568#	-0.166
SPCZE	+0.23@	-0.108	+0.234	+0.002	+0.147	+0.199	+0.10@	+0.094	+0.010	-0.238	-0.064	-0.014	-0.207	+0.116	-0.119	+0.004	-0.005	-0.044	+0.039	-0.119	-0.041	+0.018	+0.071#	+0.001	+0.511	+0.059
SPHUN	+0.292	-0.179	+0.342	+0.056	+0.273	+0.462#	+0.017	+0.129	+0.042	-0.152	-0.107	+0.158	-0.122	+0.176	+0.044	-0.179	-0.012	-0.119	-0.108	-0.121	-0.094	+0.032	+0.009	+0.082	-0.94@	-0.252
SPPOL	+0.335#	-0.050	+0.304	-0.090	+0.182	+0.109	+0.011	-0.220@	-0.138@	-0.071	-0.056	-0.072	-0.087	+0.110	+0.182	-0.022	-0.004	-0.112	+0.098	+0.194	+0.165	+0.002	+0.022	+0.225	+0.060	-0.139
SPRUS	-0.478	-0.104	+1.690*	+0.231	+0.673	+0.590	-0.028	-0.227	+0.145	-0.071	-0.024	-0.012	-0.640	+0.306	-0.018	+0.256	-0.742#	-0.217	+0.623	-0.422	-0.212	-0.051	+0.284#	-0.089	-1.269	-0.066
SPISR	+0.17@	-0.139@	-0.008	-0.044	+0.19@	+0.052	+0.006	+0.016	-0.023	+0.011	+0.007	+0.022	-0.105	+0.120#	+0.076	-0.081	+0.006	+0.016	+0.028	+0.043	-0.080	+0.067	+0.005	+0.052	-0.209	+0.015
SPMOR	-0.061	+0.018	+0.039	+0.015	+0.042	+0.044	-0.031@	-0.006	-0.006	+0.033	+0.025	+0.021	+0.037	-0.030	-0.005	+0.011	+0.043	-0.029	-0.080#	-0.049	+0.005	+0.014	-0.003	-0.019	+0.090	+0.007
SPZIM	+0.011	-0.024	+0.009	-0.072	+0.072	+0.064	-0.015	+0.029	+0.092#	+0.153	-0.038	+0.031	-0.202#	+0.005	+0.029	+0.021	+0.001	+0.054	+0.049	-0.003	-0.040	-0.026	-0.015	+0.051	-0.506#	+0.119

Note: The value in each cell is the coefficient estimate for each parameter while a superscript indicates the significance of F-test. *, # and @ indicate significance at 1%, 5% and 10% respectively

Appendix Table: B6
Test Results of Cross-Market Causality: Stock Prices vs Interest Rates
(VARs with One lag and constant)
Russian Crises Period: August 01 1998 – March 31, 1999

	IRARG	IRBRA	IRCHL	IRCOL	IRECU	IRMEX	IRVEN	IRHON	IRIDN	IRJAP	IRMLY	IRPHI	IRSIN	IRKOR	IRTAI	IRTHA	IRIND	IRPAK	IRSRI	IRCZE	IRHUN	IRPOL	IRRUS	IRISR	ERMOR	IRZIM
SPARG	+0.544	+1.494	-0.412	+1.090	+0.230	+0.263	-1.266	+1.47@	+0.312	-21.705	+3.75@	+2.302	+3.103	+1.083	+1.702	-1.823	-0.156	-0.111	+0.505	-0.576	-0.683	+1.347	+0.061	-0.863	+5.141	+2.081
SPBRA	+0.140	+0.317	-1.311	+2.217	-0.084	+0.377	-1.571	+0.899	+0.402	-15.322	+4.98@	+2.005	+8.351*	+3.217	+0.496	-2.78@	-0.406	-0.304	+6.086	+0.422	-0.853	-0.093	+0.113	+0.008	-0.451	-0.082
SPCHL	+0.064	-0.879	+0.108	+0.272	-0.332	+0.38@	-0.583	+0.82@	+0.318	-12.599	+2.005	+0.007	+1.438	+0.501	-1.983	-1.629#	-0.125	-0.025	-1.732	-0.711	-0.376	+0.201	+0.080	+0.341	+2.949	-0.253
SPCOL	+0.363	+1.001	+0.334	-0.730	+0.428	-0.120	-0.201	+0.379	-0.084	-2.433	+1.998	+1.086	-1.079	+2.939	-0.139	+0.036	+0.096	-0.054	+3.311	+0.398	+0.820	-0.010	+0.068	-0.899	+4.84@	-1.185
SPECU	+0.174	+1.162	+0.042	-0.352	-0.065	-0.164	+0.261	+0.075	+0.159	-21.42#	-0.376	+1.170	+0.902	+0.129	+1.101	-0.160	+0.045	+0.208#	+3.168	+1.294	-0.643	+0.239	+0.263*	-0.602	-1.642	+0.658
SPMEX	+0.244	+0.459	-0.345	+0.146	-0.426	+0.618#	+0.169	+0.507	-0.057	-10.163	+0.311	-0.611	+1.883	-0.789	+2.366	-1.376	-0.169	-0.089	-2.417	+0.352	-0.630	-1.048	+0.088	+0.092	+4.931	-1.509
SPVEN	-0.489	+1.143	-0.169	+0.377	-0.333	+1.263#	-1.396	+0.463	+0.105	+2.295	+0.180	+0.696	+2.231	+4.747	-14.67#	-0.104	-0.49@	-0.389@	-7.822	+3.062	-1.325	+0.135	-0.104	-0.650	+0.280	-3.359#
SPHON	+0.049	-0.292	+0.295	-0.201	-0.226	+0.320	-0.044	-0.568	-0.458@	+5.070	-2.420	-1.320	+1.375	-5.151@	+1.732	-0.536	-0.27@	-0.524*	-5.531	-4.229#	-0.472	+3.101*	-0.080	-0.027	-1.190	-1.545
SPIDN	-0.641	+0.683	+0.826	+0.248	+0.459	-0.311	-2.494*	-0.369	+0.347	+7.079	-0.325	-1.916	-1.309	-2.443	-0.088	+2.081	+0.043	-0.193	+2.140	-0.564	+0.851	+1.970	-0.061	+0.594	+0.529	-1.919
SPJAP	+0.054	-1.100	-0.101	-0.591	-0.314	+0.222	-1.126*	+0.192	-0.255	+0.052	+0.665	-1.370	+0.924	+1.841	-3.156	-0.177	+0.043	-0.158@	-3.172	-0.404	-0.154	-0.643	+0.017	+0.682	+1.779	-0.127
SPMLY	-0.049	+3.39@	+0.346	-1.955@	-0.821	+0.086	+0.393	-0.880	-0.211	+4.249	-0.398	+0.338	+5.043#	+5.388	+1.598	+0.515	+0.249	+0.014	-11.750	+0.740	-2.155#	-0.770	+0.122	-0.576	+0.030	-3.930*
SPPHI	-0.135	-0.144	+0.64@	-0.056	-0.460	+0.072	+0.120	+0.171	-0.108	+0.969	-1.749	-1.192	+0.719	-0.237	-0.619	-0.053	+0.032	-0.027	-3.597	+0.423	+0.835	+0.063	-0.016	+0.439	+1.392	+0.333
SPSIN	-0.183	+0.501	+0.200	+0.355	-0.895	+0.194	-0.631	-0.389	-0.202	+1.382	-0.927	-0.216	+2.81@	-4.808@	-0.212	-0.104	+0.090	-0.184@	-1.981	-2.87@	-0.196	+1.217	-0.094	+0.431	-2.753	-1.290
SPKOR	+0.423	+0.184	-0.063	+0.315	-1.841#	-0.348	-1.213@	+0.721	-0.064	+2.664	+2.055	+3.48@	-0.680	+0.556	+4.285	+2.918#	-0.137	-0.409*	-2.724	-4.591#	-0.747	+3.219*	-0.107	-1.159	+1.219	+0.343
SPTAI	+0.388	-2.159@	+0.166	-0.726	+0.191	+0.246	-0.572	-0.178	+0.049	-4.756	+0.452	-0.236	+1.979	+2.908	+0.313	+0.070	+0.059	-0.087	+6.261	-4.195*	+0.587	+0.198	-0.053	-0.450	-0.502	-1.46@
SPTHA	-0.357	+2.378	+0.572	+1.265	-2.417#	-0.009	+0.188	-0.563	+0.324	-18.570	-1.079	+3.85@	+2.802	-5.487	-0.264	-0.557	-0.161	-0.153	-13.9@	-0.992	+0.129	+2.026@	+0.005	+1.509	-0.834	-1.352
SPIND	+0.644#	+0.434	+0.472	-0.613	-0.217	+0.099	+0.372	-0.190	+0.284	+1.512	-0.549	+1.385	+0.353	+2.935	-0.076	+0.272	+0.018	-0.085	-9.726#	+1.263	+0.485	-0.867	-0.011	-0.892	-3.206	+0.077
SPPAK	+0.042	-0.052	+0.579	-1.203	+2.169#	-0.498	-0.041	-0.105	-0.121	-3.295	-4.126#	-0.849	-2.017	+3.421	+4.880	+2.07@	-0.097	+0.254@	-16.8#	-0.168	+0.007	-1.571	-0.026	-1.290	+4.840	+1.147
SPSRI	-0.393	+1.630	+0.266	+0.413	+0.272	+0.022	+0.443	-0.028	-0.027	-12.077	-1.075	+0.151	+0.206	-2.050	+6.242#	-0.170	+0.030	+0.039	-3.779	-1.977	-0.957#	+0.192	-0.113	-1.352#	-1.211	-1.491#
SPCZE	+0.045	+0.641	-0.320	-0.549	-0.254	-0.070	-0.332	+0.625	+0.147	-13.388	-3.089#	-0.579	-1.670	+5.140#	-2.821	-0.081	+0.088	+0.088	-3.685	-2.259	-0.985@	-0.223	+0.084	+0.301	+4.55@	-0.193
SPHUN	-0.145	-0.474	-0.401	-1.787@	+0.431	+0.013	-2.186*	+1.977#	+0.119	+12.524	-1.518	-2.244	-2.521	+5.257	+0.704	-2.015	+0.144	-0.112	-14.2@	-2.502	-0.158	+1.554	+0.042	-0.165	+3.560	+1.679
SPPOL	+0.259	-0.564	-0.063	-1.006	-0.764	+0.392	-1.197@	+0.508	-0.255	-11.695	-0.630	-0.567	+0.756	+4.032	-3.553	-1.064	-0.000	-0.179	-3.568	-0.037	-0.016	-0.501	+0.237@	+0.207	+0.613	-2.936*
SPRUS	-0.124	+4.489	+1.325	-3.295	+0.985	-0.581	-1.305	-0.204	+0.656	-25.671	-1.667	+2.159	+8.18@	-3.493	-21.9@	-2.124	+0.254	+0.041	-9.440	-0.624	-2.882	+1.340	+0.310	-0.552	+0.867	+0.518
SPISR	+0.250	-0.460	-0.245	-0.388	+0.335	-0.017	-0.486	+0.435	+0.107	-8.662	-0.034	+0.174	+0.667	+0.079	-1.929	+0.357	+0.007	-0.053	-3.003	-0.527	-0.334	-0.342	+0.052	+0.883	+0.794	-0.330
SPMOR	-0.118	-0.090	-0.081	+0.150	+0.004	-0.007	+0.080	+0.163	-0.034	+2.825	-0.065	+0.74@	+0.266	-0.686	+2.276#	-0.351	+0.023	-0.033	+0.165	-0.370	+0.016	-0.101	-0.004	+0.088	-0.460	+0.174
SPZIM	+0.054	+0.623	-0.111	+0.045	-0.058	+0.022	+0.108	-0.017	-0.029	+1.248	-1.002	-0.166	+0.239	+1.432	+1.822	+0.465	+0.020	+0.052	-4.067	+0.425	-0.346	+0.225	-0.032	-0.518	+3.72@	-0.349

Note: The value in each cell is the coefficient estimate for each parameter while a superscript indicates the significance of F-test. *, # and @ indicate significance at 1%, 5% and 10% respectively

Appendix Table: B7
Test Results of Cross-Market Causality: Interest Rates vs Exchange Rates
(VARs with One lag and constant)
Russian Crises Period: August 01 1998 – March 31, 1999

	ERARG	ERBRA	ERCHL	ERCOL	ERECU	ERMEX	ERVEN	ERHON	ERIDN	ERJAP	ERMLY	ERPHI	ERSIN	ERKOR	ERTAI	ERTHA	ERIND	ERPAK	ERSRI	ERCZE	ERHUN	ERPOL	ERRUS	ERISR	ERMOR	ERZIM
IRARG	+3.86@	-0.025	+0.091	+0.043	-0.012	+0.085	+0.186	-0.923	-0.014	+0.057	+0.001	-0.046	-0.079	+0.087	-0.419#	+0.129	-0.613#	-0.021	-0.036	+0.085	+0.090	-0.068	-0.014	+0.074	+0.090	-0.305
IRBRA	+0.352	+0.001	+0.076	+0.001	+0.001	-0.031	-0.004	-0.022	-0.002	+0.017	+0.004	+0.011	+0.024	+0.025	-0.029	-0.007	+0.068	+0.013	-0.019	-0.022	-0.020	+0.008	+0.001	+0.039	-0.033	+0.091
IRCHL	-0.980	-0.015	+0.297	-0.103	+0.010	+0.065	-0.270	-2.144	-0.036	+0.063	-0.003	-0.070	+0.059	+0.036	+0.039	+0.177	+0.107	-0.132	-0.464	-0.132	+0.030	+0.068	-0.002	-0.156	-0.27@	-0.071
IRCOL	+0.740	+0.018	-0.331*	+0.054	-0.000	-0.033	-0.390*	-3.017	+0.001	-0.032	+0.005	-0.121#	-0.032	-0.078	+0.010	+0.170#	-0.002	-0.008	-0.44@	+0.035	+0.045	+0.032	+0.009	+0.071	-0.101	+0.006
IRECU	-1.668	+0.022	-0.049	-0.001	-0.008	-0.026	+0.134	-1.201	-0.009	+0.047	-0.005	-0.066	-0.006	-0.047	+0.012	+0.017	-0.174	-0.037	+0.197	-0.080	+0.071	+0.031	+0.003	+0.156	-0.010	-0.112
IRMEX	-1.831	-0.041	-0.077	+0.121	-0.016	-0.302#	-0.066	-4.123	+0.035	+0.072	+0.030	+0.000	+0.021	-0.140	-0.090	+0.487#	-0.432	+0.018	+0.069	-0.174	-0.493#	+0.169	+0.008	+0.703#	-0.048	+0.158
IRVEN	+1.394	-0.011	-0.003	+0.070	-0.002	-0.005	+0.012	+1.709	-0.005	+0.045	-0.010	-0.006	+0.049	+0.052	+0.107	-0.236*	-0.252	+0.001	+0.49@	+0.10@	+0.029	-0.076	+0.013@	+0.127	+0.049	-0.124
IRHON	-2.007	-0.010	+0.063	-0.098@	+0.003	+0.070	-0.103	+9.145*	-0.003	-0.023	+0.02@	-0.133#	+0.173	+0.132#	-0.183	+0.274*	+0.036	-0.011	+0.547#	+0.015	-0.204#	+0.058	-0.013@	+0.023	-0.086	+0.057
IRIDN	-6.665@	+0.036	-0.474	-0.043	-0.002	+0.117	+0.119	-6.321	-0.065	+0.076	-0.018	+0.024	-0.070	-0.070	+0.047	-0.202	+0.009	-0.061	+0.677	+0.014	+0.085	+0.050	-0.012	-0.016	+0.269	+0.303
IRJAP	+0.15@	+0.001	-0.000	+0.009*	-0.001@	-0.001	-0.004	-0.178	-0.001	-0.004	+0.000	-0.005	+0.005	-0.001	+0.006	+0.001	-0.008	-0.002	-0.009	+0.002	+0.002	-0.002	-0.001@	-0.004	-0.001	-0.007
IRMLY	-0.246	+0.003	-0.018	-0.013	+0.000	+0.020	-0.007	+5.135*	-0.010	-0.019	+0.003	-0.008	+0.045	-0.023	+0.087	+0.003	-0.018	-0.019	-0.007	-0.038	+0.016	+0.021	-0.002	+0.047	-0.046	-0.046
IRPHI	+0.894	+0.004	-0.033	-0.002	-0.000	+0.005	-0.044	+0.092	+0.003	+0.014	-0.001	+0.022	-0.053	-0.032	+0.006	-0.011	+0.034	+0.027	-0.058	-0.005	-0.000	+0.010	+0.002	-0.047	-0.047	-0.027
IRSIN	-0.237	+0.004	-0.016	-0.011	+0.004	+0.007	+0.016	+0.924	+0.007	+0.044*	-0.004	+0.007	-0.024	+0.011	-0.055	+0.024	+0.097	+0.009	+0.018	-0.018	-0.021	+0.035	-0.001	+0.017	-0.012	+0.019
IRKOR	-0.168	+0.002	+0.059#	+0.002	-0.000	-0.005	-0.003	-0.090	-0.002	+0.001	+0.001	-0.010	+0.046#	+0.018@	-0.014	-0.007	-0.046	-0.018	-0.043	-0.029#	+0.034@	-0.017	-0.001	-0.017	-0.008	-0.065#
IRTAI	-0.070	+0.000	+0.003	-0.003	+0.001	+0.005	+0.032	-0.073	+0.001	+0.008	+0.001	+0.005	+0.001	-0.005	+0.033	-0.007	-0.038	-0.005	-0.042	-0.010	-0.011	-0.004	-0.002#	-0.004	+0.03@	+0.034
IRTHA	+0.426	+0.004	-0.037	+0.014	+0.007	-0.000	+0.016	+1.362	+0.001	-0.013	-0.000	+0.010	+0.045	-0.030	+0.052	+0.044	+0.036	+0.010	+0.291	+0.007	+0.022	+0.015	-0.002	-0.050	-0.020	+0.087
IRIND	-4.641	-0.054	-0.117	-0.089	+0.046	-0.186	-0.146	-3.099	-0.050	+0.034	+0.021	-0.367	-0.676	+0.084	+0.331	+0.475	+0.395	-0.148	-0.313	+0.001	+0.024	+0.240	+0.014	-0.016	+0.001	-0.677
IRPAK	+17.14#	-0.149@	+0.176	-0.033	-0.013	+0.061	-1.380#	-2.771	-0.046	-0.137	-0.320*	+0.58@	+0.404	+0.180	-0.831	-0.287	+0.629	+0.074	-0.306	+0.554#	-0.005	-0.286	-0.039	-0.400	-0.003	-0.189
IRSRI	+0.379#	-0.001	-0.010	-0.004	+0.000	+0.003	+0.012	-0.235	-0.002	+0.003	-0.001	+0.003	+0.005	-0.001	-0.010	-0.006	-0.022	-0.007	-0.021	+0.007	-0.000	-0.008	+0.000	+0.004	+0.003	-0.014
IRCZE	+0.822	-0.003	+0.057	+0.012	+0.004	-0.017	+0.048	+1.143	-0.000	-0.006	-0.006	+0.04@	-0.020	+0.044#	+0.065	-0.066#	-0.019	+0.008	-0.027	+0.047#	+0.018	-0.024	-0.003	-0.007	+0.042	-0.017
IRHUN	-0.394	+0.010	-0.109	+0.014	-0.014	+0.017	+0.042	+1.332	+0.014	+0.032	-0.028*	+0.024	+0.18@	+0.071	-0.255#	-0.277*	+0.107	+0.020	-0.128	+0.002	+0.005	+0.012	-0.003	-0.090	-0.16@	+0.020
IRPOL	-1.049	+0.005	-0.128@	-0.064@	+0.002	-0.021	-0.009	-0.188	-0.002	-0.013	-0.018#	-0.012	+0.087	+0.018	-0.062	-0.081	-0.317#	-0.066@	+0.31@	-0.057	+0.065	+0.083#	+0.006	+0.093	+0.019	+0.087
IRRUS	+4.523	+0.100	+1.057	+0.063	-0.031	-0.201	+0.811	-6.414	+0.068	+0.055	-0.031	+0.195	+0.238	-0.085	-0.282	-0.577	-2.57@	-0.178	-3.58@	+0.598	-0.345	-0.826@	+0.007	-0.305	+0.876	-0.462
IRISR	-2.279#	+0.022#	-0.106	+0.001	-0.002	+0.005	+0.088	+1.318	-0.011	-0.014	+0.002	-0.057	-0.047	-0.014	-0.046	+0.070	+0.010	+0.020	+0.492*	-0.014	+0.019	-0.054	+0.001	+0.034	-0.087	+0.266*
IRMOR	+0.278	+0.004	-0.007	-0.009	+0.001	-0.047*	+0.015	+0.095	+0.008#	+0.006	-0.001	+0.02@	-0.010	+0.023#	-0.030	-0.051*	+0.118*	+0.008	-0.032	-0.002	+0.004	+0.014	-0.001	+0.010	-0.006	+0.017
IRZIM	-3.327*	+0.007	-0.054	+0.014	-0.002	-0.006	+0.19@	+1.979	+0.026#	+0.010	+0.009	+0.023	+0.068	-0.044	+0.007	-0.031	+0.137	-0.033	+0.205	-0.096#	-0.157#	+0.051	+0.008	-0.071	-0.067	+0.258#

Note: The value in each cell is the coefficient estimate for each parameter while a superscript indicates the significance of F-test. *, # and @ indicate significance at 1%, 5% and 10% respectively

Appendix Table: B8
Test Results of Cross-Market Causality: Interest Rates vs Stock Prices
(VARs with One lag and constant)
Russian Crises Period: August 01 1998 – March 31, 1999

	SPARG	SPBRA	SPCHL	SPCOL	SPECU	SPMEX	SPVEN	SPHON	SPIDN	SPJAP	SPMLY	SPPHI	SPSIN	SPKOR	SPTAI	SPTHA	SPIND	SPPAK	SPSRI	SPCZE	SPHUN	SPPOL	SPRUS	SPISR	ERMOR	SPZIM
IRARG	+0.002	+0.021	+0.005	-0.029	-0.118*	-0.025	+0.002	+0.056#	+0.018	+0.059	+0.002	-0.028	-0.06@	+0.008	+0.002	+0.006	+0.025	+0.018	-0.021	+0.022	-0.011	-0.069*	-0.012	+0.08@	-0.111	-0.039
IRBRA	-0.009	-0.009	+0.010	-0.013	-0.001	-0.003	-0.000	-0.009	-0.002	-0.003	-0.013*	+0.000	+0.009	+0.005	+0.021*	+0.000	+0.012	+0.003	+0.012	-0.003	-0.001	+0.001	+0.002	+0.009	-0.009	-0.016
IRCHL	+0.058	-0.014	-0.012	-0.011	-0.004	+0.019	-0.034#	+0.05@	-0.002	-0.009	-0.010	-0.080#	-0.034	+0.004	-0.015	-0.009	+0.038	-0.039#	+0.009	-0.038	-0.021	+0.046@	+0.003	+0.019	-0.153	-0.008
IRCOL	-0.000	+0.015	+0.005	-0.005	+0.001	-0.014	-0.010	+0.002	+0.010	-0.080*	+0.002	-0.018	-0.014	-0.017	+0.006	-0.012	-0.008	-0.011	+0.04@	-0.009	+0.014	+0.010	+0.005	+0.041	+0.094	-0.048#
IRECU	-0.008	+0.005	-0.001	-0.000	-0.012	-0.000	+0.007	-0.007	+0.002	-0.031	-0.008	-0.013	-0.009	-0.010	+0.006	+0.029#	+0.008	-0.003	+0.017	-0.014	+0.007	-0.009	+0.001	+0.014	+0.015	+0.006
IRMEX	+0.032	+0.012	-0.036	-0.050	+0.076	-0.031	+0.000	+0.005	+0.043	-0.162#	+0.006	-0.036	+0.008	-0.038	+0.042	-0.004	-0.007	-0.042	-0.042	+0.006	-0.018	-0.055	+0.015	+0.056	+0.239	-0.047
IRVEN	+0.009	-0.007	+0.019	-0.029	-0.024	+0.007	+0.009	+0.027	+0.008	-0.065#	+0.000	-0.050#	-0.008	-0.012	+0.021	+0.021	-0.001	+0.000	+0.005	+0.014	-0.017	-0.003	-0.014#	-0.038	-0.061	-0.026
IRHON	-0.015	+0.022	-0.019	+0.003	+0.05@	-0.016	-0.007	+0.018	+0.016	+0.006	-0.007	-0.032	-0.010	+0.000	+0.011	-0.008	+0.012	-0.010	+0.038	+0.008	-0.026	-0.002	-0.014#	+0.041	+0.020	-0.026
IRIDN	-0.012	-0.088#	-0.071	+0.032	-0.047	+0.192*	+0.016	+0.023	+0.015	-0.042	-0.057@	-0.11@	+0.032	-0.006	-0.049	+0.004	-0.008	-0.050	+0.045	+0.028	-0.055	+0.082#	-0.005	+0.034	-0.070	-0.046
IRJAP	+0.001	-0.001	+0.001	-0.000	-0.000	-0.000	+0.000	+0.000	+0.000	+0.001	-0.001	+0.001	-0.001	-0.000	-0.000	-0.001	-0.001	-0.001	+0.002	+0.001	-0.001	-0.000	+0.000	+0.001	+0.002	-0.001
IRMLY	-0.003	+0.005	-0.003	+0.020#	-0.014	+0.003	+0.004	-0.008	-0.000	+0.016	-0.013#	+0.014	+0.007	-0.002	-0.019#	-0.002	-0.011	+0.004	-0.016	-0.013	+0.016#	+0.003	-0.002	-0.008	+0.008	+0.009
IRPHI	+0.009	-0.006	-0.007	+0.006	-0.006	+0.013	-0.002	-0.009	+0.007	+0.005	+0.004	+0.003	-0.015	+0.002	+0.003	-0.005	-0.005	-0.005	+0.009	-0.004	+0.001	+0.001	-0.002	+0.008	-0.032	-0.011
IRSIN	+0.002	-0.003	-0.015	-0.001	+0.010	+0.002	+0.000	-0.001	+0.003	+0.007	+0.001	-0.007	+0.009	-0.004	+0.005	+0.003	+0.005	+0.002	-0.007	-0.000	-0.004	-0.007	-0.002	+0.003	+0.033	+0.02@
IRKOR	-0.002	-0.002	+0.005	+0.001	+0.012#	+0.003	-0.001	-0.002	+0.000	+0.001	-0.003	-0.000	-0.000	+0.003	+0.005	-0.000	-0.01@	+0.002	-0.001	-0.01@	+0.001	+0.003	-0.000	-0.001	+0.007	+0.01@
IRTAI	+0.005	-0.003	-0.009#	+0.003	+0.004	-0.000	+0.002	-0.001	+0.001	-0.003	+0.000	-0.003	+0.01@	-0.005#	-0.007#	+0.004@	+0.001	-0.001	-0.003	+0.006	-0.004	+0.005#	-0.001	-0.01@	+0.013	+0.006
IRTHA	+0.003	-0.002	-0.010	-0.003	-0.014	+0.009	-0.001	+0.005	+0.000	+0.016	-0.010	+0.003	-0.005	-0.000	-0.001	+0.008	+0.012	-0.003	+0.008	-0.015	-0.008	-0.006	+0.001	+0.014	-0.032	+0.021
IRIND	-0.048	+0.12@	-0.238#	+0.012	-0.120	-0.062	-0.030	+0.029	+0.004	+0.019	+0.067	-0.062	-0.130	-0.092	+0.027	+0.036	-0.008	-0.021	-0.093	+0.109	+0.145#	-0.049	-0.033	+0.009	+0.309	+0.085
IRPAK	-0.148	+0.089	+0.132	-0.058	-0.017	-0.028	-0.042	+0.134	-0.036	-0.000	+0.059	-0.131	+0.015	-0.052	-0.027	+0.001	-0.072	+0.044	+0.001	+0.065	-0.127@	+0.009	+0.040	-0.006	+0.080	+0.091
IRSRI	-0.002	+0.004#	-0.002	+0.002	-0.000	-0.001	-0.001	+0.000	-0.001	-0.001	-0.000	-0.002	-0.002	+0.000	-0.002	+0.002	+0.000	+0.001	-0.001	+0.004@	-0.003@	-0.003	-0.000	+0.001	-0.007	-0.002
IRCZE	-0.004	-0.011@	+0.005	-0.008	-0.019#	+0.013	-0.000	+0.009	+0.002	+0.003	+0.005	-0.01@	+0.023#	+0.004	-0.004	+0.002	+0.000	+0.003	-0.007	-0.003	-0.008	+0.003	-0.006*	-0.02@	-0.017	-0.010
IRHUN	+0.001	-0.028@	+0.028	+0.002	+0.027	+0.025	-0.010	-0.007	-0.021#	+0.025	+0.009	+0.012	-0.021	-0.008	+0.03@	+0.008	-0.023	-0.007	+0.031	+0.004	-0.002	-0.001	+0.001	-0.010	-0.062	-0.009
IRPOL	-0.022	-0.004	-0.006	+0.019	-0.025	+0.03@	+0.003	+0.016	+0.008	-0.002	-0.002	-0.017	-0.018	-0.013	+0.005	+0.011	+0.017	+0.001	-0.009	+0.008	-0.003	-0.005	-0.002	+0.004	-0.016	+0.000
IRRUS	+0.347#	-0.162	-0.212	+0.038	-0.039	-0.060	+0.013	-0.236@	+0.026	-0.103	+0.041	+0.124	-0.018	+0.035	-0.096	-0.027	-0.046	-0.013	+0.185	+0.29@	-0.202@	+0.096	-0.016	+0.044	-0.081	-0.231
IRISR	+0.017	-0.021#	-0.015	-0.012	-0.022	+0.013	+0.005	-0.000	+0.007	-0.008	+0.000	+0.010	-0.013	-0.005	+0.005	-0.001	+0.011	+0.009	+0.010	-0.000	+0.009	+0.005	-0.011*	+0.018	-0.022	+0.001
IRMOR	+0.007	-0.008#	-0.007	+0.002	-0.001	+0.001	+0.003	+0.001	+0.004@	+0.002	+0.004@	+0.005	-0.003	-0.001	-0.001	-0.001	+0.005	+0.001	+0.002	+0.001	-0.008*	+0.005	+0.001	-0.008	-0.007	-0.005
IRZIM	+0.009	-0.007	-0.013	+0.007	-0.007	+0.017	+0.011	+0.010	-0.003	-0.016	+0.002	+0.008	-0.000	-0.004	+0.003	+0.000	+0.005	-0.013	-0.002	-0.012	-0.005	-0.003	+0.011#	+0.012	+0.040	+0.007

Note: The value in each cell is the coefficient estimate for each parameter while a superscript indicates the significance of F-test. *, # and @ indicate significance at 1%, 5% and 10% respectively

Appendix Table: B9
Test Results of Cross-Market Causality: Interest Rates
(VARs with One lag and constant)
Russian Crises Period: August 01 1998 – March 31, 1999

	IRARG	IRBRA	IRCHL	IRCOL	IRECU	IRMEX	IRVEN	IRHON	IRIDN	IRJAP	IRMLY	IRPHI	IRSIN	IRKOR	IRTAI	IRTHA	IRIND	IRPAK	IRSRI	IRCZE	IRHUN	IRPOL	IRRUS	IRISR	ERMOR	IRZIM
IRARG	-0.056	-0.231	-0.101	+0.118	+0.039	-0.014	-0.080	+0.092	-0.022	+4.051	+0.163	+0.154	-0.052	+0.804	-0.124	+0.281	-0.014	-0.038	-1.881	-0.169	-0.153	-0.376@	-0.015	+0.045	+1.211@	+0.888*
IRBRA	-0.045@	-0.186@	-0.033	+0.008	+0.004	+0.029	-0.008	-0.002	+0.001	+0.181	-0.154	-0.009	-0.027	+0.197	+0.279	+0.12@	+0.009	+0.009	-0.444	+0.026	+0.084@	-0.102@	+0.006	+0.060	-0.143	-0.005
IRCHL	+0.244#	+0.369	-0.120	-0.160	-0.050	+0.067	+0.199	+0.032	+0.007	-0.917	+0.046	-0.062	+0.048	+1.177@	+0.289	-0.218	+0.055	+0.012	-1.588	-0.297	+0.178	-0.237	+0.017	+0.053	+0.591	+0.228
IRCOL	+0.092	+0.488#	-0.004	+0.102	-0.068	-0.009	+0.112	-0.145@	-0.015	-2.088	-0.247	-0.307	+0.196	-0.429	+0.223	+0.040	+0.027	-0.007	+0.723	+0.215	+0.040	-0.148	-0.011	+0.031	-0.534	+0.091
IRECU	-0.013	-0.134	-0.021	-0.002	-0.030	+0.017	+0.174#	-0.065	-0.012	-0.007	-0.090	-0.153	-0.022	-0.126	+0.093	+0.005	-0.001	-0.008	+0.570	+0.101	+0.011	+0.054	-0.009	-0.057	-0.156	-0.005
IRMEX	+0.048	+0.498	-0.150	+0.102	-0.130	+0.061	+0.681*	+0.192	+0.046	-1.324	-1.194@	-0.721	-1.15@	+1.207	+1.905	+0.644	+0.034	-0.042	-1.346	+0.818	+0.063	+0.041	-0.033	+0.118	+0.880	+0.041
IRVEN	-0.039	+0.014	-0.209*	-0.004	+0.098	+0.008	-0.167@	+0.066	-0.013	-1.212	-0.106	-0.171	-0.326	+1.289*	-0.675	+0.407#	-0.019	+0.036@	+0.504	+0.367	-0.019	-0.091	-0.001	-0.039	+0.430	+0.144
IRHON	-0.137#	+0.301	-0.008	-0.065	+0.20@	-0.083@	+0.210#	-0.161@	+0.033	+0.554	+0.572#	-0.119	-0.167	+0.440	-1.18@	-0.047	-0.002	+0.032	+0.449	+0.018	+0.012	-0.304#	+0.019	-0.244	-1.140#	-0.002
IRIDN	+0.200	-0.044	-0.183	-0.309	+0.469	-0.002	+0.272	-0.079	+0.035	-0.662	-1.166@	+0.108	+0.146	-0.051	-0.000	+0.536	+0.011	+0.062	-0.229	+0.089	-0.189	+0.187	-0.021	+0.120	-0.068	+0.554
IRJAP	-0.003	-0.018	-0.002	-0.002	+0.003	-0.000	+0.004	+0.004	-0.000	+0.244#	-0.022	+0.004	-0.005	-0.000	-0.027	-0.012	+0.001	+0.001	-0.012	+0.005	+0.001	-0.010	+0.001	+0.010	+0.013	-0.002
IRMLY	+0.022	+0.158	-0.009	+0.051	+0.028	-0.003	+0.054	+0.041	+0.005	-1.289	+0.101	+0.042	-0.006	-0.184	-0.324	-0.050	-0.003	+0.010	-0.307	-0.105	-0.010	+0.047	+0.005	-0.022	-0.136	-0.190*
IRPHI	+0.018	+0.081	+0.012	+0.028	-0.010	-0.007	-0.051	+0.056	+0.011	-0.736	+0.060	+0.046	-0.143	+0.109	+0.140	-0.033	-0.002	+0.004	+0.728#	+0.091	+0.025	+0.024	-0.001	+0.021	-0.103	-0.004
IRSIN	+0.009	-0.083	-0.015	-0.027	+0.068	-0.007	+0.007	-0.045	+0.003	+0.805	+0.145	-0.057	-0.059	+0.111	+0.004	+0.074	+0.000	+0.015#	-0.335	-0.083	-0.020	-0.001	-0.008	-0.020	-0.060	+0.086
IRKOR	+0.010	-0.048	+0.019	-0.030	-0.001	+0.013	-0.012	-0.014	-0.015@	-0.460	-0.041	-0.088	+0.038	+0.521*	-0.166	+0.066#	-0.002	+0.005	-0.224	-0.014	+0.031	-0.051@	+0.009#	+0.040	+0.058	-0.028
IRTAI	-0.003	-0.045	-0.015	-0.045#	-0.003	+0.003	+0.033#	+0.004	+0.004	+0.391	-0.060	-0.033	+0.047	-0.004	-0.080	-0.008	+0.005	-0.000	+0.005	+0.002	+0.001	-0.013	-0.002	+0.005	+0.14@	-0.008
IRTHA	+0.046	-0.100	-0.068	-0.127	+0.026	+0.003	-0.033	-0.025	+0.006	-0.437	+0.116	-0.185	-0.254	+0.667#	-0.240	-0.18@	-0.019	+0.023@	-1.10@	+0.034	-0.031	-0.070	+0.004	-0.082	-0.051	+0.149
IRIND	+0.220	+0.389	-0.411	-0.401	-0.291	-0.120	+1.264*	-0.384	-0.039	-2.995	-0.286	+0.588	-0.257	-1.909	+0.057	+0.807	-0.350*	-0.038	-0.808	-0.189	+0.917#	-0.593	-0.030	-0.149	-1.812	-0.441
IRPAK	+0.427	-1.143	-0.202	-0.044	+0.073	-0.224	+0.193	-0.078	-0.134	+13.431	+1.121	-0.613	-1.359	-2.699	+1.107	-0.371	+0.21@	-0.010	-6.369	-2.52@	-0.351	+0.501	-0.003	+0.111	+3.113	+1.163
IRSRI	-0.009	-0.032	-0.004	+0.005	-0.004	+0.000	-0.009	-0.008	-0.002	+0.33@	-0.030	-0.038	-0.030	-0.059	-0.101	+0.001	-0.003	-0.004@	+0.059	+0.046	-0.004	+0.011	-0.001	+0.007	+0.053	+0.000
IRCZE	-0.015	-0.057	-0.000	+0.021	+0.062	-0.003	+0.012	+0.019	-0.012	+1.038	+0.15@	-0.064	-0.043	-0.015	-0.003	+0.094	-0.002	+0.003	+0.094	-0.107	+0.025	-0.081	+0.002	+0.042	+0.200	+0.043
IRHUN	-0.028	+0.013	-0.043	+0.068	-0.015	-0.092#	-0.106	+0.001	-0.043	-3.196@	+0.189	+0.303	+0.261	+0.383	+0.863	-0.27@	-0.04@	+0.023	-0.129	+0.002	-0.300*	+0.016	+0.031@	+0.022	+0.085	+0.142
IRPOL	+0.134*	-0.269@	+0.063	-0.111	+0.007	-0.007	+0.128#	+0.014	-0.012	+2.753#	+0.070	+0.064	-0.132	+0.068	-0.004	+0.041	-0.012	-0.014	+0.048	+0.022	+0.077	-0.211#	-0.010	-0.097	+0.047	+0.034
IRRUS	+0.037	-0.784	-0.022	-0.390	-0.168	+0.092	-0.395	+0.011	+0.263	+12.326	-1.067	-1.049	-0.732	+0.506	+2.237	-0.068	-0.073	-0.218	+4.272	+2.997	+0.259	+0.196	+0.054	+0.178	+1.411	-1.077
IRISR	+0.001	-0.205	+0.016	-0.057	+0.14@	-0.048@	+0.051	+0.129#	+0.020	-0.843	+0.134	+0.026	-0.29@	+0.671#	-1.156*	+0.052	+0.008	+0.015	-0.165	+0.218	+0.054	-0.032	+0.019@	-0.039	+1.159*	+0.094
IRMOR	-0.010	+0.049	-0.026@	-0.021	-0.008	+0.006	-0.028	+0.017	+0.011	+0.070	+0.035	+0.037	+0.020	-0.029	+0.088	-0.037	+0.016*	+0.003	-0.028	+0.026	+0.005	-0.032	+0.000	+0.021	+0.057	-0.014
IRZIM	-0.019	+0.344#	+0.050	-0.027	+0.026	-0.033	-0.045	+0.188*	+0.026	-1.298	-0.062	+0.154	+0.079	+0.018	-0.431	+0.064	+0.016	+0.005	+0.528	+1.033*	-0.042	+0.033	+0.012	+0.041	+0.258	+0.152

Note: The value in each cell is the coefficient estimate for each parameter while a superscript indicates the significance of F-test. *, # and @ indicate significance at 1%, 5% and 10% respectively.