Research Journal of Finance and Accounting
ISSN 2222-1697 (Paper) ISSN 2222-2847 (Online)
Vol.7, No.15, 2016

To What Extent Crude Oil, International Stock Markets and Exchange Rates Are Interdependent in Emerging and Developed Countries?

Samar Zlitni Abdelkefi [1*] Walid Khoufi [2]
1. Faculty of Economics and Management, Sfax University, Airport Road Km 4 BP 3018, Tunisia
2.School of High Business Studies, Sfax University, Sidi Mansour Road Km 10 BP 43-3061, Tunisia.

Abstract
Investors in stock markets under react to oil price changes in the short run. As a consequence changes in oil prices predict future stock market and exchange rates returns. Recent volatility in crude oil prices has affected economies around the world, especially the US, which is the largest consumer of oil. This paper uses monthly crude oil, stock indexes and exchange rates prices data from April 2003 until December 2014 to test and model the international markets' volatility in both emerging and developed countries. Trivariate BEKK GARCH (1, 1) model and statistical tests show several co-movements and interactions between international stock markets, exchange rates and crude oil.
Keywords: volatility spillovers, international markets, Granger causality test, variance decomposition, Trivariate GARCH BEKK (1, 1).

1. Introduction

The recent surge in crude oil prices over the recent past years has generated a lot of interest in the relationship between oil prices and financial markets. By the June of 2008 spot oil prices had risen to $133.93 per barrel. Over this same time period, the US dollar fell against other major traded currencies and emerging market stock prices rose. Because there exists a literature on the relationship between oil prices and stock prices, and a separate literature on the relationship between oil prices and exchange rates, the relationship between these two streams has, however, not been that enough studied.

The purpose of this paper is to use a Trivariate BEKK GARCH (1, 1) model to bring these two literatures together. Understanding the relationship between oil prices, exchange rates and stock market prices in both emerging and developed countries is an important topic to study because as emerging economies continue to grow and prosper, they will exert a larger influence over the global economy. China, for instance, is accumulating large reserves of foreign currency (mostly US dollars) and this will make it a bigger player in the world financial markets. Some estimates place China's reserves of foreign exchange and gold at $2.206 trillion as of December 2009. Managing this amount of money and protecting its store of value will mean that China will have a greater influence over global financial capital markets. At these growth rates, the Chinese economy will double every 9 years and the Indian economy will double every 10 years. While the demand for oil in developed economies is declining slightly, the demand for oil in emerging economies is rapidly growing. Indeed, as mentioned in Quéré, Mignon and Penot (2007), China accounted for one-fourth of world incremental oil demand over 1995-2004 and one-third in 2004.

As Jones, Leiby and Paik (2004) stated "Ideally, stock values reflect the market's best estimate of the future profitability of firms, so the effect of oil price shocks on the stock market is a meaningful and useful measure of their economic impact". However, it is surprising that little research has been conducted on the relationship between oil price shocks and financial markets. Few studies have examined the effects of oil shocks on the stock market and exchange rates. Although changes in the price of crude oil are often considered as an important factor for understanding fluctuations in stock prices, there is no consensus about the relation between stock prices and the price of crude oil. While there is a strong presumption in the financial press that oil prices drive the stock market, the empirical evidences on the impact of oil price shocks on stock prices have been mixed. Chen and al (1986) argue that oil prices do not affect the trend of stock prices, while Jones and Kaul (1996) present evidence that favors a negative association. This negative relationship, however, does not receive support by Huang and al (1996) and Wei (2003). Motivated by the possible interdependencies between oil, stock markets and exchange rates in both emerging and developed economies, our investigation is organized as follow: we will present a literature review, some statistical tests' results and the estimated coefficients for the variance-covariance matrix of Trivariate BEKK Model. The last section concludes.

2. Literature review

Bloomberg and Harris (1995) provide a good description, based on the law of one price, of how exchange rate movements can affect oil prices. Crude oil is fairly homogeneous and internationally traded. Akram (2009) finds that a weaker dollar leads to higher commodity prices. Current observations suggest that oil prices and exchange

rates do move together. Ultimately, the relationship between these two variables can only be resolved through empirical studies. Ibrahim, Tuhran and al (2012) examined the dynamic relationship between oil prices and exchange rate of selected emerging economies. Ojebiyi and Wilson (2011) analysed exchange rate volatility through an analysis of the relationship between the Nigerian Naira, oil prices and US dollar. Results show that there is a weak/negative relationship between exchange rate and oil price. Basher and al (2010) investigated the dynamic relationship between real oil prices, exchange rate index for major currencies, emerging market stock prices, interest rates, global real economic activity and oil supply. Results show that oil prices respond positively to positive shock in emerging stock markets, while respond negatively to the positive shock. McKillop (2004) and Jin (2008) argued that an increase in oil prices result in the fluctuation of exchange rate. As a consequence, volatile exchange rates make international trade and investment decisions more difficult because it increases exchange rate risk. Jin (2008) and Coudert and al (2008) suggest a mixed literature on the causality between the two variables. A recent example was the dramatic drop in the price of crude oil in the wake of the global financial and economic crises. The price of oil fell by about two thirds from its peak of $147.0 per barrel in July 2008 to $41.4 at end-December 2008. Vast literature exists on the causal relationship between exchange rate and other variables in the developed and developing economies. Koranchelian (2005) and Zalduendo (2006) show that oil prices play a significant role in determining the equilibrium real effective exchange rate of Algeria and Venezuela. Korhonen and Juurikkala (2007) confirm the statistically significant effect of the real price of oil on exchange rates. Coudert and al (2008) posited that the oil price variable tends to lead the exchange rate variable, thus, the causality runs from the oil price to the exchange rate. Kilian (2009) suggests that oil demand shocks exert significant appreciation pressures in oil-exporting economies more than oil supply and global demand shocks. Recently, Bodart and al (2012) conclude to a significant long-run impact of the price of a given commodity on the real exchange rate. Buetzer and al (2012) confirm that the potential role of oil price changes in driving real exchange rates depends on the nature of the oil shock.

Oil prices can affect stock markets directly by impacting future cash flows or indirectly through an impact on the interest rate used to discount the future cash flows. Kaneko and Lee (1995); Hammoudeh and Huimin (2005); Huang, Hwang and Peng (2005); Basher and Sadorsky (2006); Henriques and Sadorsky (2008) and Park and Ratti (2008) confirm that there is a fairly sizable literature showing that oil price movements affect stock prices. While most of the research investigating the relationship between oil prices and stock prices has been conducted using developed economies, there is some research looking into the relationship between oil prices and emerging stock markets (Hammoudeh and Huimin, 2005 and Basher and Sadorsky, 2006). These investigations provide evidence that changes in oil prices affect emerging market stock prices. Chang, McAleer, and Tansuchat (2009) explained the effect of oil price shocks on stock prices through expected cost flows, the discount rate and the equity pricing model. Ågren (2006) and Hammoudeh (2007) show that volatility spillover occurs when changes in price or returns volatility in one market have a lagged impact on volatility in the financial, energy and stock markets. The reaction of stock markets to oil price and returns shocks will determine whether stock prices rationally reflect the impact of news on current and future real cash flows. Stock markets experienced were extremely bullish from the 1990s onwards. This trend was facilitated by increased access to equity markets, the significant development of financial assets and capital mobility, excess demand by investors, etc. The subprimes crisis led to large losses for several stock markets: for instance Dow-Jones (6%), CAC40 (12%), Nikkei225 (16.15%), etc. Recently, Idi Cheffou and al. (2014) did not reject contagion between the US and three major European stock markets (Germany, the UK and France) following the investigation of volatility spillover.

Conflicting findings on the relationship between crude oil prices and exchange rates in the hand and between crude oil and stock markets motivated us to study co-movements between crude oil, exchange rates and stock markets in eight emerging countries and seven developed economies belonging to North and South America, Central and Pacific Asia, Africa and Eastern and Western Europe by employing Trivariate BEKK GARCH (1, 1) which is able to capture the joint behavior of cross-market linkages.

3. Data

It covers monthly returns of stock market indices, exchange rates and crude oil for eight emerging countries (Brazil, Chile, China, Mexico, Malaysia, Philippines, Russia and South Africa) and seven developed economies (Australia, Canada, France, Japan, New Zealand Switzerland and United Kingdom). The period is chosen between January 2003 and December 2014. This choice is motivated by the inclusion of two important events: the Subprimes crisis and that of sovereign debt in Europe.

4. Multivariate BEKK GARCH (1, 1) Specification

Investigations of Shamiri and Isa (2009) focused on the multivariate GARCH model with BEKK representation to test the transfer of volatility in the financial crisis of 2007 to the stock markets of Southeast Asia. They found a spillover effect of the volatility from US to Asian countries. Bensafta and Semodo (2011) introduce breaks in

variance in a multivariate GARCH to analyze contagion during crises. Authors emphasize that the bias correction of heteroscedasticity conditional correlation allows saying that crises are not always contagious for confirming results found by Forbes and Rigobon (2002).

Engle and Kroner (1995) propose the following specification (model BEKK)

$$H_t = C'C + A'\varepsilon_{t-1}\varepsilon'_{t-1}A + B'H_{t-1}B \quad (1)$$

Where C is a symmetric matrix (N×N), A and B are two matrices (N×N). This specification is applied in several empirical studies. In particular, it ensures that the variance-covariance matrix is positive. However, the number of parameters to estimate for the variance-covariance matrix is very high. It is of the order of N (N+1) /2+ $2N^2$: 164 parameters to be estimated for 8 markets. Most studies using a multivariate GARCH specification to limit the number of studied assets and / or impose restrictions on the process generating H_t. Bollerslev (1990) and Ng (1991) assume that correlations are constant. Bollerslev, Engle and Wooldridge (1988) require diagonality condition matrices A and B. This implies that the variances of H_t depend only on the square past residuals and an autoregressive term. Covariances depend on the cross product past residuals and an autoregressive term. This specification also seems very restrictive because does not take into account the dependence of conditional volatilities between markets evidenced particularly by Hamao Masulis and Ng (1990) and Chan, Karolyi and Stulez (1992) on data with high frequencies. Engle and Ng (1993), Glosten, Jagannathan and Runkle (1993) and Kroner and Ng (1998) found that, in most cases, the effect of a negative shock to the conditional variance is greater than that of a positive shock. We adopt the extension below the BEKK specification for capturing asymmetric responses of conditional variances and covariances of returns:

$$H_t = C'C + A'\varepsilon_{t-1}\varepsilon'_{t-1}A + B'H_{t-1}B + S'\xi_{t-1}\xi'_{t-1}S + T'\eta_{t-1}\eta'_{t-1}T \quad (2)$$

Where S and T are two size matrices (N×N) such as:

$$\xi_{it} = \varepsilon_{it} I_{\xi it} \text{ where } I_{\xi it} = 1 \text{ if } \varepsilon_{it} < 0 \text{ and 0 otherwise} \quad (3)$$

$$\eta_{it} = \varepsilon_{it} I_{\eta it} \text{ where } I_{\eta it} = 1 \text{ if } |\varepsilon_{it}| > \sqrt{h_{iit}} \text{ and 0 otherwise} \quad (4)$$

For the reasons already mentioned, we impose the condition of diagonality for S and T matrices.

5.Statistical tests

5.1 Unit-Root and Stationarity (Table 1)

Before studying the links between various markets, ADF and KPSS tests are applied to examine the fixed properties of the different series. The null hypothesis is that the ADF test series has a unit root, while the stationarity is the null hypothesis in the KPSS test. Thus, we make a KPSS test as confirmatory test results of the ADF. But if the results of both tests are contradictory, then the KPSS is preferable.

5.2 Lag Length Selection (Table 2)

Before running the Granger causality test and variance decomposition analysis, it is first necessary to select the order P of lag. The choice of the order depends mainly on information criteria because there are many restrictions on the likelihood Ratio Test (LR). If two tests show conflicting results, SBIC is more reliable. The results show a lag order equal to unity (holding the SBIC as the most reliable information criterion).

5.3 Granger causality test (Table 3)

Variable is the cause of another if the predictability of the latter is improved when the information on the first variable is incorporated in the analysis. The assumptions are made as follows: • H_0: the variable does not cause the other. • H_A: the variable is the cause of the other.

In Western Europe, the British and French stock markets unilaterally Granger cause both the respective exchange markets as oil. For Switzerland, no sense of causality is recorded between the Swiss Franc and the SMI 25. Western Europe proves the crude oil's ability to cause (unilaterally) the foreign exchange market for all countries. Eastern Europe shows the absence of causality between the stock market and the Russian Ruble. The RTSI index Granger causes crude oil which in turn was able to estimate the Russian currency. Africa highlights a one-way direction of causality between the stock market and the South African Rand. It emphasizes that no direction of causality is recorded between the stock market and crude oil that causes unilaterally exchange market. Central Asia is characterized by the absence of causality between the stock market and the exchange rate on the one hand and the Chinese Yuan and the crude oil on the other hand. But, it highlights a sense of unidirectional causality and significant at the 5% level from crude oil to Shanghai. Asia Pacific shows that Australia and New Zealand recorded a unidirectional causality between the stock market and crude oil on the one hand and energy and the exchange market on the other hand. While in Australia, the ASX stock index Granger causes the Australian Dollar. New Zealand shows a unilateral causal direction from the Dollar to the New Zealander stock market. Japan and Philippines are characterized by the lack of causality between crude oil and stock indexes and the respective exchange rates but these are caused by their stock indexes respectively. In Malaysia, no Granger causality is detected between the stock market and the Malaysian Ringgit. Crude oil causes, unilaterally, exchange market. The KLCI seems able to predict future values of crude oil. In North

America, the same sense of causality and the same behavior of the three markets were recorded in Canada and Mexico. South America shows that Bovespa index, unilaterally, causes as well the Brazilian Real as crude oil. IPSA stock index is caused by the Chilean Peso. A bilateral and significant causality at the 5% threshold is recorded between crude oil and the Brazilian Real. Chile is characterized by absence of causality between crude oil and stock market on the one hand and the Chilean Peso and the second energy on the other hand.

5.4 Error Variance Decomposition (Table 4)

One way to determine how important the different exogenous shocks are in explaining the dependent variables is to calculate the fractions of the forecast error variance of these variables attributable to the respective orthogonal shocks. The central question is: What fractions of these forecast errors are due to the individual shocks?

With the use of a vector autoregression (VAR), we are able to study the links between financial markets. The purpose is to highlight the contribution of each of the innovations to the error's variance. Heuristically, the variance is written to the forecast error at a horizon h (here h is 1 to 10) according to the error variance attributed to each variable. The variance decomposition is somewhat more sensitive to changes in the forecasting variables which are used.

In emerging countries, the stock market with higher own forecast error belongs to Brazil, the lowest to China. On the foreign exchange market, the highest variance is recorded in Philippines, the lowest in Brazil. For crude oil, the greatest value is in China and the lowest in Russia. For developed ones, the stock market with the highest own forecast error belongs to France; the lowest is recorded in Australia. On the foreign exchange market, the highest specific variance is detected at the Swiss Franc, the lowest in Canada. For crude oil, the greatest value is in New Zealand and the lowest in Canada.

Variance decomposition of own crude oil's error prediction, as part of Western Europe shows that the highest value is recorded in Switzerland (90.26%), the lowest in the United Kingdom (not exceeding 67.85% from the sixth month): the FTSE 100 index provides 23.65%. The French stock market seems to have the largest proper value of the variance; the lowest is registered in Switzerland. Swiss Franc seems to be more capable than the Euro and the British Pound to predict its own variance. Eastern Europe shows that crude oil explains only 55.06% of its own forecast error (42.68% of the variance is explained by the RTSI index). Both the RTSI index and the Russian Ruble prove insensitive to shock. Africa shows that the lowest value of specific variance is detected in crude oil (72.20%) followed by the South African Rand (83.97%) and the corresponding index (99.28%) which appears to be independent of the two other markets. Central Asia highlights that the Chinese Yuan has the highest percentage for own variance (97.54%) followed by Shanghai (92.49%) and finally crude oil (89.87%). In Asia Pacific, comparing own variance decomposition of the three markets for each of the four countries, we find that the crude oil has the highest value at New Zealand (91.32%), the lowest belongs to Australia. The Philippine Peso (97.88%) and Malaysian Ringgit (97.75%) appear to have the highest own variance in forecasting error; Australia represents the lowest value. The Philippine and the Japanese stock markets have the highest own variance values of forecast error. Variance decomposition analysis of North American countries reveals that the lowest own variance of crude oil forecast error is registered in Canada, while in Mexico, an emerging country, it reached 81.82%. The Mexican Peso explains 97.78% of its own variance, the Canadian Dollar provides only 60.86% (36.13% is due to the SPTSX index). IPC and SPTSX highlight their ability to predict their own high-level variances of the forecast error. In South America, crude oil records a proper value reaching 70.62% in Brazil and 87.77% in Chile. The Brazilian Real explains only 64.04% of its own variance (34.03% of the variance is explained by the stock market). The Chilean Peso proves successful in correcting its forecast variance (93.97%). Bovespa stock index seems to be more capable than IPC (93.97%) in terms of variance's explanation and prediction.

6.Results and Discussions: TRIVARIATE BEKK GARCH (1, 1) (Table 6)

The estimated BEKK-GARCH model can be obtained by substituting the following matrices (example of Brazil)

$$A=\begin{bmatrix} -0.189873324 & 0.262064580 & -0.128629553 \\ 0.937836576 & 0.153892738 & 0.913661347 \\ -0.088920219 & 0.107670512 & 0.381605823 \end{bmatrix}$$

$$B=\begin{bmatrix} 0.588312962 & -0.180830798 & 0.461888001 \\ 0.632566134 & 0.804681544 & -0.013938540 \\ -0.600132257 & -0.332137873 & -0.112929149 \end{bmatrix}$$

$$C=\begin{bmatrix} 0.001417579 & 0 & 0 \\ -0.000816576 & 0.003638437 & 0 \\ -0.007904019 & 0.025514654 & -0.000000651 \end{bmatrix}$$

In emerging countries, cross volatility coefficient (in average) varies between -0.97 and 0.94. Regarding the variance fluctuates between -0.96 and 0.89. For developed countries, the coefficient of cross volatility (in average) ranges from -98.67% (stock index of New Zealand to crude oil) and 99.94% (Swiss Franc to crude oil). In variance, it varies between -97.84% (Swiss Franc to crude oil) and 99.34% (ASX index to crude oil). In South Africa, volatility transmission's analysis between the three markets shows that there is one-way transmission in average from the stock market while it is bidirectional in variance (ranging from -61.54% to 48.70%). Bidirectional transmission (on average) is recorded between the stock market and crude oil and unilateral in variance from the second. Volatility transmission between the South African Rand and crude oil reveals unidirectional transmission in average and variance from the South African currency. In Eastern Europe, a bidirectional transmission (in average) between the Russian Ruble and RTSI index is detected and unilateral in variance (from the stock market). A unilateral transfer in average is recorded from energy to RTSI. A bilateral transmission (in mean) is recorded between the Russian currency and crude oil. In Central Asia, the Shanghai and the Chinese Yuan experiencing bidirectional transmission in variance [(B (1, 2) = 38% and B (2, 1) = -96.91%)] and unilateral in average from the second [(A (2, 1) = -63.45%)]. Shanghai conveys the volatility (in mean and variance) to crude oil. No transmission is recorded between the Chinese currency and crude oil. Asia Pacific's own transmission coefficients stock indexes are all significant except that of New Zealand; those of exchange rates are significant except Australia. For crude oil, these parameters are only significant in the case of Japan, New Zealand and the Philippines. Variance transmission's coefficients (for stock indices) are significant except Australia. As part of the exchange rate, they prove significant in Australia, Malaysia and Philippines. Only in Japan, own variance volatility transmission coefficient for crude oil is not significant. Cross-volatility coefficients reveal, that except Japan, all stock indices belonging to Pacific convey volatility in average and variance to the respective exchange rates. But, they seem not to transmit the shock (in mean) to Japan, Malaysia and Philippines. Cross-volatility transmission (in average) reveals that the exchange rate manages to convey the shock to crude oil in Japan, Malaysia and Philippines. This energy proves its ability of transferring volatility to Malaysia, New Zealand and the Philippines. The cross- variance transmission analysis highlights that apart from Japan where there is a transfer sided variance from the Yen to Nikkei, a bidirectional transmission (variance) is detected between the stock market and interest rate changes. In New Zealand, no volatility transmission (in variance) between its stock market and crude oil while a bilateral transfer is recorded as part of the Philippines. Australia and Japan show a unilateral variance transmission from ASX to crude oil and from the energy to Nikkei [B (3, 1) = 32.01%)]. A bidirectional transmission in variance between the Yen and crude oil is stored in Japan [B (2, 3) = -90.14% proving the shock's persistence and B (3, 2) = -17.79%)], New Zealand and the Philippines. The Australian Dollar transfers, unilaterally, the volatility in variance to crude oil. But, in Malaysia this energy proves its ability to significantly transmit (at the 10% level) volatility (in variance) to Malaysian Ringgit [B (3, 2) = 32.03%]. In South America, a bilateral transfer medium is recorded between BOVESPA and the Brazilian Real, while in variance, it proves important unilaterally from the latter [B (2, 1) = 63.26%]. In Chile, no transmission (in variance) is detected between IPSA and the Peso. But, it turns out that the first transmit volatility, in average to the second. The South American stock market and crude oil seem to communicate well in that the transmission is bilateral in variance. While transmission in average is detected in Brazil, Chile is characterized by a bilateral transfer. In average, transmission's direction is bidirectional between crude oil and the Brazilian Real. But, in variance, only the energy manages to convey volatility. We report taht, in average; it concerns only the developed countries. Crude oil and studied exchange rates are characterized by a bilateral transmission in variance. The Mexican Peso and crude oil show a two-way transfer of volatility as well in average as in variance. Only the Canadian Dollar transmits sharply the volatility, in average and variance, to crude oil [A (2, 3) = 73.08% and B (2, 3) = 96.27%]. Western Europe highlights that UK has two-way average transmission volatility (in variance) between FTSE 100 and the British Pound. In France, the transfer direction is bilateral (in variance) between Euro and CAC 40 while it is unidirectional, in average, from Euro. In Switzerland, it is one-sided direction, in average, from the Swiss Franc [A (2, 1) = 79.16%] and, in variance, from the SMI 25 [B (1, 2) = -55.41%]. A bilateral medium transmission is detected between crude oil and CAC while in variance, it proves to be unidirectional from the Euro [B (1, 3) = -95.85%]. Crude oil manages to convey volatility in average and variance to Swiss Franc. The FTSE conveys strongly the volatility in average [A (1, 3) = 61.12%] and in variance [B (1, 3) = 71.81%] to crude oil. Transmission volatility's analysis between the exchange rate and crude oil in Western Europe reveals that in the UK, this sense is unilateral in variance from the energy while it is bidirectional in average. In Switzerland, no average transmission is detected. In variance, this transmission is unilaterally from crude oil. In the following table, 1 refers to stock market index, 2 refers to the exchange rate and 3 refers to crude oil. *, ** and*** means significant at 1%, 5% and 10% levels respectively.

7.Conclusion

Knowing the importance of the relationship between stock prices and oil prices in the hand and the relationship between oil prices and exchange rates in the other hand, this paper combines these two streams of literature

together into one empirical Trivariate BEKK GARCH (1, 1). It is possible to gain a more complete understanding of the interactions between crude oil, stock markets and exchange rates in both emerging and developed countries. Granger causality test highlights that Western Europe proves the crude oil's ability to cause the foreign exchange market for all countries. The RTSI index Granger causes crude oil which in turn was able to estimate the Russian currency. Africa highlights a one-way causality between the stock market and the South African Rand. Granger causality test emphasizes that no causality is recorded between the stock market and crude oil that causes unilaterally exchange market. Asia Pacific shows that Australia and New Zealand recorded a unidirectional causality between the stock market and crude oil on the one hand and energy and the exchange market on the other hand. Japan and Philippines are characterized by the lack of causality between crude oil and stock indexes and the respective exchange rates but these are caused by their stock indexes respectively. In Malaysia, no Granger causality is detected between the stock market and the Malaysian Ringgit. Crude oil causes unilaterally exchange market. South America shows that Bovespa, unilaterally, causes as well the Brazilian Real as the crude oil. IPSA stock index is caused by the Chilean Peso.

In emerging countries, variance decomposition analysis shows that the stock market with higher own forecast error belongs to Brazil, the lowest to China. On the foreign exchange market, the highest variance is recorded in Philippines, the lowest in Brazil. For crude oil, the greatest value is in China and the lowest in Russia. For developed ones, the stock market with the highest own forecast error belongs to France; the lowest is recorded in Australia. On the foreign exchange market, the highest specific variance is detected at the Swiss Franc while the lowest in Canada. For crude oil, the greatest value is in New Zealand and the lowest in Canada. In emerging countries, cross volatility coefficient (in average) varies between -0.97 and 0.94. The variance fluctuates between -0.96 and 0.89. For developed countries, the coefficient of cross volatility (in average) ranges from -98.67% (stock index of New Zealand to crude oil) and 99.94% (Swiss Franc to crude oil). In variance, it varies between -97.84% (Swiss Franc to crude oil) and 99.34% (ASX index to crude oil). This study highlights the asymmetry of the impact of oil price shocks on both stock markets and exchange rates regardless of geographic location considered.

REFERENCES

Akram, Q.F. (2009), "Commodity prices, interest rates and the dollar", Energy Economics, 31, 838-851.

Basher, S.A. and Sadorsky, P. (2006), "Oil price risk and emerging stock markets", Global Finance Journal, 17, 224-251.

Benassy-Quere, A., Mignon, V. and Penot, A. (2007), "China and the relationship between the oil price and the dollar", Energy Policy, 35, 5795-5805.

Elliott, G., Rothenberg. T. J. and Stock, J. H. (1996), "Efficient tests for an autoregressive unit root", Econometrica, 64, 813-836.

El-Sharif, I., Brown, D., Burton, B., Nixon, B. and Russell, A. (2005), "Evidence on the nature and extent of the relationship between oil prices and equity values in the UK", Energy Economics, 27, 819-830.

Faff, R.W. and Brailsford, T.J. (1999), "Oil price risk and the Australian stock market", Journal of Energy Finance and Development, 4, 69-87.

Golub, S. (1983), "Oil prices and exchange rates", Economic Journal, 93, 576-593.

Gregory, A.W., Haug, A.A. and Lomuto, N. (2004), "Mixed signals among tests for cointegration", Journal of Applied Econometrics, 19, 89-98.

Hamilton, J.D. (2009), "Causes and consequences of the oil shock of 2007-08", Brookings Papers on Economics Activity, Spring, 215-259.

Hammoudeh, S. and Aleisa, E. (2004), "Dynamic relationships among GCC stock markets and NYMEX oil futures", Contemporary Economic Policy, 22, 250-269.

Hammoudeh, S., Dibooglu, S. and Aleisa, E. (2004), "Relationships among US oil prices and oil industry equity indices", International Review of Economics and Finance, 13, 427- 453.

Hammoudeh, S. and Huimin, L. (2005), "Oil sensitivity and systematic risk in oil-sensitive stock indices", Journal of Economics and Business, 57, 1-21.

Henriques, I. and Sadorsky, P. (2008), "Oil prices and the stock prices of alternative energy companies", Energy Economics, 30, 998-1010.

Huang, B.-N., Hwang, M.J. and Peng, H-P. (2005), "The asymmetry of the impact of oil price shocks on economic activities: An application of the multivariate threshold model", Energy Economics, 27, 455-476.

Jones, C. and Kaul, G. (1996), "Oil and the stock markets", Journal of Finance, 51, 463-91.

Kilian, L. and Vigfusson, R.J. (2009), "Pitfalls in estimating asymmetric effects of energy price shocks", Manuscript, University of Michigan.

Krugman, P. (1983b), "Oil shocks and exchange rate dynamics, in Frankel, J.A. Exchange Rates and International macroeconomics", University of Chicago Press, Chicago.

Park, J. and Ratti, R.A. (2008), "Oil price shocks and stock markets in the US and 13 European countries", Energy Economics, 30, 2587–2608.

Sadorsky, P. (1999), "Oil price shocks and stock market activity", Energy Economics, 21, 449-469.

Sadorsky, P. (2000), "The empirical relationship between energy futures prices and exchange rates", Energy Economics, 22, 253-266.

Zhang,Y-F., Fan,Y., Tsai,H-T. and Wei,Y-M. (2008), "Spillover effect of US dollar exchange rate on oil prices", Journal of Policy Modelling, 30, 973-991.

Table 1: Unit Root and Stationarity

	With constant			With constant and trend				With constant			With constant and trend		
Brazil	BOVESPA	BRL/USD	CRUDE OIL	BOVESPA	BRL/USD	CRUDE OIL	*Australia*	ASX	AUD/USD	CRUDE OIL	ASX	AUD/USD	CRUDE OIL
ADF	-9.570286*	-12.04372*	-9.176819*	-9.947420*	-12.28834*	-9.440125*	ADF	-10.04791*	-2.344378	-9.176819*	-10.05000*	-3.518047**	-9.440125*
KPSS	0.519478*	0.452880*	0.226275***	0.032387*	0.028440*	0.042957*	KPSS	0.161291***	1.105548	0.226275***	0.105585***	0.107129***	0.042957***
Chile	IPSA	CLP/USD	CRUDE OIL	IPSA	CLP/USD	CRUDE OIL	*Canada*	SPTSX	CAD/USD	CRUDE OIL	SPTSX	CAD/USD	CRUDE OIL
ADF	-10.33518*	-11.44187*	-9.176819*	-10.57229*	-11.43688*	-9.440125*	ADF	-9.382410*	-8.169653*	-9.176819*	-9.422546*	-8.468470*	-9.440125*
KPSS	0.440157**	0.389202**	0.226275***	0.043526*	0.364626	0.042957*	KPSS	0.164110***	0.362642**	0.226275***	0.076828***	0.039680***	0.042957***
China	SHANGHAI	CNY/USD	CRUDE OIL	SHANGHAI	CNY/USD	CRUDE OIL	*France*	CAC	EUR/USD	CRUDE OIL	CAC	EUR/USD	CRUDE OIL
ADF	-6.242187*	-8.348339*	-9.410863*	-6.218562*	-8.342802*	-9.575016*	ADF	-10.36741*	-8.653553*	-9.176819*	-10.32541*	-8.824477*	-9.440125*
KPSS	0.062293***	0.219982***	0.152052***	0.064467*	0.203884*	0.029489*	KPSS	0.185872***	0.247991***	0.226275***	0.144824**	0.032071***	0.042957***
Malaysia	KLCI	MYR/USD	CRUDE OIL	KLCI	MYR/USD	CRUDE OIL	*Japan*	NIKKEI	JPY/USD	CRUDE OIL	NIKKEI	JPY/USD	CRUDE OIL
ADF	-10.44482*	-11.46338*	-9.176819*	-10.48809*	-11.42985*	-9.440125*	ADF	-9.777106*	-9.107105*	-9.103575*	-9.741921*	-9.354806*	-9.333961*
KPSS	0.088694***	0.500000**	0.226275***	0.044110*	0.500000	0.042957*	KPSS	0.158755***	0.385534**	0.202563***	0.158869*	0.173877*	0.038195***
Mexico	IPC	MXN/USD	CRUDE OIL	IPC	MXN/USD	CRUDE OIL	*New-Zealand*	DJNZ	NZD/USD	CRUDE OIL	DJNZ	NZD/USD	CRUDE OIL
ADF	-10.29744*	-9.821742*	-9.176819*	-10.69284*	-9.793172*	-9.440125*	ADF	-10.42849*	-7.915530*	-8.491656*	-10.42678*	-7.904529*	-8.724203*
KPSS	0.477984*	0.500000*	0.226275***	0.062199*	0.500000	0.042957*	KPSS	0.232414***	0.060046***	0.260418***	0.184185*	0.041815***	0.044831***
Philippines	PSEI	PHP/USD	CRUDE OIL	PSEI	PHP/USD	CRUDE OIL	*United-Kingdom*	FTSE	GBP/USD	CRUDE OIL	FTSE	GBP/USD	CRUDE OIL
ADF	-11.42124*	-9.996257*	-8.491656*	-11.37446*	-10.03446*	-8.724203*	ADF	-11.83172*	-10.29648*	-9.176819*	-11.80313*	-10.30891*	-9.440125*
KPSS	0.061281***	0.500000*	0.260418***	0.061315*	0.500000	0.044831*	KPSS	0.129519***	0.109202***	0.226275***	0.093443***	0.065874***	0.042957***
Russia	RTSI	RUB/USD	CRUDE OIL	RTSI	RUB/USD	CRUDE OIL	*Switzerland*	SMI 25	CHF/USD	CRUDE OIL	SMI 25	CHF/USD	CRUDE OIL
ADF	-8.696539*	-9.052151*	-9.176819*	-8.885822*	-9.385980*	-9.440125*	ADF	-8.980768*	-10.28086*	-9.176819*	-8.974406*	-10.25927*	-9.440125*
KPSS	0.312481***	0.404205**	0.226275***	0.041444*	0.314669	0.042957*	KPSS	0.190958***	0.053635***	0.226275***	0.142308**	0.041604***	0.042957***
South-Africa	FTSSA	ZAR/USD	CRUDE OIL	FTSSA	ZAR/USD	CRUDE OIL							
ADF	-12.16917*	-8.785553*	-8.491656*	-12.20967*	-8.844799*	-8.724203*							
KPSS	0.202322***	0.180774***	0.260418***	0.099807*	0.053097*	0.044831*							

Table 2: Lag length selection

	With constant			With constant and trend				With constant			With constant and trend		
Brazil	BOVESPA	BRL/USD	CRUDE OIL	BOVESPA	BRL/USD	CRUDE OIL	*Australia*	ASX	AUD/USD	CRUDE OIL	ASX	AUD/USD	CRUDE OIL
ADF	-9.570286*	-12.04372*	-9.176819*	-9.947420*	-12.28834*	-9.440125*	ADF	-10.04791*	-2.344378	-9.176819*	-10.05000*	-3.518047**	-9.440125*
KPSS	0.519478*	0.452880*	0.226275***	0.032387*	0.028440*	0.042957*	KPSS	0.161291***	1.105548	0.226275***	0.105585***	0.107129***	0.042957***
Chile	IPSA	CLP/USD	CRUDE OIL	IPSA	CLP/USD	CRUDE OIL	*Canada*	SPTSX	CAD/USD	CRUDE OIL	SPTSX	CAD/USD	CRUDE OIL
ADF	-10.33518*	-11.44187*	-9.176819*	-10.57229*	-11.43688*	-9.440125*	ADF	-9.382410*	-8.169653*	-9.176819*	-9.422546*	-8.468470*	-9.440125*
KPSS	0.440157**	0.389202**	0.226275***	0.043526*	0.364626	0.042957*	KPSS	0.164110***	0.362642**	0.226275***	0.076828***	0.039680***	0.042957***
China	SHANGHAI	CNY/USD	CRUDE OIL	SHANGHAI	CNY/USD	CRUDE OIL	*France*	CAC	EUR/USD	CRUDE OIL	CAC	EUR/USD	CRUDE OIL
ADF	-6.242187*	-8.348339*	-9.410863*	-6.218562*	-8.342802*	-9.575016*	ADF	-10.36741*	-8.653553*	-9.176819*	-10.32541*	-8.824477*	-9.440125*
KPSS	0.062293***	0.219982***	0.152052***	0.064467*	0.203884*	0.029489*	KPSS	0.185872***	0.247991***	0.226275***	0.144824**	0.032071***	0.042957***
Malaysia	KLCI	MYR/USD	CRUDE OIL	KLCI	MYR/USD	CRUDE OIL	*Japan*	NIKKEI	JPY/USD	CRUDE OIL	NIKKEI	JPY/USD	CRUDE OIL
ADF	-10.44482*	-11.46338*	-9.176819*	-10.48809*	-11.42985*	-9.440125*	ADF	-9.777106*	-9.107105*	-9.103575*	-9.741921*	-9.354806*	-9.333961*
KPSS	0.088694***	0.500000**	0.226275***	0.044110*	0.500000	0.042957*	KPSS	0.158755***	0.385534**	0.202563***	0.158869*	0.173877*	0.038195***
Mexico	IPC	MXN/USD	CRUDE OIL	IPC	MXN/USD	CRUDE OIL	*New-Zealand*	DJNZ	NZD/USD	CRUDE OIL	DJNZ	NZD/USD	CRUDE OIL
ADF	-10.29744*	-9.821742*	-9.176819*	-10.69284*	-9.793172*	-9.440125*	ADF	-10.42849*	-7.915530*	-8.491656*	-10.42678*	-7.904529*	-8.724203*
KPSS	0.477984*	0.500000*	0.226275***	0.062199*	0.500000	0.042957*	KPSS	0.232414***	0.060046***	0.260418***	0.184185*	0.041815***	0.044831***
Philippines	PSEI	PHP/USD	CRUDE OIL	PSEI	PHP/USD	CRUDE OIL	*United-Kingdom*	FTSE	GBP/USD	CRUDE OIL	FTSE	GBP/USD	CRUDE OIL
ADF	-11.42124*	-9.996257*	-8.491656*	-11.37446*	-10.03446*	-8.724203*	ADF	-11.83172*	-10.29648*	-9.176819*	-11.80313*	-10.30891*	-9.440125*
KPSS	0.061281***	0.500000*	0.260418***	0.061315*	0.500000	0.044831*	KPSS	0.129519***	0.109202***	0.226275***	0.093443***	0.065874***	0.042957***
Russia	RTSI	RUB/USD	CRUDE OIL	RTSI	RUB/USD	CRUDE OIL	*Switzerland*	SMI 25	CHF/USD	CRUDE OIL	SMI 25	CHF/USD	CRUDE OIL
ADF	-8.696539*	-9.052151*	-9.176819*	-8.885822*	-9.385980*	-9.440125*	ADF	-8.980768*	-10.28086*	-9.176819*	-8.974406*	-10.25927*	-9.440125*
KPSS	0.312481***	0.404205**	0.226275***	0.041444*	0.314669	0.042957*	KPSS	0.190958***	0.053635***	0.226275***	0.142308**	0.041604***	0.042957***
South-Africa	FTSSA	ZAR/USD	CRUDE OIL	FTSSA	ZAR/USD	CRUDE OIL							
ADF	-12.16917*	-8.785553*	-8.491656*	-12.20967*	-8.844799*	-8.724203*							
KPSS	0.202322***	0.180774***	0.260418***	0.099807*	0.053097*	0.044831*							

Table 3: Granger Causality test

EMERGING COUNTRIES

Brezil

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
BRL/USD does not Granger cause BOVESPA		0.11675	0.7331	H_0
BOVESPA does not Granger cause BRL/USD	141	4.96576	0.0275	H_A
CRUDE OIL does not Granger cause BOVESPA		0.08141	0.7758	H_0
BOVESPA does not Granger cause CRUDE OIL	141	5.30342	0.0228	H_A
CRUDE OIL does not Granger cause BRL/USD		5.57005	0.0197	H_A
BRL/USD does not Granger cause CRUDE OIL	141	5.49030	0.0206	H_A

Chile

: Null Hypothesis	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
CLP/USD does not Granger cause IPSA		9.27790	0.0028	H_A
IPSA does not Granger cause CLP/USD	141	0.96930	0.3266	H_0
CRUDE OIL does not Granger cause IPSA		0.07336	0.7869	H_0
IPSA does not Granger cause CRUDE OIL	141	0.70335	0.4031	H_0
CRUDE OIL does not Granger cause CLP/USD		0.01510	0.9024	H_0
CLP/USD does not Granger cause CRUDE OIL	141	1.07021	0.3027	H_0

China

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
CNY/USD does not Granger cause SHANGHAI		0.13301	0.7159	H_0
SHANGHAI does not Granger cause CNY/USD	139	1.80409	0.1815	H_0
CRUDE OIL does not Granger cause SHANGHAI		6.70050	0.0107	H_A
SHANGHAI does not Granger cause CRUDE OIL	139	0.15220	0.6971	H_0
CRUDE OIL does not Granger cause CNY/USD		0.15944	0.6903	H_0
CNY/USD does not Granger cause CRUDE OIL	139	1.34479	0.2482	H_0

Malaysia

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
MYR/USD does not Granger cause KLCI		2.38462	0.1248	H_0
KLCI does not Granger cause MYR/USD	141	0.03703	0.8477	H_0
CRUDE OIL does not Granger cause KLCI		0.00128	0.9715	H_0
KLCI does not Granger cause CRUDE OIL	141	4.84205	0.0294	H_A
CRUDE OIL does not Granger cause MYR/USD		3.63342	0.0587	H_A
MYR/USD does not Granger cause CRUDE OIL	141	0.19514	0.6594	H_0

Mexico

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
MXN/USD does not Granger cause IPC		2.87600	0.0922	H_A
IPC does not Granger cause MXN/USD	141	0.76570	0.3831	H_0
CRUDE OIL does not Granger cause IPC		1.65880	0.1999	H_0
IPC does not Granger cause CRUDE OIL	141	3.61089	0.0595	H_A
CRUDE OIL does not Granger cause MXN/USD		3.19455	0.0761	H_A
MXN/USD does not Granger cause CRUDE OIL	141	0.22999	0.6323	H_0

Philippines

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
PHP/USD does not Granger cause PSEI		0.00441	0.9472	H_0
PSEI does not Granger cause PHP/USD	135	2.75227	0.0995	H_A
CRUDE OIL does not Granger cause PSEI		0.17109	0.6798	H_0
PSEI does not Granger cause CRUDE OIL	135	0.42575	0.5152	H_0
CRUDE OIL does not Granger cause PHP/USD		1.43575	0.2330	H_0
PHP/USD does not Granger cause CRUDE OIL	135	0.11741	0.7324	H_0

Russia

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
RUB/USD does not Granger cause RTSI		0.75007	0.3880	H_0
RTSI does not Granger cause RUB/USD	141	1.56887	0.2125	H_0
CRUDE OIL does not Granger cause RTSI		1.98718	0.1609	H_0
RTSI does not Granger cause CRUDE OIL	141	8.98473	0.0032	H_A
CRUDE OIL does not Granger cause RUB/USD		4.62617	0.0332	H_A
RUB/USD does not Granger cause CRUDE OIL	141	0.25705	0.6130	H_0

South-Africa

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
ZAR/USD does not Granger cause FTSSA		0.87398	0.3516	H_0
FTSSA does not Granger cause ZAR/USD	135	8.92203	0.0034	H_A
CRUDE OIL does not Granger cause FTSSA		0.48838	0.4859	H_0
FTSSA does not Granger cause CRUDE OIL	135	0.13055	0.7184	H_0
CRUDE OIL does not Granger cause ZAR/USD		5.97063	0.0159	H_A
ZAR/USD does not Granger cause CRUDE OIL	135	1.13108	0.2895	H_0

DEVELOPED COUNTRIES

Australia

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
AUD/USD does not Granger cause ASX	141	2.50496	0.1138	H_0
ASX does not Granger cause AUD/USD		25.8292	1.E-06	H_A
CRUDE OIL does not Granger cause ASX	141	0.61967	0.4325	H_0
ASX does not Granger cause CRUDE OIL		3.43602	0.0659	H_A
CRUDE OIL does not Granger cause AUD/USD	141	20.8723	1.E-05	H_A
AUD/USD does not Granger cause CRUDE OIL		1.56599	0.2129	H_0

Canada

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
CAD/USD does not Granger cause SPTSX	141	4.30487	0.0399	H_A
SPTSX does not Granger cause CAD/USD		54.1944	1.E-11	H_A
CRUDE OIL does not Granger cause SPTSX	141	0.31216	0.5773	H_0
SPTSX does not Granger cause CRUDE OIL		6.35079	0.0129	H_A
CRUDE OIL does not Granger cause CAD/USD	141	10.9668	0.0012	H_A
CAD/USD does not Granger causeCRUDE OIL		2.37451	0.1256	H_0

France

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
EUR/USD does not Granger cause CAC	141	0.10958	0.7411	H_0
CAC does not Granger cause EUR/USD		9.30874	0.0027	H_A
CRUDE OIL does not Granger cause CAC	141	0.01191	0.9133	H_0
CAC does not Granger cause CRUDE OIL		5.25002	0.0235	H_A
CRUDE OIL does not Granger cause EUR/USD	141	10.2713	0.0017	H_A
EUR/USD does not Granger cause CRUDE OIL		0.28123	0.5967	H_0

Japan

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
JPY/USD does not Granger cause NIKKEI	140	0.07265	0.7879	H_0
NIKKEI does not Granger cause JPY/USD		6.72544	0.0105	H_A
CRUDE OIL does not Granger cause NIKKEI	140	0.45246	0.5023	H_0
NIKKEI does not Granger cause CRUDE OIL		0.95691	0.3297	H_0
CRUDE OIL does not Granger cause JPY/USD	140	0.48282	0.4883	H_0
JPY/USD does not Granger cause CRUDE OIL		0.19033	0.6633	H_0

New-Zealand

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
NZD/USD does not Granger cause DJNZ	135	3.80173	0.0533	H_A
DJNZ does not Granger cause NZD/USD		0.92872	0.3370	H_0
CRUDE OIL does not Granger cause DJNZ	135	0.01262	0.9107	H_0
DJNZ does not Granger cause CRUDE OIL		3.06531	0.0823	H_A
CRUDE OIL does not Granger cause NZD/USD	135	10.3518	0.0016	H_A
NZD/USD does not Granger cause CRUDE OIL		0.47121	0.4936	H_0

Switzerland

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
CHF/USD does not Granger cause SMI 25	141	1.96690	0.1630	H_0
SMI 25 does not Granger cause CHF/USD		0.04430	0.8336	H_0
CRUDE OIL does not Granger cause SMI 25	141	1.86629	0.1741	H_0
SMI 25 does not Granger cause CRUDE OIL		4.03291	0.0466	H_A
CRUDE OIL does not Granger cause CHF/USD	141	5.14325	0.0249	H_A
CHF/USD does not Granger cause CRUDE OIL		0.98112	0.3237	H_0

United-Kingdom

Null Hypothesis:	Obs	F-Statistic	Prob.	*Accepted Hypothesis*
GBP/USD does not Granger cause FTSE	141	0.86651	0.3535	H_0
FTSE does not Granger cause GBP/USD		8.58334	0.0040	H_A
CRUDE OIL does not Granger cause FTSE	141	0.13478	0.7141	H_0
FTSE does not Granger cause CRUDE OIL		4.65395	0.0327	H_A
CRUDE OIL does not Granger cause GBP/USD	141	8.87310	0.0034	H_A
GBP/USD does not Granger cause CRUDE OIL		0.00459	0.9461	H_0

Table 4: Variance Decomposition Analysis

Emerging Countries

Brazil

Variance Decomposition of BOVESPA:					Variance Decomposition of BRL/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	BOVESPA	BRL/USD	CRUDE OIL	S.E.	BOVESPA	BRL/USD	CRUDE OIL	S.E.	BOVESPA	BRL/USD	CRUDE OIL
1	0.028268	100.0000	0.000000	0.000000	0.018280	32.92461	67.07539	0.000000	0.037448	18.65127	3.747128	77.60160
2	0.028906	99.86916	0.064218	0.066620	0.018778	33.82600	64.24632	1.927673	0.039557	23.71279	5.101005	71.18621
3	0.028939	99.86737	0.064374	0.068260	0.018818	34.01390	64.06271	1.923395	0.039747	24.26902	5.056085	70.67490
4	0.028940	99.86697	0.064398	0.068637	0.018820	34.02684	64.04579	1.927366	0.039763	24.32309	5.054378	70.62253
5	0.028940	99.86695	0.064399	0.068653	0.018820	34.02803	64.04460	1.927371	0.039764	24.32727	5.054073	70.61866
6	0.028940	99.86695	0.064399	0.068655	0.018820	34.02811	64.04451	1.927381	0.039764	24.32759	5.054054	70.61836
7	0.028940	99.86695	0.064399	0.068655	0.018820	34.02811	64.04451	1.927382	0.039764	24.32761	5.054053	70.61834
8	0.028940	99.86695	0.064399	0.068655	0.018820	34.02811	64.04451	1.927382	0.039765	24.32761	5.054053	70.61834
9	0.028940	99.86695	0.064399	0.068655	0.018820	34.02811	64.04451	1.927382	0.039765	24.32761	5.054053	70.61834
10	0.028940	99.86695	0.064399	0.068655	0.018820	34.02811	64.04451	1.927382	0.039765	24.32761	5.054053	70.61834

Chile

Variance Decomposition of IPSA:					Variance Decomposition of CLP/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	IPSA	CLP/USD	CRUDE OIL	S.E.	IPSA	CLP/USD	CRUDE OIL	S.E.	IPSA	CLP/USD	CRUDE OIL
1	0.018717	100.0000	0.000000	0.000000	0.114562	2.457352	97.54265	0.000000	0.037808	7.357304	1.530727	91.11197
2	0.019384	95.14891	4.813419	0.037670	0.137706	5.351884	94.64811	1.42E-06	0.039160	7.318059	2.734088	89.94785
3	0.019706	94.18784	4.782730	1.029429	0.138714	5.890700	93.94830	0.161003	0.039859	8.996379	2.790781	88.21284
4	0.019742	93.93574	4.769454	1.294810	0.139671	5.810388	94.02973	0.159877	0.039977	9.282044	2.790273	87.92768
5	0.019772	93.70630	4.916857	1.376843	0.140407	5.845216	93.99560	0.159184	0.040029	9.370390	2.822487	87.80712
6	0.019778	93.68575	4.923663	1.390586	0.140480	5.863177	93.97286	0.163958	0.040042	9.399907	2.822703	87.77739
7	0.019780	93.67714	4.924341	1.398519	0.140494	5.862584	93.97329	0.164125	0.040046	9.407994	2.822853	87.76915
8	0.019780	93.67206	4.927843	1.400102	0.140517	5.862834	93.97309	0.164073	0.040048	9.410005	2.823777	87.76622
9	0.019781	93.67125	4.928210	1.400545	0.140521	5.863430	93.97237	0.164200	0.040048	9.410904	2.823759	87.76534
10	0.019781	93.67094	4.928301	1.400760	0.140521	5.863496	93.97229	0.164213	0.040048	9.411106	2.823771	87.76512

China

Variance Decomposition of SHANGHAI:					Variance Decomposition of CNY/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	SHANGHAI	CNY/USD	CRUDE OIL	S.E.	SHANGHAI	CNY/USD	CRUDE OIL	S.E.	SHANGHAI	CNY/USD	CRUDE OIL
1	0.035306	100.0000	0.000000	0.000000	0.002041	0.107534	99.89247	0.000000	0.036516	0.773777	1.133073	98.09315
2	0.036186	95.44503	0.001544	4.553429	0.002137	1.680617	98.11047	0.208913	0.037696	0.784577	3.400096	95.81533
3	0.037482	93.72975	0.412785	5.857465	0.002181	1.617313	98.00720	0.375486	0.038962	5.170788	3.717508	91.11170
4	0.037682	92.81235	0.532755	6.654890	0.002194	1.913436	97.65294	0.433627	0.039107	5.571118	3.961982	90.46690
5	0.037739	92.55506	0.671563	6.773375	0.002197	1.942506	97.61261	0.444881	0.039250	6.155297	3.948954	89.89575
6	0.037763	92.51229	0.703601	6.784108	0.002198	1.994723	97.55989	0.445384	0.039277	6.168594	3.945263	89.88614
7	0.037767	92.49901	0.718081	6.782911	0.002199	2.003750	97.55092	0.445326	0.039288	6.176702	3.945020	89.87828
8	0.037770	92.49624	0.719974	6.783790	0.002199	2.009145	97.54529	0.445566	0.039290	6.177878	3.945663	89.87646
9	0.037770	92.49402	0.720374	6.785608	0.002199	2.009909	97.54427	0.445820	0.039291	6.178566	3.946532	89.87490
10	0.037770	92.49331	0.720374	6.786319	0.002199	2.010165	97.54392	0.445916	0.039291	6.179958	3.946694	89.87335

Malaysia

Variance Decomposition of KLCI:					Variance Decomposition of MYR/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	KLCI	MYR/USD	CRUDE OIL	S.E.	KLCI	MYR/USD	CRUDE OIL	S.E.	KLCI	MYR/USD	CRUDE OIL
1	0.016372	100.0000	0.000000	0.000000	0.080527	0.000429	99.99957	0.000000	0.037693	11.75015	0.953799	87.29605
2	0.016613	98.75707	1.232395	0.010532	0.090747	0.005422	98.00145	1.993131	0.039597	17.04313	1.259164	81.69771
3	0.016630	98.56747	1.400722	0.031807	0.093240	0.095235	97.81508	2.089681	0.039723	17.43941	1.262042	81.29855
4	0.016635	98.51213	1.454257	0.033618	0.093846	0.096460	97.76530	2.138241	0.039730	17.46300	1.264732	81.27227
5	0.016636	98.49867	1.466854	0.034476	0.094002	0.098621	97.75385	2.147532	0.039731	17.46418	1.264716	81.27111
6	0.016637	98.49517	1.470183	0.034645	0.094042	0.098916	97.75087	2.150213	0.039731	17.46424	1.264767	81.27099
7	0.016637	98.49429	1.471020	0.034693	0.094052	0.099018	97.75012	2.150861	0.039731	17.46424	1.264773	81.27099
8	0.016637	98.49406	1.471236	0.034705	0.094055	0.099041	97.74993	2.151030	0.039731	17.46424	1.264775	81.27098
9	0.016637	98.49400	1.471290	0.034708	0.094055	0.099047	97.74988	2.151073	0.039731	17.46424	1.264775	81.27098
10	0.016637	98.49399	1.471304	0.034709	0.094056	0.099049	97.74987	2.151084	0.039731	17.46424	1.264775	81.27098

Mexico

Variance Decomposition of IPC:					Variance Decomposition of MXN/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	IPC	MXN/USD	CRUDE OIL	S.E.	IPC	MXN/USD	CRUDE OIL	S.E.	IPC	MXN/USD	CRUDE OIL
1	0.021125	100.0000	0.000000	0.000000	0.126050	0.215824	99.78418	0.000000	0.037836	8.762103	4.439741	86.79816
2	0.021575	97.82881	1.576737	0.594448	0.141409	0.871523	97.85021	1.278264	0.039606	12.81528	4.930493	82.25422
3	0.021623	97.60996	1.651981	0.738055	0.145386	0.836383	97.84674	1.316875	0.039770	13.22315	4.907905	81.86895
4	0.021632	97.54029	1.719455	0.740255	0.146437	0.848726	97.79398	1.357296	0.039786	13.25728	4.918498	81.82422
5	0.021634	97.52762	1.729731	0.742648	0.146725	0.847989	97.78908	1.362932	0.039788	13.26106	4.918141	81.82080
6	0.021634	97.52359	1.733788	0.742622	0.146803	0.848377	97.78636	1.365268	0.039788	13.26130	4.918511	81.82019
7	0.021634	97.52262	1.734692	0.742687	0.146824	0.848383	97.78584	1.365774	0.039788	13.26133	4.918533	81.82014
8	0.021634	97.52234	1.734971	0.742690	0.146830	0.848400	97.78567	1.365933	0.039788	13.26133	4.918551	81.82012
9	0.021634	97.52226	1.735043	0.742693	0.146832	0.848402	97.78562	1.365973	0.039788	13.26133	4.918554	81.82012
10	0.021635	97.52224	1.735063	0.742693	0.146832	0.848403	97.78561	1.365985	0.039788	13.26133	4.918555	81.82012

Philippines

Variance Decomposition of PSEI:					Variance Decomposition of PHP/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	PSEI	PHP/USD	CRUDE OIL	S.E.	PSEI	PHP/USD	CRUDE OIL	S.E.	PSEI	PHP/USD	CRUDE OIL
1	0.024732	100.0000	0.000000	0.000000	0.127490	0.003063	99.99694	0.000000	0.038397	12.10066	2.642685	85.25665
2	0.024749	99.87445	0.001022	0.124528	0.143911	1.575300	98.17100	0.253695	0.040089	13.30111	2.893318	83.80557
3	0.024751	99.85949	0.006449	0.134058	0.147926	1.770845	97.96447	0.264688	0.040207	13.41677	2.878880	83.70435
4	0.024752	99.85822	0.006877	0.134904	0.148976	1.829001	97.89927	0.271727	0.040215	13.42109	2.883941	83.69497
5	0.024752	99.85795	0.007109	0.134938	0.149253	1.842965	97.88408	0.272959	0.040216	13.42181	2.884031	83.69416
6	0.024752	99.85790	0.007153	0.134944	0.149327	1.846818	97.87982	0.273363	0.040216	13.42179	2.884217	83.69400
7	0.024752	99.85789	0.007167	0.134944	0.149347	1.847819	97.87872	0.273459	0.040216	13.42179	2.884245	83.69396
8	0.024752	99.85789	0.007171	0.134944	0.149352	1.848088	97.87843	0.273487	0.040216	13.42179	2.884255	83.69396
9	0.024752	99.85788	0.007172	0.134944	0.149353	1.848159	97.87835	0.273494	0.040216	13.42179	2.884258	83.69395
10	0.024752	99.85788	0.007172	0.134944	0.149354	1.848178	97.87833	0.273495	0.040216	13.42179	2.884258	83.69395

Russia

Variance Decomposition of RTSI:					Variance Decomposition of RUB/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	RTSI	RUB/USD	CRUDE OIL	S.E.	RTSI	RUB/USD	CRUDE OIL	S.E.	RTSI	RUBUSD	CRUDE OIL
1	0.042810	100.0000	0.000000	0.000000	0.125214	1.171701	98.82830	0.000000	0.037169	35.20042	2.274468	62.52511
2	0.045011	98.62192	0.431333	0.946746	0.140576	1.085305	97.42824	1.486456	0.039451	41.95169	2.278424	55.76988
3	0.045295	98.52125	0.426421	1.052329	0.144667	1.124372	97.18666	1.688964	0.039717	42.58161	2.248830	55.16956
4	0.045335	98.49970	0.440752	1.059546	0.145748	1.107834	97.11604	1.776123	0.039754	42.66816	2.255276	55.07656
5	0.045341	98.49671	0.441214	1.062075	0.146050	1.106785	97.09975	1.793466	0.039759	42.67912	2.254876	55.06600
6	0.045341	98.49593	0.441946	1.062128	0.146133	1.105599	97.09494	1.799461	0.039760	42.68057	2.255270	55.06416
7	0.045341	98.49578	0.442024	1.062196	0.146156	1.105411	97.09371	1.800883	0.039760	42.68073	2.255293	55.06397
8	0.045342	98.49574	0.442069	1.062195	0.146162	1.105328	97.09335	1.801322	0.039760	42.68075	2.255318	55.06393
9	0.045342	98.49573	0.442077	1.062198	0.146164	1.105311	97.09325	1.801434	0.039760	42.68075	2.255321	55.06392
10	0.045342	98.49572	0.442080	1.062198	0.146165	1.105305	97.09323	1.801467	0.039760	42.68075	2.255323	55.06392

South-Africa

Variance Decomposition of FTSSA:					Variance Decomposition of ZAR/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	FTSSA	ZAR/USD	CRUDE OIL	S.E.	FTSSA	ZAR/USD	CRUDE OIL	S.E.	FTSSA	ZAR/USD	CRUDE OIL
1	0.019590	100.0000	0.000000	0.000000	0.014777	6.259555	93.74044	0.000000	0.038307	23.74505	1.864415	74.39054
2	0.019676	99.32302	0.507146	0.169835	0.015874	14.30216	84.62505	1.072789	0.039976	24.37808	3.004466	72.61745
3	0.019691	99.28713	0.522910	0.189957	0.015963	14.58539	84.07139	1.343217	0.040184	24.55792	3.189174	72.25291
4	0.019692	99.28064	0.526143	0.193218	0.015976	14.63623	83.98079	1.382982	0.040209	24.58046	3.215847	72.20369
5	0.019692	99.27990	0.526471	0.193625	0.015977	14.64157	83.97005	1.388379	0.040213	24.58351	3.219321	72.19717
6	0.019692	99.27981	0.526515	0.193678	0.015978	14.64228	83.96865	1.389072	0.040213	24.58389	3.219766	72.19634
7	0.019692	99.27980	0.526520	0.193684	0.015978	14.64236	83.96848	1.389160	0.040213	24.58394	3.219822	72.19624
8	0.019692	99.27979	0.526521	0.193685	0.015978	14.64238	83.96845	1.389171	0.040213	24.58395	3.219829	72.19623
9	0.019692	99.27979	0.526521	0.193685	0.015978	14.64238	83.96845	1.389172	0.040213	24.58395	3.219830	72.19622
10	0.019692	99.27979	0.526521	0.193685	0.015978	14.64238	83.96845	1.389172	0.040213	24.58395	3.219830	72.19622

Developed Countries

Australia

Variance Decomposition of ASX:					Variance Decomposition of AUD/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	ASX	AUD/USD	CRUDE OIL	S.E.	ASX	AUD/USD	CRUDE OIL	S.E.	ASX	AUD/USD	CRUDE OIL
1	0.016256	100.0000	0.000000	0.000000	0.011408	8.155826	91.84417	0.000000	0.037556	13.23743	8.885926	77.87664
2	0.016513	98.10294	1.879404	0.017656	0.020514	17.24498	81.79345	0.961570	0.038975	15.66320	9.969728	74.36707
3	0.016661	96.52613	2.228395	1.245471	0.027550	18.10598	80.64217	1.251842	0.039482	16.40944	10.23496	73.35560
4	0.016666	96.47072	2.239308	1.289972	0.033100	18.24251	80.15961	1.597875	0.039532	16.44387	10.25456	73.30157
5	0.016681	96.31844	2.391163	1.290393	0.037460	18.24771	79.94660	1.805688	0.039541	16.43716	10.26356	73.29928
6	0.016707	96.07175	2.639566	1.288688	0.040943	18.24227	79.81546	1.942266	0.039560	16.43459	10.33764	73.22777
7	0.016737	95.79152	2.918834	1.289642	0.043764	18.23360	79.73241	2.033994	0.039592	16.43552	10.45284	73.11165
8	0.016767	95.51559	3.191554	1.292852	0.046077	18.22596	79.67518	2.098860	0.039628	16.43824	10.58094	72.98082
9	0.016794	95.26267	3.440678	1.296655	0.047993	18.21977	79.63400	2.146233	0.039664	16.44125	10.70552	72.85323
10	0.016819	95.03823	3.661340	1.300431	0.049593	18.21491	79.60320	2.181887	0.039697	16.44409	10.81945	72.73646

Canada

Variance Decomposition of SPTSX:					Variance Decomposition of CAD/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	SPTSX	CAD/USD	CRUDE OIL	S.E.	SPTSX	CAD/USD	CRUDE OIL	S.E.	SPTSX	CAD/USD	CRUDE OIL
1	0.016577	100.0000	0.000000	0.000000	0.007043	5.070144	94.92986	0.000000	0.037429	30.22642	5.432790	64.34079
2	0.017030	98.39853	1.601411	5.70E-05	0.008849	36.24056	63.46476	0.294677	0.039052	34.80275	5.320214	59.87703
3	0.017375	97.34134	1.561393	1.097268	0.008997	36.18298	61.66140	2.155622	0.039819	36.94823	5.304973	57.74679
4	0.017402	97.13627	1.557230	1.306504	0.009053	36.08739	60.92437	2.988241	0.039984	37.30557	5.306858	57.38758
5	0.017411	97.11415	1.555631	1.330217	0.009056	36.09845	60.89149	3.010060	0.040026	37.36780	5.297907	57.33429
6	0.017413	97.11330	1.556483	1.330218	0.009058	36.12560	60.86550	3.008898	0.040034	37.37881	5.296038	57.32515
7	0.017414	97.11271	1.556772	1.330514	0.009058	36.13194	60.85951	3.008549	0.040036	37.38320	5.295664	57.32114
8	0.017414	97.11231	1.556811	1.330882	0.009059	36.13305	60.85758	3.009376	0.040036	37.38449	5.295631	57.31988
9	0.017414	97.11216	1.556806	1.331032	0.009059	36.13307	60.85721	3.009715	0.040037	37.38480	5.295620	57.31958
10	0.017414	97.11215	1.556805	1.331050	0.009059	36.13310	60.85715	3.009746	0.040037	37.38486	5.295615	57.31952

France

Variance Decomposition of CAC:					Variance Decomposition of EUR/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	CAC	EUR/USD	CRUDE OIL	S.E.	CAC	EUR/USD	CRUDE OIL	S.E.	CAC	EUR/USD	CRUDE OIL
1	0.020365	100.0000	0.000000	0.000000	0.009811	4.044819	95.95518	0.000000	0.037695	11.88460	3.108625	85.00678
2	0.020572	99.89999	0.074986	0.025024	0.010651	11.88431	84.61636	3.499329	0.039599	17.21715	3.002407	79.78044
3	0.020579	99.89173	0.083140	0.025131	0.010766	13.20735	82.99232	3.800333	0.039743	17.69782	3.004969	79.29721
4	0.020580	99.89086	0.083722	0.025415	0.010777	13.34789	82.83289	3.819227	0.039753	17.73264	3.006144	79.26122
5	0.020580	99.89078	0.083763	0.025460	0.010778	13.36022	82.81934	3.820439	0.039754	17.73518	3.006284	79.25854
6	0.020580	99.89077	0.083766	0.025464	0.010778	13.36124	82.81823	3.820528	0.039754	17.73538	3.006297	79.25832
7	0.020580	99.89077	0.083766	0.025465	0.010778	13.36132	82.81814	3.820535	0.039754	17.73539	3.006298	79.25831
8	0.020580	99.89077	0.083766	0.025465	0.010778	13.36133	82.81813	3.820535	0.039754	17.73540	3.006298	79.25831
9	0.020580	99.89077	0.083766	0.025465	0.010778	13.36133	82.81813	3.820535	0.039754	17.73540	3.006298	79.25831
10	0.020580	99.89077	0.083766	0.025465	0.010778	13.36133	82.81813	3.820535	0.039754	17.73540	3.006298	79.25831

Japan

Variance Decomposition of NIKKEI:					Variance Decomposition of JPY/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	NIKKEI	JPY/USD	CRUDE OIL	S.E.	NIKKEI	JPY/USD	CRUDE OIL	S.E.	NIKKEI	JPY/USD	CRUDE OIL
1	0.024681	100.0000	0.000000	0.000000	0.009967	14.26659	85.73341	0.000000	0.038246	11.88248	0.125114	87.99240
2	0.025129	99.64382	0.057051	0.299125	0.010482	20.74599	79.24353	0.010483	0.039640	13.59917	0.727618	85.67321
3	0.025150	99.57791	0.072791	0.349294	0.010522	21.25218	78.71023	0.037583	0.039699	13.66639	0.785341	85.54827
4	0.025151	99.57110	0.074857	0.354045	0.010525	21.27867	78.67717	0.044164	0.039701	13.66692	0.788685	85.54440
5	0.025151	99.57053	0.075055	0.354411	0.010525	21.27981	78.67519	0.045004	0.039701	13.66688	0.788847	85.54428
6	0.025151	99.57049	0.075071	0.354437	0.010525	21.27986	78.67506	0.045084	0.039701	13.66688	0.788855	85.54427
7	0.025151	99.57049	0.075072	0.354439	0.010525	21.27986	78.67505	0.045090	0.039701	13.66688	0.788856	85.54427
8	0.025151	99.57049	0.075072	0.354439	0.010525	21.27986	78.67505	0.045091	0.039701	13.66688	0.788856	85.54427
9	0.025151	99.57049	0.075072	0.354439	0.010525	21.27986	78.67505	0.045091	0.039701	13.66688	0.788856	85.54427
10	0.025151	99.57049	0.075072	0.354439	0.010525	21.27986	78.67505	0.045091	0.039701	13.66688	0.788856	85.54427

New-Zealand

Variance Decomposition of DJNZ:					Variance Decomposition of NZD/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	DJNZ	NZD/USD	CRUDE OIL	S.E.	DJNZ	NZD/USD	CRUDE OIL	S.E.	DJNZ	NZD/USD	CRUDE OIL
1	0.014757	100.0000	0.000000	0.000000	0.011774	6.361605	93.63839	0.000000	0.038031	1.036331	4.169537	94.79413
2	0.015004	97.49729	2.349159	0.153548	0.012888	7.762779	86.12807	6.109147	0.039970	3.797093	4.277768	91.92514
3	0.015040	97.08811	2.652369	0.259523	0.013115	8.317871	84.21083	7.471303	0.040173	4.123659	4.449303	91.42704
4	0.015049	97.00375	2.688218	0.308029	0.013156	8.436211	83.86777	7.696019	0.040205	4.164126	4.492557	91.34332
5	0.015050	96.98860	2.693962	0.317436	0.013163	8.457597	83.80814	7.734263	0.040211	4.170770	4.500618	91.32861
6	0.015051	96.98592	2.695018	0.319064	0.013165	8.461418	83.79746	7.741125	0.040212	4.171992	4.502056	91.32595
7	0.015051	96.98543	2.695214	0.319354	0.013165	8.462111	83.79551	7.742378	0.040212	4.172218	4.502316	91.32547
8	0.015051	96.98534	2.695250	0.319406	0.013165	8.462237	83.79516	7.742607	0.040212	4.172260	4.502363	91.32538
9	0.015051	96.98533	2.695257	0.319416	0.013165	8.462260	83.79509	7.742649	0.040212	4.172267	4.502372	91.32536
10	0.015051	96.98532	2.695258	0.319418	0.013165	8.462265	83.79508	7.742657	0.040212	4.172269	4.502373	91.32536

Switzerland

Variance Decomposition of SMI 25:					Variance Decomposition of CHF/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	SMI 25	CHF/USD	CRUDE OIL	S.E.	SMI 25	CHF/USD	CRUDE OIL	S.E.	SMI 25	CHF/USD	CRUDE OIL
1	0.014823	100.0000	0.000000	0.000000	0.010934	1.977202	98.02280	0.000000	0.037780	2.829160	2.750213	94.42063
2	0.015512	98.14282	1.144293	0.712888	0.011190	1.888348	94.90557	3.206078	0.039590	6.402271	2.560368	91.03736
3	0.015613	97.66263	1.271485	1.065890	0.011214	1.991165	94.48755	3.521286	0.039805	7.094911	2.534056	90.37103
4	0.015629	97.58334	1.280695	1.135964	0.011217	2.023360	94.43556	3.541083	0.039834	7.191502	2.534455	90.27404
5	0.015632	97.57191	1.281557	1.146533	0.011218	2.028555	94.42858	3.542866	0.039839	7.204836	2.534935	90.26023
6	0.015632	97.57025	1.281680	1.148069	0.011218	2.029291	94.42758	3.543128	0.039839	7.206806	2.535009	90.25819
7	0.015632	97.57000	1.281701	1.148299	0.011218	2.029398	94.42743	3.543173	0.039839	7.207109	2.535018	90.25787
8	0.015632	97.56996	1.281704	1.148335	0.011218	2.029414	94.42741	3.543180	0.039839	7.207156	2.535019	90.25782
9	0.015632	97.56996	1.281705	1.148340	0.011218	2.029417	94.42740	3.543181	0.039839	7.207163	2.535020	90.25782
10	0.015632	97.56995	1.281705	1.148341	0.011218	2.029417	94.42740	3.543181	0.039839	7.207164	2.535020	90.25782

United-Kingdom

Variance Decomposition of FTSE:					Variance Decomposition of GBP/USD:				Variance Decomposition of CRUDE OIL:			
Period	S.E.	FTSE	GBP/USD	CRUDE OIL	S.E.	FTSE	GBP/USD	CRUDE OIL	S.E.	FTSE	GBP/USD	CRUDE OIL
1	0.016512	100.0000	0.000000	0.000000	0.010700	7.836903	92.16310	0.000000	0.037763	18.44419	9.252712	72.30310
2	0.016600	98.94268	0.634496	0.422828	0.011316	14.39169	82.65514	2.953175	0.039701	23.50459	8.471025	68.02439
3	0.016602	98.93795	0.635895	0.426152	0.011336	14.62127	82.39786	2.980873	0.039755	23.64943	8.487511	67.86306
4	0.016602	98.93777	0.635961	0.426265	0.011337	14.63076	82.38721	2.982030	0.039758	23.65554	8.488172	67.85629
5	0.016602	98.93777	0.635965	0.426268	0.011337	14.63119	82.38672	2.982089	0.039758	23.65583	8.488195	67.85598
6	0.016602	98.93777	0.635965	0.426268	0.011337	14.63121	82.38670	2.982092	0.039758	23.65584	8.488196	67.85596
7	0.016602	98.93777	0.635965	0.426268	0.011337	14.63121	82.38670	2.982092	0.039758	23.65584	8.488196	67.85596
8	0.016602	98.93777	0.635965	0.426268	0.011337	14.63121	82.38670	2.982092	0.039758	23.65584	8.488196	67.85596
9	0.016602	98.93777	0.635965	0.426268	0.011337	14.63121	82.38670	2.982092	0.039758	23.65584	8.488196	67.85596
10	0.016602	98.93777	0.635965	0.426268	0.011337	14.63121	82.38670	2.982092	0.039758	23.65584	8.488196	67.85596

Table 6: Estimated coefficients for the variance – covariance matrix of Trivariate BEKK model

	EMERGING COUNTRIES								DEVELOPED COUNTRIES							
	Brazil		Chile		China		Mexico		Australia		Canada		France		Japan	
Variable	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*
1. Mean (1)	0.0053***	0.0017	0.0018**	0.0009	-0.0017	0.0028	0.0042	0.0008	0.0001	0.0013	0.0036*	0.0012	0.0036*	0.0013	0.0023	0.0017
2. Mean (2)	0.0020*	0.0011	0.0024***	0.0005	0.0004***	0.0001	-0.0015	0.0001	-0.0007	0.0013	0.0002	0.0005	0.0007	0.0007	0.0007	0.0008
3. Mean (3)	0.0048***	0.0026	0.0027	0.0020	0.0043	0.0031	0.0027	0.0001	0.0022	0.0037	0.0052**	0.0025	0.0062**	0.0027	0.0070**	0.0030
4. C(1,1)	0.001	0.0179	0.0046	0.0045	0.0128**	0.0056	-0.0006	0.0003	0.0055*	0.0033	0.0006	0.0025	0.0054***	0.0028	0.0070***	0.0037
5. C(2,1)	-0.0008	0.0063	-0.0012	0.0008	0.0004	0.0002	0.0006	0.0004	-0.0044**	0.0020	-0.0008	0.0008	-0.0022***	0.0012	-0.0057*	0.0010
6. C(2,2)	0.0036*	0.0020	0.0001	0.0006	0.0001	0.0003	-0.0002	0.0008	-0.0004	0.0041	-0.0001	0.0029	-0.0006	0.0054	0.0001	0.0043
7. C(3,1)	-0.0079	0.0090	-0.0213***	0.0065	0.0089	0.0098	0.0196	0.0020	-0.0031	0.0135	0.0123*	0.0042	-0.0158*	0.0045	-0.0027	0.0049
8. C(3,2)	0.0255***	0.0022	0.0015	0.0062	-0.0191**	0.0075	-0.0179	0.0030	0.0103	0.0147	0.0001	0.03297	-0.0004	0.0200	0.0001	0.0169
9. C(3,3)	-0.0006	0.0235	0.0001	0.0012	-0.0002	0.0819	0.0193	0.0018	0.0018	0.0062	-0.0001	0.0177	-0.0004	0.0160	-0.0001	0.0168
10. A(1,1)	-0.1898*	0.1132	0.0508	0.1084	0.2161*	0.1247	-0.2249***	0.0196	0.7196*	0.1349	0.4131*	0.1046	0.4338*	0.1198	0.5747*	0.1010
11. A(1,2)	0.2620***	0.0747	-0.7719***	0.1792	-0.0033	0.0055	0. 0547	0.0017	0.4469*	0.1036	0.2065*	0.0439	0.0454	0.0422	-0.0368	0.050
12. A(1,3)	-0.1286	0.1417	-0.5488***	0.2092	0.4568***	0.1230	-0.0382	0.1134	0.9289*	0.2555	0.9522*	0.2430	0.6167*	0.1713	0.9309*	0.1619
13. A(2,1)	0.9378***	0.1818	0.0005	0.0254	-0.6345**	0.2961	0.0437	0.0078	-0.2888	0.1809	-0.4312**	0.1871	0.6013**	0.3041	0.5584**	0.2404
14. A(2,2)	0.1538	0.1161	0.7781***	0.1154	-0.6950***	0.1695	-0.9896***	0.0057	-0.1090	0.0864	-0.2511*	0.0889	0.1331	0.1176	-0.1789***	0.1059
15. A(2,3)	0.9136***	0.2267	0.0128	0.0587	-0.0989	0.3313	-0.0897***	0.0170	-0.4731	0.3025	0.7308***	0.4338	0.2328	0.4954	-0.7261**	0.3331
16. A(3,1)	-0.0889	0.0998	0.1669***	0.0562	-0.1416	0.1616	0.6927***	0.0122	-0.0501	0.0493	-0.0608	0.0478	-0.13731**	0.0684	-0.1032	0.0660
17. A(3,2)	0.1076**	0.0551	-0.9139***	0.0852	-0.0016	0.0038	0.9634***	0.0014	0.0156	0.0374	-0.0299	0.0219	-0.0089	0.0361	-0.0364	0.0317
18. A(3,3)	0.3816***	0.1191	0.3642***	0.1011	-0.2112**	0.1040	0.0934	0.0761	0.1089	0.1435	-0.5175*	0.0986	0.2925*	0.0843	-0.3285**	0.0944
19. B(1,1)	0.5883***	0.1370	-0.0424	0.3797	-0.5009***	0.0845	-0.9734***	0.0144	0.1449	0.1524	0.7297*	0.1019	0.0550	0.1719	-0.8701*	0.1402
20. B(1,2)	-0.1808	0.1147	0.1011	0.0678	0.3799***	0.0044	0.7165***	0.0019	-0.4353*	0.1196	-0.2915*	0.0540	-0.1687**	0.0768	-0.0331	0.1036
21. B(1,3)	0.4618*	0.2643	0.8159***	0.4065	0.1749**	0.0862	-0.7700***	0.1183	0.8834**	0.5543	0.9345**	0.3642	-0.9585*	0.2527	0.0574	0.3051
22. B(2,1)	0.6325**	0.2709	-0.0140	0.0190	-0.9691***	0.6587	-0.7804***	0.0084	0.6971*	0.1814	0.9778*	0.2136	-0.9435*	0.2259	-0.9577*	0.3911
23. B(2,2)	0.8046***	0.1478	0.0364	0.0233	-0.3482**	0.1452	0.6096***	0.0010	0.5394*	0.1266	0.7490*	0.0787	-0.2940	0.1887	0.1936	0.2106
24. B(2,3)	-0.0139	0.4209	-0.0308	0.0324	0.0006	0.2805	-0.0825**	0.0367	0.9294*	0.4604	0.9627*	0.5462	-0.9756***	0.6722	-0.9013*	0.3513
25. B(3,1)	-0.6001***	0.1031	0.4448***	0.0850	0.0921	0.1409	0.6423**	0.0163	0.1066	0.1274	-0.3192*	0.0526	0.1301	0.1101	0.3201*	0.0798
26. B(3,2)	-0.3321***	0.0570	0.0774**	0.0321	0.0112	0.0072	-0.7170***	0.0019	-0.0425	0.0829	0.0498	0.0314	-0.1728*	0.0433	-0.1779*	0.0393
27. B(3,3)	-0.1129	0.1669	0.2299	0.2388	-0.5699***	0.1598	0.3848***	0.0654	-0.7361*	0.1648	0.2554***	0.1380	0.5310*	0.1414	(-0.1022)	0.1766

	Malaysia		Philippines		Russia		South Africa		New Zealand		Suitzerland		United Kingdom	
Variable	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*	*Coeff*	*Std Error*
1. Mean (1)	0.2470**	0.0001	0.0042***	0.0001	0.0017	0.0026	0.1107***	0.0012	0.0005	0.0009	0.0002	0.001	0.0035*	0.0011
2. Mean (2)	-0.2208***	0.0001	0.0019***	0.0001	0.0014	0.0017	-0.0031**	0.0012	0.0018**	0.0009	0.0031*	0.0008	0.0011	0.0008
3. Mean (3)	-0.3333***	0.0001	0.0004***	0.0001	-0.0016	0.0021	0.0020	0.0028	-0.0004	0.0028	0.0048	0.0039	0.0069*	0.0026
4. C(1,1)	0.1744***	0.0001	-0.0006***	0.0002	0.0155***	0.0042	0.0048*	0.0026	0.0020***	0.0011	0.0052	0.0051	0.0025	0.0018
5. C(2,1)	0.3506***	0.0001	0.00002	0.0001	0.3092***	0.0015	-0.0068***	0.0019	0.0048*	0.0015	-0.0038	0.0027	-0.0021	0.0017
6. C(2,2)	-0.0069	0.0001	-0.0001***	0.0001	-0.0001	0.0083	-0.0001	0.01428	0.0001	0.0099	-0.0003	0.0038	0.0001	0.0029
7. C(3,1)	-0.4172***	0.0010	-0.0132***	0.0010	0.2038***	0.0040	0.0092*	0.0048	-0.0141*	0.0037	0.0175**	0.0084	0.0254*	0.0038
8. C(3,2)	0.0026	0.0023	0.0182***	0.0007	-0.0001	0.0220	0.0001	0.0094	-0.0001	0.0244	0.0002	0.0316	-0.0001	0.0244
9. C(3,3)	0.3102***	0.0010	-0.0001	0.0001	-0.0001	0.0082	0.0001	0.0127	-0.0001	0.0049	-0.0001	0.0281	-0.0001	0.0187
10. A(1,1)	0.4327***	0.0022	-0.2753***	0.0007	0.4530***	0.1403	0.9047***	0.1142	0.0819	0.0819	0.2495**	0.1168	0.2502**	0.1070
11. A(1,2)	0.3533***	0.0003	-0.8264***	0.0005	-0.6842***	0.0753	-0.0056	0.1094	0.4272*	0.0939	0.0997	0.15963	0.2271*	0.0541
12. A(1,3)	0.42340***	0.4743	0.2106***	0.0497	-0.0911	0.1431	0.5377**	0.2096	-0.9366*	0.2617	0.5949	0.6548	0.6124*	0.2241
13. A(2,1)	-0.2131***	0.0043	0.0384***	0.0060	0.1760**	0.0777	-0.1999	0.1280	-0.0670	0.1041	0.7916*	0.1711	0.4795*	0.1674
14. A(2,2)	0.9449***	0.0001	0.7237***	0.0021	0.9833***	0.1997	0.1311	0.1039	-0.1422***	0.0746	-0.1100	0.1263	-0.1160	0.0848
15. A(2,3)	0.1164***	0.0266	0.5827***	0.0143	0.2434***	0.0871	0.8590***	0.2836	0.1612	0.2518	0.9994	0.7265	0.7517***	0.4128
16. A(3,1)	-0.4454***	0.0005	0.2480***	0.0030	-0.2681*	0.1527	-0.1080**	0.0513	-0.1307*	0.0354	-0.1452*	0.0433	-0.0318	0.0373
17. A(3,2)	0.8844***	0.0001	-0.9704***	0.0006	-0.9069***	0.0964	-0.0057	0.0378	0.0505**	0.0240	0.0769	0.0793	0.0552**	0.0254
18. A(3,3)	-0.0520	0.0337	-0.2435***	0.0474	0.1057	0.1131	-0.2422**	0.1167	0.2055*	0.0687	0.1576	0.1901	0.3489*	0.1127
19. B(1,1)	0.5142***	0.0048	-0.9601***	0.0058	0.7005***	0.2571	-0.0984	0.1519	0.4899*	0.0815	-0.3573*	0.1293	-0.2607*	0.0986
20. B(1,2)	0.2481***	0.0004	-0.1332***	0.0008	0.1187*	0.0639	0.4869***	0.1160	-0.3839*	0.0984	-0.5541*	0.0730	0.5503*	0.0648
21. B(1,3)	0.8941	0.1021	-0.4253***	0.0366	0.7917***	0.1246	-0.0301	0.2821	-0.7166	0.4385	-0.4025	0.4976	0.7181***	0.3840
22. B(2,1)	-0.3069***	0.0018	0.0165***	0.0036	-0.0671	0.0425	-0.6154***	0.1747	-0.8881*	0.1867	0.5686	0.3854	-0.9440*	0.1888
23. B(2,2)	-0.2006***	0.0002	0.0019***	0.0005	-0.0038	0.0108	-0.6122***	0.1324	-0.0534	0.1381	-0.3994	0.3376	-0.4696*	0.1299
24. B(2,3)	0.0158	0.0136	0.0534***	0.01107	0.0157	0.0343	-0.9419***	0.2462	-0.7914*	0.1907	-0.8783*	0.7711	-0.5181	0.6409
25. B(3,1)	0.2168***	0.0006	0.3838***	0.0015	0.2874	0.4250	0.2649***	0.0686	-0.0658	0.0502	-0.1824**	0.0883	-0.0157	0.0929
26. B(3,2)	0.3203***	0.0007	0.6176***	0.0001	0.0188	0.1052	0.0513	0.0500	-0.1706*	0.0197	0.1060	0.0744	-0.1497*	0.0526
27. B(3,3)	-0.1312***	0.0504	-0.6556***	0.0209	-0.7006***	0.2719	-0.2562	0.1568	-0.6048*	0.0355	-0.1582	0.4589	-0.3319	0.2925