Center for Management Science Research
ISSN: 3006-5291 3006-5283 Volume 3, Issue 4, 2025

FINANCIAL CONTAGION IN STOCK AND FOREX MARKET DURING EUROZONE DEBT CRISIS

Nazakat Hussain[1], Ghulam Mujtaba[*2], Zafar Iqbal[3]

[1]*Lecturer, Department of Business Administration, University of Kotli AJ&K.*
[*2,3]*Assistant Professor, Department of Business Administration, University of Kotli AJ&K.*

ghulam.mujtaba@uokajk.edu.pk

DOI: https://doi.org/10.5281/zenodo.16829726

Keywords
AEEMs, DCC-GARCH Model, Forex market, Subprime crisis.

Article History
Received: 30 April, 2025
Accepted: 14 July, 2025
Published: 31 July ,2025

Copyright @Author
Corresponding Author: *
Ghulam Mujtaba

Abstract
This study examined the financial contagion of Forex Market and Asian Emerging Equity Markets (AEEMs) at the time of Eurozone debt crisis. For examining the cross-market volatility spillovers, linkages and shocks propagation, we employed DCC-GARCH model on daily data of seven years, including tranquil and turmoil period. The findings exposed a significant dynamic correlation between foreign exchange and the Asian emerging equity markets. Stronger financial contagion of Asian emerging markets and foreign exchange markets with increased volatility transmission and co-movement across the markets was noted. It was observed that the markets were significantly affected by the Eurozone debt crisis. These findings offer significant insights for investors and policymakers, highlighting the importance of financial stability and portfolio diversification strategies in crises episodes. The close monitoring of both forex and stock markets is, therefore, highly important to lessen the risk elements in crises duration

INTRODUCTION

In the extant literature, the association between foreign exchange market and equity market has been explained by *international trading effect* and *portfolio balance effect*. The former stated that the international level of trading creates a link between the two markets (Dornbusch & Fischer, 1980). The changes in exchange rates not only affect multinational firms but also have an indirect effect on the market prices of domestic firms. The later approach, on the other hand, proposed that the fluctuation in stock prices causes the exchange rate to fluctuate (Frankel, 1983; Makore & Chikutuma, 2025). This approach stated that stock prices go up due to the impact of some external parameters which enhance the wealth of domestic investors and raise the demand for local currency. Higher demand for money enhances the interest rate, which consequently absorbs the foreign capital inflows and causes appreciation in domestic currency. The first approach proposed that the fluctuations in exchange rate leads to variations in stock prices while the second approach stated that stock prices lead to fluctuations in exchange rate.

The connection between foreign exchange market and equity market is governed by some common factors such as interest rates (Ajayi & Mougoue, 1996). However, the nature of association between these two markets depends on the stock market's performance (Gavin, 1989). For instance, at the time of crisis, the lack of investors' confidence in economy may lead to displacement of assets. Investors in such a situation change their portfolio preferences into

other currencies dominated assets, resulting in low demand for the domestic currency. In contrast to these approaches, the *asset market theory* of Frenkel (1976) stated that the association between exchange rate and equity markets is non-existent. Scholars and policymakers are now more interested in studying the dynamic relationship between stock prices and exchange rates because of the liberalization of the financial markets. This is due to the easing of restrictions on capital inflows, advancements in information technology, and the progressive removal of foreign exchange control in emerging markets. To diversify their holdings and create an effective hedging strategy, foreign investors are also curious about whether these two markets are interdependent.

Using various approaches and datasets, several empirical investigations have been carried out to confirm the correlation between stock prices and currency rates (see for instance; Fang, 2002; Huy, 2016; Khan & Ali, 2015; Phylaktis & Ravazzolo, 2005; Rahman & Uddin, 2009; Türsoy, 2017). However, these studies determined the relationship between stock prices and exchange rates during a period when markets were functioning normally. Only a few studies have identified the behavior of these markets at the time of crisis particularly with regard to emerging markets in Asia (see for instance; Dimitriou & Simos, 2014; Long, Tsui, & Zhang, 2014). Studying the behavior of these two markets in the backdrop of crisis is important because there would be significant exchange rate realignments following a crisis. It is, therefore, anticipated that adding exchange rate and equities market indices will shed more light on the consequences of contagion.

Considering this aspect, the present study aimed to examine influence of the Eurozone debt crisis on emerging Asian stock markets and foreign exchange market. The study used DCC-GARCH model to examine time-varying correlations between the equities and foreign exchange markets. By using this model, the study addressed the heteroscedasticity issues and examined the dynamics of the second-order moment of financial time-series. Understanding the pattern of dynamic correlation between these two markets could be beneficial for investors and policymakers. The study's significance from an investor's point of view is that understanding market interdependence is crucial for deciding how to hedge and diversify foreign investments. Financial instability, such as bank failures and stock market collapses, is a significant problem that can directly impact the nation's wellbeing, which policymakers should be aware of. The study is also expected to pave a way for further research in this domain to enrich existing literature.

2. Literature Review

At the start of the 21st century, the world economies suffered a lot from the financial crises after the great depression. Alongside other crises episodes, Eurozone crises also negatively affected the world markets. Depression in the economy has caused a decline in the stock prices which induced investors to invest in foreign markets. Consequently, the local currencies depreciated. Contagion of stock and forex markets at the time of crises not only affected the stock markets but it also negatively impacted the value of the currency. There are mainly five channels of spillovers within these two markets. The first channel describes the spillover effect from exchange rate to stock prices, i.e. international trading effect. The second channel describes the spillover from stock prices to exchange rate, i.e. portfolio balance effect. Third channel originates from monetary policy, while contagion between currencies is fourth channel. The fifth channel is the cross-border contagion among the markets. Different research studies explored the casual linkages between exchange rate and stock prices (see for instance; Agrawal, Srivastav, & Srivastava, 2010; Fang, 2002; Mishra, 2004; Nath & Samanta, 2003; Rady, Essam, Yahia, & Shalaby, 2024; Salisu & Oloko, 2015).

A few researchers looked at the direction of the stock market and exchange rate relationship. Mishra (2004) used the granger causality test and vector error correction model over the monthly stock returns. A unidirectional link between exchange rate and stock prices was found. These findings were in line with the study of Muhammad, Rasheed, and Husain (2002). Further, Khan and Ali (2015) investigated the causal relationship between exchange rate volatility and stock prices. The results of the study using the GARCH model showed that there is a two-way causal relationship between exchange rates and stock prices. Due to the increase

in the process of economic integration, it might be possible that global and domestic economic factors have an influence on the relationship between stock prices and exchange rates. Aloui, Aïss, and Nguyen (2011) captured the effect of local and global factors by utilizing advanced econometric techniques. In Canada, Michelis and Ning (2011) examined the relationship between stock prices and exchange rate along with macroeconomic variables. The study found a dynamic and asymmetric interaction between the variables.

Empirically, a significant number of studies have been undertaken to investigate the nature of association between exchange rates and stock prices. Some studies found a positive relationship between the two variables (see for instance; Diamandis & Drakos, 2011; Hussain, Bashir, & Rehman, 2024; Phylaktis & Ravazzolo, 2005; Sohail & Hussain, 2009). Contrary to this, many researchers reported a negative linkage (see for instance; Dimitrova, 2005; Kim, 2003; Nugraheni & Risman, 2025; Raza & Afshan, 2017; Yang, Tu, & Zen, 2014). Furthermore, the studies reporting the absence of association among stock and exchange returns are also available in the literature (see for instance; Fowowe, 2015; Franck & Young, 1972; Ratner, 1996; Solnik, 1987). In addition to these studies, some researchers focused on specified categories of the countries to examine the phenomenon. For example, Akdogu and Birkan (2016), Diamandis and Drakos (2011), Michelis and Ning (2011), Zia and Rahman (2011) explored the linkage between these two markets in the context of developed and emerging markets. These all studies, however, investigated the behavior of these markets at the time of normal market conditions.

Numerous financial crises have occurred in the last few decades, which produced abrupt changes in the nature of relationship among the financial markets. The crises spread across the markets due to their interlinkages. The phenomenon which explains the spread of disturbance from one market to another market is known as contagion (Forbes & Rigobon, 2002). There are some studies which addressed the contagion of foreign exchange markets. For example, Rigobon (1998) provided evidence for the existence of the contagion effect in foreign exchange markets. Celik (2012) investigated how the US crisis affected the foreign exchange markets in developed and developing countries. Similarly, Kamel, Benhabib, and Maliki (2014) measured the financial contagion in foreign exchange market at the time of US subprime crisis and Eurozone debt crisis. Exchange rate volatility and its associated dangers have grown in importance since the Bretton Woods system collapsed in the early 1970s (Sahasrabuddhe & Seddon, 2025). This became more important particularly with the rise in globalization and the most recent global financial crises.

Few researchers specifically addressed the contagion effect between the forex and the stock markets in the backdrop of the financial crisis. By considering the impact of the 2008 financial crisis, Tsagkanos and Siriopoulos (2013) investigated the dynamic relationship between stock prices and exchange rates in the EU and the USA. Applying the advanced econometric technique (SNCR), the researchers observed the existence of dynamic relationship between these two markets. Dimitriou and Simos (2014) conducted a similar study and by using DCC-GARCH model, the study showed that the contagion effect of global financial crisis largely impacted these two markets. Long et al. (2014) examined the phenomenon in context of developed and developing countries. However, there is a dearth of literature that addresses the problem of contagion between the equities and foreign exchange markets during the Eurozone crisis, especially in emerging economies of Asia. This study has attempted to address this gap by examining the contagion effect between the forex and stock markets of Asian emerging countries during the period of Eurozone debt crisis.

3. Methodology

To examine the occurrence of contagion between Asian Emerging Equity markets and FX market during the Eurozone debt crisis, the study utilized the daily data of seven years from 2005 to 2012. The study sample was comprised of the major Asian Emerging Equity Markets and the Forex Market. These countries were selected based on MSCI classification. The data on all the sample economies were taken in dollar form and collected from Bloomberg. For analysis, this study divided the overall period to the normal period and the crisis

period. The selection of normal and crisis period was based on the study of Ahmad, Sehgal, and Bhanumurthy (2013). For examining the association between the returns of different variables over time, the time-varying correlation required to be estimated. A variety of approaches have been recommended in the literature for studying connectivity over time, particularly in the multivariate GARCH family (Barunik & Krehlik, 2018; Silvennoinen & Tersvirta, 2009). Engle (2002) presented the "Dynamic Conditional Correlation (DCC) model" as a practical approach for evaluating the time-varying correlation among diverse asset returns across time. Multivariate Dynamic Conditional Correlation (MDCC) model specification takes the following form.

$$H_t = D_t C_t D_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where D_t is generated through the given univariate GARCH (1, 1) process:

$$H_{i,t} = \boldsymbol{\omega_i} + \alpha_i \mu_{i,t-1}^2 + \beta_t h_{i,t-1} \dots\dots\dots (2)$$

In the above equation (1), correlation matrix C_t is taken as:

$$C_t = (diag(Q_t))^{-\frac{1}{2}} (diag(Q_t))^{-\frac{1}{2}} \dots (3)$$

In this study, coefficients of correlation are important as they provide key indication on the pattern of association between forex market and stock return series across time. The approach adjusts the volatility by the procedure, so the model is not biased by the volatility. Unlike the volatility-adjusted cross-market correlations used by Forbes and Rigobon (2002), DCC-GARCH continually adjusts the correlation for time-varying volatility. Consequently, DCC gives a bigger metric for dynamic relationships. Earlier, Chiang, Jeon, and Li (2007) used DCC-GARCH model to investigate the occurrence of contagion affect during the Asian financial crisis. Kuperand and Lestano (2007) applied the same model to investigate the relationship between Thai and Indonesian stock markets over time. Similarly, Lahrech and Sylwester (2011) used the model to study the dynamic link between Latin American and US stock markets.

To investigate the presence of a contagion effect, this study used a one-tailed test. The test determines the means of DCC correlation in tranquil and turmoil time periods, as well as whether the means of DCC correlations are higher during turbulence than during tranquility. The hypothesis of the study is as under:

$H_0 = \mu_p^{crises} \leq \mu_p^{pre-crises}$

$H_1 = \mu_p^{crises} > \mu_p^{pre-crises}$

μ_p^{crises} indicates the means of time varying correlation at turmoil period and $\mu_p^{pre-crises}$ indicates the means of time varying correlation in tranquil period. The hypothesis test results are determined by matching the t-statistics to the threshold estimate. If the calculated value of t-statistics is above the threshold estimate, we will accept the alternative hypothesis (H1) and reject the Null hypothesis (H0), providing evidence for the presence of contagion effects among the markets.

4. Results

In the first step of analysis, the descriptive statics were examined. This was examined initially for the overall period of the study, and then separately for pre-crisis and crisis period. The results are presented in table 1.

Table 1. Descriptive statistics

	BSE	JCI	KOSPI	KLCI	PSEi	PSX	SET50	SSE	TWSE	UDI
Overall										
Mean	0.0004	0.0007	0.0004	0.0002	0.0006	0.0004	0.0023	0.0003	8.4800	-5.9600
Median	0.0006	0.0010	0.0008	0.0002	0.0000	0.0001	0.0000	0.0002	0.0003	-6.5105
Max.	0.1462	0.0762	0.1128	0.0426	0.0937	0.0825	0.1058	0.0903	0.0652	0.0173
Min.	-0.1110	-0.1010	-0.1117	-0.1000	-0.1309	-0.0604	-0.1606	-0.0923	-0.0674	-0.0230
Std. Dev.	0.0166	0.0154	0.0151	0.0082	0.0140	0.0148	0.0143	0.0179	0.0136	0.0035
Skewness	-0.2350	-0.6949	-0.5848	-1.2915	-0.7206	-0.3048	-1.1092	-0.3369	-0.3846	-0.0751
Kurtosis	10.1167	9.8110	9.9787	18.0575	11.4405	5.2605	18.7463	6.1069	5.9781	7.2657
Pre-Crisis Period										
Mean	0.0007	0.0007	0.0004	0.0002	0.0005	0.0003	1.9500	0.0007	0.0001	-7.4800
Median	0.0015	0.0009	0.0010	0.0002	0.0000	0.0001	0.0000	0.0009	0.0003	-6.2800
Max.	0.1462	0.0762	0.1128	0.0426	0.0937	0.0825	0.1058	0.0903	0.0652	0.0161
Min.	-0.1110	-0.1095	-0.1117	-0.0998	-0.1309	-0.0604	-0.1606	-0.0926	-0.0674	-0.0230
Std. Dev.	0.0188	0.01647	0.0160	0.0091	0.0153	0.0166	0.0152	0.0198	0.0144	0.0035
Skewness	-0.2544	-0.6535	-0.5813	-1.3574	-0.7467	-0.2823	-1.3239	-0.3465	-0.3384	-0.3102
Kurtosis	9.0647	9.3140	10.4290	17.4279	11.1361	4.5991	20.5880	5.6359	5.9043	8.5310
Crisis Period										
Mean	-1.6205	0.0008	0.0003	0.0003	0.0008	0.0004	0.0007	-0.0005	-2.2505	-2.8200
Median	0.0000	0.0010	0.0003	0.0002	0.0004	0.0001	0.0001	0.0000	0.0002	-0.0001
Max.	0.0324	0.0701	0.0490	0.0240	0.0408	0.0282	0.0575	0.0409	0.0446	0.0173
Min.	-0.0379	-0.0930	-0.0642	-0.0253	-0.0527	-0.0406	-0.0581	-0.0529	-0.0574	-0.0134
Std. Dev.	0.0109	0.0131	0.0130	0.0061	0.0107	0.0100	0.0123	0.0130	0.0117	0.0035
Skewness	-0.1135	-0.8081	-0.5723	-0.3702	-0.3363	-0.3181	-0.1587	-0.4100	-0.5547	0.4169
Kurtosis	3.4763	10.1663	5.9941	4.8303	5.4554	4.6672	6.2777	4.4450	5.2411	4.5830

Table 1 shows the behavior of the data of all the emerging equity markets and the foreign exchange market. Descriptive statistics for the complete sample demonstrate positive average daily returns of all the markets. Taiwan has the greatest average daily return followed by Indonesia. The average lowest return in the sample is for UDI. The unconditional normality statistics indicate that the parameter/coefficient of skewness is zero for a symmetric normal distribution. Data is adversely biased, as seen by negative Skewness values in all stock markets and the forex market. Furthermore, the kurtosis parameter is set to three for the normal distribution, which is also known as the zero value of excess kurtosis. All returns exhibit positive excess kurtosis, indicating that the return series are widely tailed and non-normal, whereas random return series contain more extreme values. The pattern remained nearly similar for separate analysis of pre-crisis and crisis period. In a tranquil period, all markets showed the positive daily return except UDI. However, in the crisis period, average return for 03 stock markets and forex market were negative. Similar to the tranquil era, all markets exhibit a higher Kurtosis value during the turmoil era.

After checking the descriptive statistics, the study examined the dynamic conditional correlation between the foreign currency market and Asian emerging equity markets. The results of the analysis are reported in table 2.

Table 2. Dynamic conditional correlation coefficient and contagion effect

	Mean	Variance	t-statistics
$H_0=\mu_p^{crises} \leq \mu_p^{pre-crises}$			
Tranquil DCC UDI_BSE	0.138869272	0.000352594	49.86
Turmoil DCC UDI_BSE	0.301800364	0.000119848	
Tranquil DCC UDI_JCI	0.190765153	0.000271197	55.49
Turmoil DCC UDI_JCI	0.248272821	0.000171013	
Tranquil DCC UDI_KOSPI	0.186576924	0.000257548	69.76
Turmoil DCC UDI_KOSPI	0.304696814	0.000169268	
Tranquil DCC UDI_KLCI	0.188036583	0.000083297	27.73
Turmoil DCC UDI_KLCI	0.216422824	0.000036655	
Tranquil DCC UDI_PSEi	0.006307673	0.000233348	13.66
Turmoil DCC UDI_PSEi	0.009344808	0.000113956	
Tranquil DCC UDI_PSX	-0.04600446	0.000276192	-6.67
Turmoil DCC UDI_PSX	-0.02965635	0.000100098	
Tranquil DCC UDI_SET50	0.156736362	0.000229725	55.43
Turmoil DCC UDI_SET50	0.249260248	0.000151242	
Tranquil DCC UDI_SSE	0.079151512	0.000709453	75.28
Turmoil DCC UDI_SSE	0.209682004	0.000392051	
Tranquil DCC UDI_TWSE	0.142366598	0.000208614	96.94
Turmoil DCC UDI_TWSE	0.314307354	0.000137260	

Table 2 reports the findings of a dynamic conditional correlation between the foreign currency market and Asian emerging equity markets. The results indicate that time varying correlation is high in turmoil period as compared to tranquil period for almost all the economies. The significant test value provides the support to reject the null hypothesis against the alternative hypothesis which demonstrates that contagion exists in these markets at the time of crisis. The findings thus supported the existence of contagion effect in Asian emerging equity markets.

The outcomes of dynamic conditional correlation in this paper show the significant positive time varying correlation between FX market and equity markets. Large portfolio management in emerging Asian countries can effectively manage foreign exchange market risk through the use of conditional correlation modeling. The findings showed that time-varying correlation is a feature of emerging economies. These findings are aligned with the findings of Gagnon and Karolyi (2006), which reported a higher level of correlation between the markets in turbulence time. The outcomes are also in line with the study of Tai (2007), in which a significant and positive linkage between currency and equity market was supported. Our study is, however, different from the study of Tai (2007) in context of methodology, sample and nature of crisis. The findings are further aligned with the study of Lin (2011), Dimitriou and Simos (2014). Consistent with the findings of the earlier studies, this research article contributed to the existing literature by finding the presence of contagion effect between foreign exchange market and Asian emerging equity markets. By utilizing multivariate DCC- GARCH model, this study found a significantly high dynamic conditional correlation between foreign exchange and equity markets in turmoil period as compared to tranquil period.

5. Conclusion

This study endeavors to explore the presence of contagion between Forex market and Asian Emerging equity markets at the time of Eurozone debt crisis. The study used DCC-GARCH model over the data of 2005 to 2012 for empirical analysis. To compare the dynamic correlation of crisis and pre-crisis duration, data were divided into two phases, i.e. a tranquil and a turmoil period. One

tailed test was applied to check whether the dynamic correlations are the same or different in turmoil and tranquil times. The study discovered a significant increase in the dynamic correlation between FX and AEEMs in almost all the markets, thereby confirming the existence of contagion effect in the markets. The results show that the Asian emerging markets and foreign exchange contagion is significantly affected by Eurozone debt crisis.

The study revealed that at turmoil time dynamic correlation between foreign exchange market and equity market got a significant increase. This study findings are in line with the study of Ahmadian-Yazzdi, Sokhanvar, Roudari, and Tiwari (2025). The findings suggested that the substantial upsurge in the time-varying correlation between these two markets is not a good sign for investors. The investors should not combine forex and equity in their diversified portfolio at the time of crisis. This study, however, is confined to the Eurozone debt crisis and future research could expand the scope to compare the similarities and differences across various financial crises and their respective economic impacts. Furthermore, the study focused on a single commodity only, the subsequent studies could explore contagion effects among multiple commodities. Incorporating equity markets from both emerging and developed economies could also provide a more comprehensive understanding of cross-market contagion dynamics.

References

Agrawal, G., Srivastav, A.K., & Srivastava, A. (2010). A study of exchange rates movement and stock market volatility. *International Journal of Business and Management, 5* (12), 62-73.

Ahmad, W., Sehgal, S., & Bhanumurthy, N.R. (2013). Eurozone crisis and BRIICKS stock markets: Contagion or market interdependence? *Economic Modelling*, *33*, 209-225.

Ahmadian-Yazdi, F., Sokhanvar, A., Roudari, S., & Tiwari, A.K. (2025). Dynamics of the relationship between stock markets and exchange rates during quantitative easing and tightening. *Financial Innovation*, *11* (1), 1-32.

Ajayi, R.A., & Mougouė, M. (1996). On the dynamic relation between stock prices and exchange rates. *Journal of Financial Research, 19* (2), 193-207.

Akdogu, S.K., & Birkan, A.O. (2016). Interaction between stock prices and exchange rate in emerging market economies. *Research in World Economy*, *7* (1), 80-94.

Aloui, Aïssa, M.S.B., & Nguyen, D.K. (2011). Global financial crisis, extreme interdependences, and contagion effects: The role of economic structure? *Journal of Banking & Finance*, *35* (1), 130-141.

Barunik, J., & Krehlik, T. (2018). Measuring the frequency dynamics of financial connectedness and system risk. *Journal of Financial Econometrics, 16* (2), 271-296.

Celık, S. (2012). The more contagion effect on emerging markets: The evidence of DCC-GARCH model. *Economic Modelling*, *29* (5), 1946-1959.

Chiang, T.C., Jeon, B.N., & Li, H. (2007). Dynamic correlation analysis of financial contagion: Evidence from Asian markets. *Journal of International Money and Finance*, *26* (7), 1206-1228.

Diamandis, P.F., & Drakos, A.A. (2011). Financial liberalization, exchange rates and stock prices: Exogenous shocks in four Latin America countries. *Journal of Policy Modeling*, *33* (3), 381-394.

Dimitriou, D.I., & Simos, T.M. (2014). Contagion effects on stock and FX markets: a DCC analysis among USA and EMU. *Studies in Economics and Finance*, *31* (3), 246- 254.

Dimitrova, D. (2005). The relationship between exchange rates and stock prices: Studied in a multivariate model. *Issues in Political Economy*, *14* (1), 3-9.

Dornbusch, R., & Fischer, S. (1980). Exchange rates and the current account. *The American Economic Review, 70* (5), 960-971.

Engle, R. (2002). New frontiers for ARCH models. *Journal of Applied Econometrics*, *17* (5), 425-446.

Fang, W. (2002). The effects of currency depreciation on stock returns: Evidence

from five East Asian economies. *Applied Economics Letters, 9* (3), 195-199.

Forbes, K.J., & Rigobon, R. (2002). No contagion, only interdependence: measuring stock market comovements. *Journal of Finance,* 57, 2223-2261.

Fowowe, B. (2015). The relationship between stock prices and exchange rates in South Africa and Nigeria: structural breaks analysis. *International Review of Applied Economics, 29* (1), 1-14.

Frankel, J.A. (1983). Estimation of portfolio-balance functions that are mean-variance optimizing: The mark and the dollar. *European Economic Review, 23* (3), 315-327.

Franck, P., & Young, A. (1972). Stock price reaction of multinational firms to exchange realignments. *Financial Management*, *1* (3), 66-73.

Frenkel, J.A. (1976). A monetary approach to the exchange rate: doctrinal aspects and empirical evidence. *The Scandinavian Journal of Economics*, *78* (2), 200-224.

Gagnon, L., & Karolyi, G.A. (2006). Price and volatility transmission across borders. *Financial Markets, Institutions & Instruments, 15* (3), 107-158.

Gavin, M. (1989). The stock market and exchange rate dynamics. *Journal of International Money and Finance, 8* (2), 181-200.

Hussain, M., Bashir, U., & Rehman, R.U. (2024). Exchange rate and stock prices volatility connectedness and spillover during pandemic induced-crises: Evidence from BRICS countries. *Asia-Pacific Financial Markets, 31* (1), 183-203.

Huy, T.Q. (2016). The linkage between exchange rates and stock prices: Evidence from Vietnam. *Asian Economic and Financial Review, 6* (7), 363-373.

Kamel, S.M., Benhabib, A., & Maliki, S. (2014). Foreign exchange market and contagion: The evidence through GARCH model. *International Journal of Innovation and Applied Studies*, *7* (1), 283-297.

Khan, R.E.A., & Ali, R. (2015). Causality analysis of volatility in exchange rate and stock market prices: A case study of Pakistan. *Asian Economic and Financial Review, 5* (5), 805-815.

Kim, K.H. (2003). Dollar exchange rate and stock price: evidence from multivariate cointegration and error correction model. *Review of Financial Economics*, *12* (3), 301-313.

Kuperand, G.H., & Lestano (2007). Dynamic conditional correlation analysis of financial market interdependence: An application to Thailand and Indonesia. *Journal of Asian Economics, 18* (4), 670-684.

Lahrech, A., & Sylwester, K. (2011). US and Latin American stock market linkages. *Journal of International Money and Finance*, *30* (7), 1341-1357.

Lin, C.H. (2011). Exchange rate exposure in the Asian emerging markets. *Journal of Multinational Financial Management*, *21* (4), 224-238.

Long, L., Tsui, A.K., & Zhang, Z. (2014). Conditional heteroscedasticity with leverage effect in stock returns: Evidence from the Chinese stock market. *Economic Modelling*, *37*, 89-102.

Makore, I., & Chikutuma, C.N. (2025). Exchange rate volatility and its impact on international trade: Evidence from Zimbabwe. *Journal of Risk and Financial Management, 18* (7), 376. https://doi.org/10.3390/jrfm18070376

Michelis, L., & Ning, C. (2010). The dependence structure between the Canadian stock market and the USD/CAD exchange rate: a copula approach. *Canadian Journal of Economics*, *43* (3), 1016-1039.

Mishra, A.K. (2004). Stock market and foreign exchange market in India: are they related? *South Asia Economic Journal*, *5* (2), 209-232.

Muhammad, N., Rasheed, A., & Husain, F. (2002). Stock prices and exchange rates: Are they related? Evidence from South Asian countries [with comments]. *The Pakistan Development Review, 41* (4), 535-550.

Nath, G.C., & Samanta, G.P. (2003). Integration between foreign exchange and capital markets in India: An empirical exploration.

The IUP Journal of Applied Finance, 9 (6), 13-25.

Nugraheni, P., & Risman, A. (2025). The determinants of firm value: Commodity prices, exchange rates, inflation, and business risk as intervening variable. *International Journal of Indonesian Business Review, 4* (1), 76-87.

Phylaktis, K., & Ravazzolo, F. (2005). Stock prices and exchange rate dynamics. *Journal of International Money and Finance, 24* (7), 1031-1053

Rady, A., Essam, F., Yahia, H., & Shalaby, M. (2024). The dynamic relationship between exchange rate volatility and stock prices in the Egyptian real estate market and the moderating effect of interest rates. *European Journal of Business and Management Research, 9* (5), 31-44.

Rahman, M.L., & Uddin, J. (2009). Dynamic relationship between stock prices and exchange rates: Evidence from three South Asian countries. *International Business Research*, *2* (2), 167-174.

Ratner, M. (1996). Investigating the behavior and characteristics of the Madrid Stock Exchange. *Journal of Banking & Finance, 20* (1), 135-149.

Raza, S.A., & Afshan, S. (2017). Determinants of exchange rate in Pakistan: Revisited with structural break testing. *Global Business Review*, *18* (4), 825-848.

Rigobon, R. (1998, September). Informational speculative attacks: Good news is no news. *Federal Reserve Board IF Seminar Paper*. https://ssrn.com/abstract=125011

Sahasrabuddhe, A., & Seddon, J. (2025). The perils of technocratic power: Central bank discretion and the end of bretton woods revisited (*QUCEH Working Paper Series # 25-06*). Queen's University Centre for Economic History, Queen's University Belfast.

Salisu, A.A., & Oloko, T.F. (2015). Modeling oil price-US stock nexus: A VARMA-BEKK-AGARCH approach. *Energy Economics, 50*, 1-12.

Silvennoinen, A., & Teräsvirta, T. (2009). Multivariate GARCH models. In T. Mikosch, J.-P. Kreiß, R.A. Davis, & T.G. Andersen (Eds.) *Handbook of financial time series* (pp 201-229). Springer, Berlin, Heidelberg.

Sohail, N., & Hussain, Z. (2009). Long-run and short-run relationship between macroeconomic variables and stock prices in Pakistan. *Pakistan Economic and Social Review*, *47* (2), 183-198.

Solnik, B. (1987). Using financial prices to test exchange rate models: A note. *Journal of Finance, 42* (1), 141-149.

Tai, C.S. (2007). Market integration and contagion: Evidence from Asian emerging stock and foreign exchange markets. *Emerging Markets Review*, *8* (4), 264-283.

Tsagkanos, A., & Siriopoulos, C. (2013). A long-run relationship between stock price index and exchange rate: A structural nonparametric cointegrating regression approach. *Journal of International Financial Markets, Institutions and Money*, *25*, 106-118.

Türsoy, T. (2017). Causality between stock prices and exchange rates in Turkey: Empirical evidence from the ARDL bounds test and a combined cointegration approach. *International Journal of Financial Studies, 5* (1), 8. https://doi.org/10.3390/ijfs5010008

Yang, Z., Tu, A.H., & Zeng, Y. (2014). Dynamic linkages between Asian stock prices and exchange rates: new evidence from causality in quantiles. *Applied Economics*, *46* (11), 1184-1201.

Zia, Q.Z., & Rahman, Z. (2011). The causality between stock market and foreign exchange market of Pakistan. *Interdisciplinary Journal of Contemporary Research in Business*, *3* (5), 906-919.