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Full Length Research Paper

Stock prices and exchange rates dynamics: Evidence from emerging markets

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This study empirically investigates the dynamic relationship between the Turkish stock price and the exchange rates, and also considers the US stock prices as a world market, in the long- and short-run. The study analyzes the period of floating exchange rate in Turkey which spans from 2001:08 to 2009:08 via applying cointegration, Granger causality and impulse response tests. The result from the cointegration reveals that the long run relationship is maintained. Granger causality shows that there are bidirectional relationships between exchange rate and Turkish stock prices. The impulse response results indicate the shocks of Turkish stock price, exchange rates, and US stock price response within a short time; in other words, the shocks are temporary.

Key words: Exchange rate, stock price, vector autoregression (VAR).

INTRODUCTION

Investigating the exchange rates and stock prices linkage has received a considerable attention of researchers and policy makers in the last few years. This growing attention appears after following the generalized floating of the major currencies in early 1973. The importance of exchange rates in influencing domestic prices, including stock prices, has been brightened. The research of this area has mainly focused on the causality determination between stock prices and exchange rates in developed countries and developing countries. Investigating the dynamic relationship between stock prices and exchange rate in emerging markets such as Turkey is interesting for a number of reasons. First, in a period of growing trade and financial liberalization, Turkey is now more subject to the fluctuations in exchange rate at the micro and macro levels.

Also, the analysis of this exposure is meaningful as a result of shifting from various forms of pegged arrangements towards a floating exchange rate system. Secondly, Turkey becomes more vulnerable to the contagion effects, parallel to rapid integration of the world financial markets. To capture the contagion effects, the study analyze the effects of the US stock market effects on Turkey in the analysis period. Thirdly, there are limited but growing number of studies that analyze this dynamic relationship in emerging markets of Turkey.

There are some theoretical backgrounds of the dynamic relationship between stock price and exchange rate in the literature. The classical economic theory suggests two approaches about the relationship between the stock prices and exchange rates, the traditional approach and portfolio approach. The traditional approach (flow, micro) (Dornbusch and Fisher, 1980) focus on how the current account movements affect international competitiveness and the trade balance position, thereby, influencing real income and output of the country, which in turn affects current and future cash flows of companies and stock prices. This theory claims that the depreciation of the domestic currency makes local firms more competitive, leading to an increase in their export and consequently higher stock price. The inference from this approach suggests that exchange rates leads stock price.

The portfolio oriented approach (stock, macro) of exchange rates, view exchange rate as equity; the supply and demand for assets such as bonds and stocks. According to portfolio approach, exchange rates are determined by the market mechanism just like all the other commodities, implying that stock prices leads to exchange rates and they are negatively related.

The motivation behind this study is to investigate the period of the adaption of floating exchange rate regimes by Turkey in the beginning of year 2001, which in turn lighted a new era of increased exchange rate volatility. Jorin (1990) stated that exchange rates were four times as volatile as interest rates and ten times as volatile as inflation during the 1980s. The aim of the study is to investigate whether the dynamic relationship between the Turkish stock prices and exchange rate works under the traditional approach or the portfolio approach, for the period span from 2001:08 to 2009:08; taking into consideration the effect of the world market (US stock prices index). The analysis period has been determined for the new era of exchange rate regime (floating) at the beginning of the year 2001.

This study contributes to the existing literature as follow: first, the study analyzes the period of floating exchange rates in Turkey. Secondly, this study analyzes the effects of external shocks on the locals' market, US stock market, this can be thought of representing the influence of the world market. Thirdly, the study analyzes the linkage between exchange rates and stock prices via applying vector autoregressive (VAR) methodology, cointegration, and the Granger causality through vector error correction model (VECM) technique, and impulse response to get further insight into the short run dynamic relations over the sample period.

LITERATURE REVIEW

The literatures that investigate the relationship between stock prices and exchange rate have examined both developed and developing countries, while limited but growing number of studies investigates this relation in Turkey.

Aggarwal (1981) examines the significance correlation of the value of the dollar on foreign exchanges with US stock prices. The study analyzes the period span from 1974 to 1978 on a monthly bass. The findings indicate a significant positive correlation between stock prices and strength of the US dollar, particularly when the value of dollar is not lagged. Bahmani and Sohrabian (1992) investigate the two ways relationship between exchange rates and stock prices in US. The study analyzes the period span from July 1973 to December 1988 via applying Granger causality and cointegration tests. The findings show that there is bidirectional causality between stock prices measured by S&P 500 index and the effective exchange rate of the dollar, at least in the short run. The cointegration analysis reveals that there is no long run relationship between two variables. Ajayi and Mougoue (1996) examine the intertemporal relation between stock price indices and exchange rates for Canada, France, Germany, Italy, Japan, Netherlands, United Kingdom, and US. The study analyzes the period span from 1985 to 1991 on a daily basis via applying co integration and error correction model tests. The findings reveal significant short- and long- run feedback relations between the two financial markets. Specifically, an increase in aggregate domestic stock price has a negative short run effect on domestic currency value. In the long run, however, increase in the stock prices has a positive effect on domestic currency value. On the other hand, currency depreciation has a negative short- and long- run effect on the stock market.

Abdalla and Murinde (1997) investigate the interaction between the exchange rate and stock prices in the emerging financial markets of India, Korea, Pakistan and Philippines. The study analyze the period span from January 1985 to July 1994, via applying bivariate vector autoregressive model using monthly observations of the International Finance Corporation (IFC) stocks and real effective exchange rate. The findings showed unidirectional causality from exchange rate to stock prices in all sample countries except the Philippines. Nieh and Lee (2001) examine the relationship between stock prices and exchange rate for G-7 countries. The study analyzes the period span from October 1, 1993 to February 15, 1996 on a daily basis for the closing stock prices and exchange rates. The findings show that there is no long-run equilibrium relationship between stock prices, and in exchange rates in all of the G-7 countries, there is no significant correlation in the US.

Phylaktis and Ravazzolo (2005) investigate the long- and short- run dynamics between stock prices and exchange rates and the channels through which exogenous shocks impact on a group of pacific Basin countries. The study analyzes the period span from 1980 to 1998 on a monthly basis via applying cointegration methodology and multivariate Granger causality tests. The finding suggests that stock and foreign exchange markets are positively related and the U.S stock market acts as a conduit for these links; and the financial crises had a temporary effect on the long-run co-movement of these markets.

Yau and Nieh (2006) investigate short- and long- term interrelationships among stock prices of Taiwan and Japan, and New Taiwan Dollar/ Yen exchange rates. The study analyzes the period span from January 1991 to July 2005 via applying cointegration and Granger causality tests. The findings include the stock prices of Taiwan and Japan impact each other for short durations. The portfolio approach is supported for the short term and traditional approach is more plausible for the long-term in the Taiwanese financial market, where as the portfolio approach is not suitable for the Japanese stock markets, all with regard to relationship between stock prices and exchange rate. Also the findings imply that there appears to be no longer term relation between NTD/Yen exchange rate and the stock prices of Taiwan and Japan.

Erbaykal and Okuyan (2007) investigate the validity of the traditional or portfolio approach in emerging markets (Brazil, Zech, China, Indonesia, Philippine, South Korea, India, Hungary, Malaysia, Mexico, Chili, Thailand, and Turkey). The study analyzes different periods based on the data availability for the tested countries via applying cointegration and Granger causality tests. The findings stated that there is a negative relationship between stock prices and exchange rates in six countries in the long run. Also, there is a casual relationship in eight countries, for five of them, it is unidirectional causality from stock prices to exchange rates, and for three countries there is bidirectional causality between stock prices and exchange rates.

Yau and Nieh (2009) investigate the exchange rate effects of the New Taiwan Dollar against the Japanese Yen on stock prices in Japan and Taiwan. The study analyzes the period span from January 1991 to March 2008 via applying the newly threshold error correction model (TECM). The finding suggests that there is a long run equilibrium relationship between NTD/JPY and the stock prices of Japan and Taiwan. However, an asymmetric threshold cointegration relationship only exists in Taiwan's financial market. The study also finds long term equilibrium and asymmetric casual relationships between NTD/USD and the stock prices of Taiwan. In addition, the results of TECM Granger causality tests show that no short run casual relationship exists between the two financial assets considered for both countries` cases. However, in the long run, a positive casual relationship running from either the Japan or US exchange rate to the stock prices of Taiwan strongly argues for traditional approach.

Turkish stock prices and exchange rates dynamics have been reviewed by the following authors. Bahmani and Domac (1997) investigate the relationship between stock prices and exchange rates in Turkey. The study analyzes the relationship via applying co integration technique and error correction model tests. The findings show that the stock prices and exchange rates do have a long run relationship. Also, via applying error correction model reveals that in short run stock prices and exchange rates do cause each other. Sevuktekin and Nargelecekenler (2007) investigate the long run and short run relationships between stock price and exchange rates in Turkey. The study analyzes the period span from January 1986 to December 2006 via applying co integration and Granger causality tests. The findings imply that there is a positive and significant long run relationship between stock prices and exchange rates. Also, there are two way relationships in long run, while there is no casual relationship between stock prices and exchange rates in short run. Pekkaya and Bayramoglu (2008) analyze the causality between exchange rate and stock prices of Istanbul Stock Index and S&P 500 in Turkey. The study analyzes the period span from 1990 to 2007 via applying Granger causality test. The findings imply that there is a Granger cause from Turkey stock prices and S&P 500 to exchange rates for the period 1990 to 2007. The Granger cause between exchange rates and Turkey stock prices is bidirectional. On the other hand, S&P 500 has a unidirectional Granger cause against Turkey stock prices and exchange rates. Aydemir and Demirhan (2009) investigate the causal relationship between stock prices and exchange rates, the national 100, services, financial, industrial, and technology indices are taken as stock price indices. The study analyzes the period span from February 2001 to January 2008 via applying Toda-Yamamoto Granger causality. The findings indicate that there is bidirectional causal relationship between exchange rates and all stock market indices. The negative causality exists from national 100, services, financial, and industrial indices to the exchange rates; the technology index shows a positive causal relationship to the exchange rate. On the other hand, negative casual relationship from exchange rate to all stock market indices is determined.

DATA AND METHODOLOGY

The data series used in this paper is obtained from the International Monetary Fund, International Financial Statistics (IFS) and spans for the period of 2001:08 to 2009:08 on a monthly basis. The nominal exchange rate, national currency per US end of period (ER), and the stock prices for both Turkey (LTSP) and US (LUSSP) as a world market were used. Turkey and US stock prices are in the natural logarithm.

Since the study deals with time series data, before preceding any step, analyzing the stationarity of the data series should be considered (unit root). Unit root should precede any empirical estimation to avoid the problem of spurious regression. As first step, the unit root tests are applied to investigate whether the data series of interest are stationary by the means of Augmented Dickey-Fuller (ADF), Phillip-perron (P and P) and Ng-perron tests. The results of ADF, P and P, and Ng-perron tests with and without trend reported in Table 1, indicates that the exchange rate and stock prices series are non-stationary at level. On the other hand, unit root tests on the time series reveals that all the variables are stationary at first difference I(1).

Since all the variables are non stationary at level, we test for cointegration by means of Johansen cointegration. For this purpose, we estimate a reduced form of vector autoregressive model (VAR) in the following form:

$$= A_1\gamma_{t-1} + A_2\gamma_{t-1} + \cdots + A_\rho\gamma_{t-\rho} + \varepsilon_t$$

Where *Aî*s are (nxn) coefficient matrices and ε_t is an unobservable i.i.d. zero mean error.

The order of VAR is initially determined by information criteria. Results from information criteria were conflicting. In this case, with conflicting results, the researcher opted for another criterion to determine the lag length based on VAR specification residuals until all the residuals of collograms are uncorrelated (white noise). Based on this method, the optimal lag length was determined to be nine in the model.

The result in Table 2 shows *t* statistics and critical values for both trace and eigenvalue. The result reveals that the null hypothesis of zero cointegration vectors can be rejected according to both trace

Table 1. Results of ADF, P and P, and Ng-perron tests with and without trend.

Variable	K	ADF		P and P		NG-Perron	
		A	B	A	B	A	B
Set A at level I(0)							
LTSP	1	-1.5932	-1.9852	-1.2117	-1.5996	0.0013	-1.8905
ER	1	-2.9805**	-2.9454	-2.8560	-2.9726	-2.7270	-2.7893
LUSSP	3	-1.9083	-2.5718	-1.5479	-1.6256	-2.0715**	-2.1569
Set B at 1st difference I(1)							
LTSP	1	-6.7513*	-6.7588*	-7.5819*	-7.5873*	-3.2557*	-4.1534*
ER	1	-7.4857*	-7.4794*	-9.3705*	-9.3334*	-2.5086*	-3.7963*
LUSSP	3	-3.2431**	-3.1564	-8.1257*	-8.1465*	-0.5279*	-1.7896*

*, **, and *** significant level at 1, 5, and 10% respectively, based on the test critical values. K: lag length. A: Intercept. B: Intercept and trend.

Table 2. Johansen cointegration test.

Hypothesis	R=0	R=1	R=2
Trace	44.9987*	18.7548*	2.0719
Critical value	29.7970	15.4947	3.8414
Eigen, max	26.2439*	16.6828*	2.0719
Critical value	21.1316	14.2646	3.8414

*, rejection the null hypothesis of no cointegration at 5% level.

Table 3. Pair wise Granger causality test.

Null hypothesis	F- statistic	Probability
LTSP does not Granger Cause EX	2.0198	0.0449*
LTSP does not Granger Cause LUSSP	1.5087	0.1623
EX does not Granger Cause LTSP	2.1711	0.0346*
EX does not Granger Cause LUSSP	1.9188	0.0634
LUSSP does not Granger Cause EX	2.1764	0.0342*
LUSSP does not Granger Cause LTSP	1.5087	0.1635

LTSP, EX, and LUSSP denotes logarithm of Turkish stock prices, exchange rates and logarithm of U.S stock prices, respectively. * reject H_0 (no Granger cause) at 5% level.

and max eigenvalue statistics. In other words, the trace and eigenvalue statistics indicate that at least one cointegrating relationship exists. The long run cointegrating vector can be written as follows:

$$LTSP = -2.1083ER + 3.8535\ LUSSP$$

The results from long run relation cointegration equation reveal that the variables have their anticipated signs. The negative relationship between exchange rates and stock prices were consistent with the study of Soenen and Hennigar (1988).

When the variables are non stationary and cointegrated, the adequate method to examine the issue of causation between the stock prices and exchange rates is the vector error correction model (VECM) (Granger, 1988). The resultant from subtracting y_{t-1} from both sides and rearranging the terms in a model known as vector error correction model (VECM) is in the following form:

$$\Delta_{yt} = \Pi_{yt-1} + \Gamma_{\Delta yt-1} + \cdots + \Gamma_{p-1\Delta t-p+1} + u_t$$

Where Π = - (I_K – A….-A_P), and Γ_i = - (A_{t+1}+… + A_P) for I = 1, … , P-1.

Short run vector error correction model was estimated with nine lags, estimation results reveal that exchange rate turns to be positive as follows:

$$-0.2069\Delta(LTSP) = 0.4314\Delta(ER) + 1.3052\Delta(LUSSP) - 0.0141ec_{t-1}$$

The issue of causation between the stock prices and exchange rate was tested. The Granger causality test in vector error correction form allows the examination of dynamic casual interaction amongst the stock prices and exchange rates. The result shown in Table 3 reveals that LTSP and LUSSP granger causes to the exchange rate EX. The granger cause between exchange rate EX and LTSP is bidirectional and LUSSP has unidirectional granger cause on exchange rate EX. In other words, there are two way relationships between the Stock prices LTSP and exchange rates EX. This finding is in line with Bahmani-Oskooee and Sohrabian (1992) who state that there could be a two-way relationship between exchange rates and stock prices. The unidirectional granger cause between LUUSP and exchange rate EX is in line with the findings of Pekkaya and Bayramoglu (2008).

Impulse response in the bivariate VAR can provide further evidence on the short run relation that is not addressed by the Granger causality test. The advantage of this approach is that the data was allowed to decide whether the shocks are permanent or temporal. The impulse response results reported in Figure 1 reveals that the logarithm of Turkish stock prices response to its own shock is both significant and negative in the 2nd period. The response of the logarithm of Turkish stock prices to a shock from the exchange rates is positively significant in the 6th period. The response of the logarithm of Turkish stock prices to a shock from the US stock prices is positively significant in the 6th period. The finding reveals

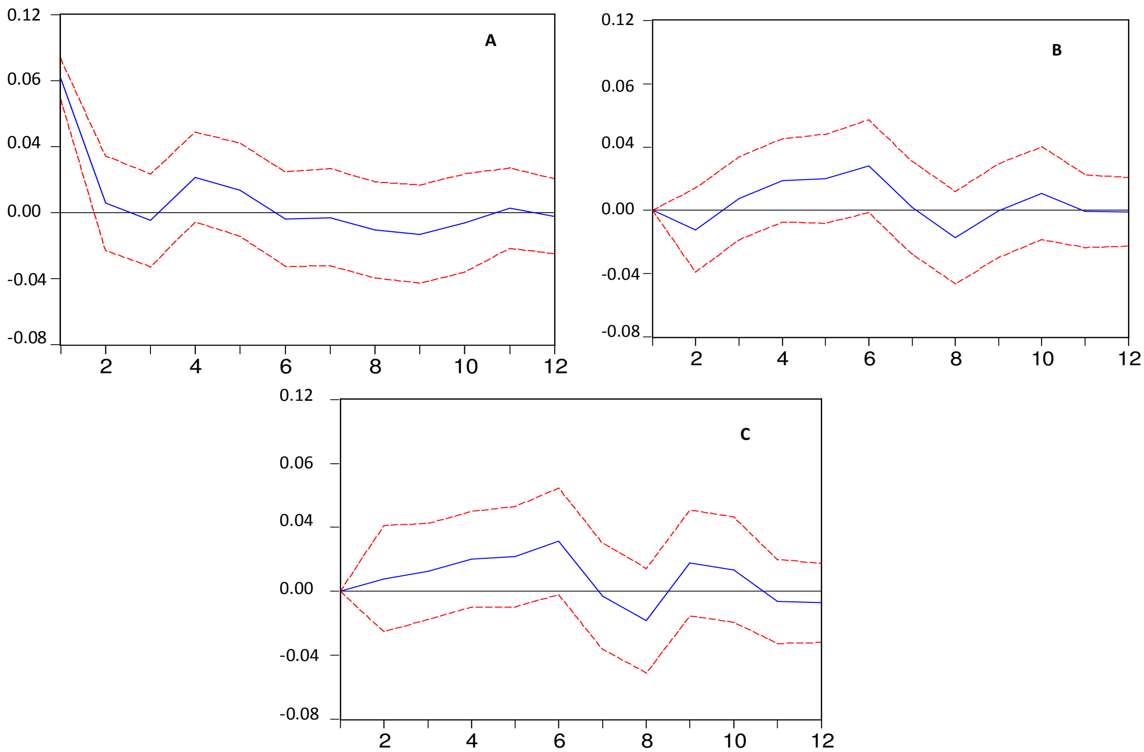

Figure 1. Impulse response to non-factorized one S.D. innovations ± 2 S.E; a) response of D (LTSP) to D (LTSP); b) response of D(LTSP) to D(EX); c) response of D(LTSP) to D(LUSSP).

Table 4. Variance decomposition test.

Period	D(LTSP)	D(ER)	D(LUSSP)
1	100.000	0.000	0.000
6	84.261	6.419	9.318
12	80.165	7.401	12.433
18	80.010	7.741	12.247
24	79.572	7.900	12.527
30	79.461	7.951	12.587
36	79.476	7.947	12.576
42	79.457	7.948	12.593
48	79.454	7.950	12.594

that the Turkish stock price response to its own shock and shock from both exchange rates and logarithm of the US stock prices will dies out maximum within the first 6 periods.

The variance decomposition provided information about the relative importance of each random innovation in affecting the variables in VAR. The results reported in Table 4 indicate that Turkish stock prices respond to its own innovation but the effect goes down over time period. While the effects of exchange rates and US stock prices increases over the time, the effects of the US stock price are higher and continue increasing.

Conclusion

This study examines the dynamic linkages between Turkish stock prices and exchange rates, taking into consideration the effects of the world market, US stock market, in the floating exchange rate period. The results from long run cointegration indicate that the exchange rate has a negative impact and the US stock markets have a positive impact on the Turkish stock market in the analysis period. This result indicates that Turkey stock market is integrated with the world. The causality dimensions determined that there are two way relationships between exchange rate and Turkish stock prices. This result indicates that the dynamic relationship between Turkey stock market and exchange rate interaction are joint effect from theories, traditional approach and portfolio approach, in the tested period. Also, the short-run relationship is maintained between the Turkish stock market and exchange rates.

The negative impact of exchange rates on Turkish stock prices supports the study of Soenen and Hennigar (1988), whom asserts a strong negative relationship. This means a decline in the value of Turkish lira is expected to stimulate domestic economic activity. This study has a policy implication to the decision makers in Turkey.

Depreciation in the Turkish lira will help the economy, but it will not solve the trade problem.

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