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How does Turkish stock market respond to the external shocks? Pre- and post- crises analyses

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This paper analyzes the impact of current financial crisis on Turkish stock market movements and external linkages with selected developed countries. We employ the multivariate co-integration method and structural break analyses using daily stock market indices of Turkey, the US, England and Germany. Our empirical result indicates that Turkish stock market has significant co-integration relationship with selected developed countries' stock markets in the crises free period. However, the Turkish stock market deviated during crises using its own financial dynamics. The current financial crisis in the US has no impact on the development of Turkish stock market. Our result has important implication that portfolio investors can capitalize on this feature of Turkish stock market in the case of financial crises in the developed countries.

Key words: Turkish stock market, external linkages, financial crises, structural break, co-integration.

INTRODUCTION

The first securities market was established in 1866 under the name of "Dersaadet Securities Exchange" in Istanbul. Following the collapse of the Ottoman Empire, the Turkish Republic enacted a new law in 1929 to reorganize the capital markets under the "Istanbul Securities and Foreign Exchange Bourse". During the industrialization process in the following decades, the number and size of the stock companies increased and they started to open up their equity to the public. In this period, mostly individual investors and some institutional investors demanded these stocks.

In 1981, the "Capital Market Law" was enacted and Capital Markets Board established in Ankara. In October 1984, the "Regulations for the Establishment and Functions of Securities Exchanges" was published in the Official Gazette and the Istanbul Stock Exchange (ISE) was formally inaugurated at the end of 1985. In terms of monthly turnover velocity, the ISE has surpassed several European stock exchanges such as Paris, Stockholm, Amsterdam, Vienna and Brussels. After intensive efforts to establish a modern infrastructure, beginning from its establishment, the ISE has become the world's 23rd largest stock exchange market. However, the lasting instable nature of the economic, financial and political environment caused stock returns to be sensitive and volatile. Due to the fact that Turkey is a candidate for European Union membership and a member of the G-20, very liberal foreign exchange regime is implemented and as a result, international investors possessed half of the market value of the shares trading in the ISE.

The latest global financial crisis which was triggered in the US housing market in September 2008, with the failure and merging of a number of American financial companies and two American firms, Fannie Mae and Freddie Mac, have been nationalised to ensure the financial stability of the two firms. One week later, Lehman Brothers filed for bankruptcy after being denied support by the American Federal Reserve Bank. This was followed by purchasing Merrill Lynch by the Bank of America. Due to this crisis, major decreases which happened in the global stock markets spread from the US stock market. Turkish stock market also decreased together with the global stock markets. After a 50% decline in the Turkish stock market index in 2008, it recovered in 2009 as the index rose by 73% until the end of August. This fast recovery attracted the attention of policy makers and portfolio investors. In this study, we examine the reaction of the Turkish stock market to latest

financial crisis and investigate the global linkages of the Turkish stock market before and after the said crises.

LITERATURE REVIEW

The majority of literature emphasizes the leading role of the US market in the world stock market. Among them, Eun and Shim (1989), Arshanapali et al. (1995), Hassan and Naka (1996), Wu and Su (1998), Bessler and Yang (2003), Cumperayot et al. (2006), Ozdemir and Cakan (2007), and Abu Hassan and Ergun (2009) find results supporting the US leading role in the world.

In the pacific region, stock markets of the developed and developing countries have linkages with different degree of cointegration (Click and Plummer, 2005; Caporale et al., 2005; Phylaktis and Ravazzolo, 2005). In the North America region, the studies find that the stock markets are cointegrated (Chen et al., 2002; Fujii, 2005). In the European region, the linkages that are strong between developed European markets are weak among emerging markets (Verchenko, 2000; Brada et al., 2002; Syriopoulos, 2004, 2007; Floros, 2004). German stock market has a greater dominant role in the region (Friedman and Shachmurove, 1997; Cheung and Lai, 1999; Égert and Kočenda, 2007).

Voronkova (2003) introduces a structural break into the model and shows that Central European markets tend to display equilibrium relationships once controlled for structural change (like financial liberalization dates) with Western European and US counterparts. Voronkova (2004) finds links between the Central European markets that is stronger than has been previously reported and as a result, the Central European markets have become more integrated with global markets. Friedman and Shachmurove (1997) emphasize that the European Community stock markets operate within a single time zone and respond to global events simultaneously, emphasizing that the smaller EC markets are more independent. Gelos and Sahay (2001) found that financial markets move together during crisis events between European countries.

As for the Turkish stock market, there are limited studies upon which to establish any solid evidence on financial linkages. This is partly due to the fact that Turkey as a candidate country is not incorporated in the studies which investigate EU financial market linkages and interaction. ISE enjoys a volatility spillover relationship and strong linkages with the stock markets of developed countries. According to Alper and Yilmaz (2004), there is clear evidence of volatility contagion from the financial centres especially in the aftermath of the Asian Crisis to the ISE. Darrat and Bankato (2003) find that there exists a significant co-integrating relation binding the ISE with the four matured markets (US, the UK, Japan and Germany) especially US and UK stock markets as the main sources of volatility spillovers for the ISE. Erdal and Gunduz (2001) investigate to what extent the ISE is integrated regionally and globally. They find that there is no co-integration among the equity markets of Turkey, Egypt, Israel, Jordan and Morocco. However, there exists a strong co-integration relationship binding ISE with seven matured markets and in addition to that the US and Japanese markets are more influential on Turkey as compared to other emerging markets. There is no lead lag relationship between the ISE and other developed and emerging markets.

Financial crises that occurred in a developed country is expected to influence the other financial markets with different level, changing according to the markets own characteristics and co-movements with the external markets. Among recent studies, Ravichandran and Maloain (2010) found that stock market linkages strengthened after crises and Asteriou et al. (2010) find an asymmetric increase in dependence among stock markets during crises periods.

DATA AND METHODOLOGY

Daily stock market indices of ISE 100, Nasdaq 100, DAX 30 Performance and FTSE 100 are used in this study. Our sample data covers the period between January 1, 2000 and May 30, 2010. The data is obtained from Datastream and transformed to natural logarithms prior to analysis. In our four-variable model, we focus on the structural breaks in the series in order to find out the possible impacts of them on the interaction of ISE and selected countries stock markets. In doing so, unit root with structural breaks, multivariate cointegration, cointegration with structural breaks models are used.

First, stationary tests which are augmented Dickey–Fuller (ADF) (Dickey and Fuller, 1981); Phillips-Perron (PP) (Phillips and Perron, 1988), are applied to determine the order of integration. If there is a shift in the time series, it should be taken into account in testing for a unit root because the ADF test may be distorted if the shift is simply ignored. Saikkonen and Lutkepohl (2002) and Lanne et al. (2002) have proposed the following model; A shift function, which

is $f_t(\theta)'\gamma$, is added in the equation:

$$y_t = \mu_0 + \mu_1 t + f_t(\theta)' \gamma + e_t$$

Where θ and γ are unknown parameters or parameter vectors and the errors e_t are generated by an AR(p) process. And shift function is defined as:

$$f_t^{(1)} = d_{1t} = \begin{cases} 0, & t \prec T_B \\ 1, & T \ge T_B \end{cases}$$

The shift function, $ft(\theta)\gamma$ is a simple shift dummy variable with shift data T_{B} . Saikkonen and Lutkepohl (2002) and Lanne et al. (2002) have proposed unit root tests based on estimating the deterministic term by the generalised least squares (GLS) procedure and subtracting it from the original series. Thereafter an ADF-type test is performed on the adjusted series.

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Variable -			First differences		
		UR with SB	ADF	UR with SB	
ISE	2.7420*	-1.2823	-40.5578*	-38.0296*	
US	1.5890	-1.9957	-44.2196*	-16.2046*	
Germany	1.2054	-1.3456	-43.7061*	-36.2406*	
England	1.0596	-1.9631	-46.3588*	-9.9178*	

Critical values for ADF with intercept are 1, 5, 10% is -3.503, -2.893 and -2.583. Critical values for unit root with structural break and with intercept are 1, 5, 10% is -3.48, -2.88 and -2.58.

Table 2. Johansen cointegration test result.

Models	Lag	Trace LR	λmax	99%
08/10/1990- 08/11/2010	4	1 cointegration vector *	70.46	60.81
Break date 10/08/2008	2	1 cointegration vector *	79.70	68.67
08/10/1990- 10/08/2008		1 cointegration vector *	75.23	60.81
10/08/2008- 08/11/2010	2	No cointegration	52.66	60.81

* Cointegrating vector at the 0.01 level indicate the existence of significant linkages.

Secondly, Johansen multivariate cointegration (Johansen, 1988, 1995; Johansen and Juselius, 1990) is employed to our fourvariable model to investigate the impact of structural breaks (Johansen et al., 2000) resulted from financial crises on the interaction between ISE and selected stock markets. In Johansen's (1995) notation, a *p*-dimensional vector error correction model (VECM) can be written as:

$$\Delta y_t = \Pi^* \begin{bmatrix} y_{t-1} \\ 1 \end{bmatrix} + \sum_{j=1}^{p-1} \Gamma_j \Delta y_{t-j} + e_t$$

Where $\Pi^* = \begin{bmatrix} \Pi : v_0^* \end{bmatrix}$ is (K x(K +1)). The intercept can be

absorbed into the cointegrating relations; thus $\Pi^* = \alpha \beta^*$ has rank *r*. The trace test is of the form:

$$LR(r_0) = -T \sum_{j=r_0+1}^{K} \log(1 - \lambda_j)$$

where the λ_{j} are the eigenvalues obtained by applying reduced rankregression techniques.

EMPIRICAL RESULTS

Stationarity (unit root) test with structural break results which is reported in Table 1 indicate that all series are nonstationary in log levels but stationary in log first differences.

The estimations are performed using ADF and unit root with SB test specifications, which include an intercept.

Lag selection is based on Akaike Information Criterion. All series are I(1), stationary in first difference according to unit root with SB test.

In the second step, Johansen multivariate co-integration analyses was performed and the result is presented in Table 2. At this step, we applied two approaches which are:

 Sub-sample period determined according to the structural breaks in the models, and
Cointegration with structural breaks

II. Connegration with structural breaks

Cointegration analyses include structural breaks and the usual cointegration analyses give same result which is that significant long term linkages exist between the Turkish stock market and the selected world dominant stock markets. However, sub period analysis shows the lack of cointegration relationship after the financial crises in the US. Turkish stock market deviated from the developed countries stock markets during the crises period. Most probably, inner factors that influence Turkish stock market plays stronger role than external factors at the movements of Turkish stock market especially in crises times.

Conclusion

This paper analyzes the impact of current financial crisis which occurred in the US and afterwards in the other financial centers in 2008 on external linkages of Turkish stock market movements with selected developed countries' stock markets applying the usual multivariate cointegration test and cointegration with structural breaks models. In order to eliminate the impact of structural break in our usual cointegration analyses, we divide the whole period spans from 08/10/1990 to 08/11/2010 into two sub-period based on structural break that occurred due to crises.

In our full sample period, usual cointegration analyses test and cointegration with structural break analyses produced same result which is significant cointegration despite severe financial crises in the US. However, subperiod analyses give significant cointegration in the time period before crises and lack of cointegration in the second period after the crises. Turkish stock market deviates from the world dominant stock markets during the late financial crises possibly due to country's own specific factors.

Hence, there is sufficient empirical evidence which shows that ISE respond to late financial crises temporarily. International portfolio investors can benefit from this diversification especially during financial crises.

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