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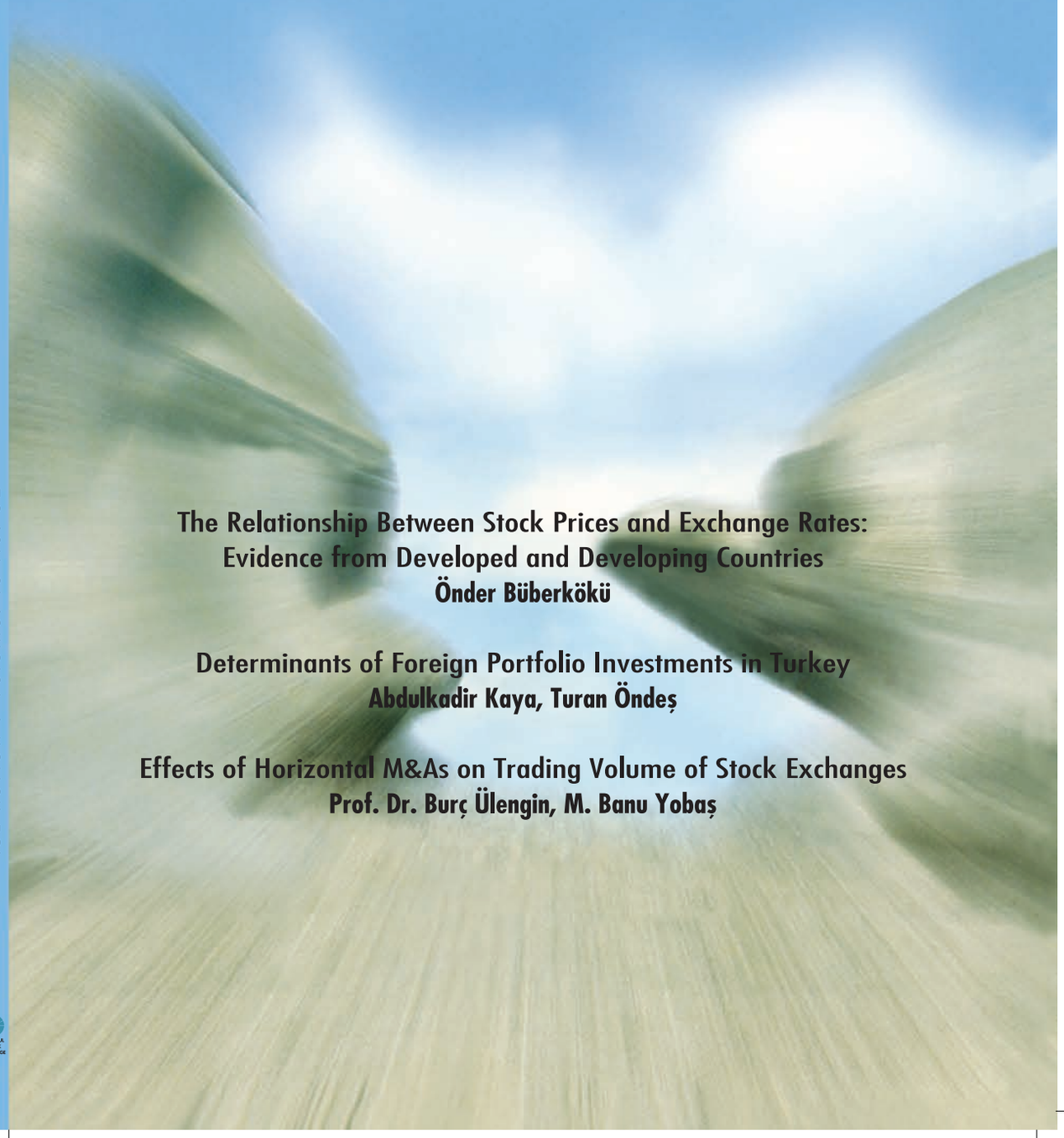

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Objectives and Contents

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Articles sent to the ISE Review will be published after the examination of the Managing editor and the subsequent approval of the Editorial Board. Standard conditions that the articles should meet for publication are as follows:

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The ISE Review has been included in the "World Banking Abstracts" Index published by the Institute of European Finance (IEF) since 1997, in the Econlit (Jel on CD) Index published by the American Economic Association (AEA) since 2000, and in the TÜBİTAK-ULAKBİM Social Science Database since 2005.

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THE RELATIONSHIP BETWEEN STOCK PRICES AND EXCHANGE RATES: EVIDENCE FROM DEVELOPED AND DEVELOPING COUNTRIES

Önder BÜBERKÖKÜ*

Abstract

This study analyses the relationship between exchange rates and stock prices in some developed and developing countries, namely Japan, Canada, England, Switzerland, Germany, Australia and Singapore, S. Korea, and Turkey. The study examines the long-run relationship between these market variables by using Johansen (1988) and Engle-Granger (1987) cointegration tests and short-run dynamic relationship by using Granger causality test, a variance decomposition analysis and an impulse response analysis. The findings indicate that there is uni-directional causality from stock prices to exchange rates in Canada and Switzerland, while no causal relationship is found in Japan, Germany, England, and Australia. Moreover, there is uni-directional causality from exchange rates to stock prices in Singapore and S. Korea, whereas uni-directional causality from stock prices to exchange rates is found in Turkey. These findings are also robust with respect to various methods used. In addition, the results show that there is no long-run relationship between the two examined variables in any studied country except Singapore

Keywords: Stock prices, exchange rates, Johansen (1988), Engle-Granger (1987) cointegration tests, Granger causality, variance decomposition, impulse response analysis, developed countries, developing countries
JEL Classification: G10, G15, F30

1. Introduction

Stock and foreign exchange markets are important components of global financial system. Increasing financial liberalization, international integration and capital inflow among economies have further emphasized the importance of the relationship between stock prices and exchange rates.

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In the extant literature, two hypotheses on the relationship between stock prices and foreign exchange rates have been extensively examined, namely traditional approach and portfolio balance approach. According to traditional approach, changes in exchange rates can affect stock prices through the foreign trade channel. That is, changes in exchange rates can affect firms' domestic and international sales, which will, in turn, affect the firms' stock prices. Due to this mechanism, there is causality from exchange rates to stock prices (Dornbush and Fischer, 1980). On the other hand, portfolio balance approach implies that stock prices lead to changes in exchange rates. The premise here is that an increase in stock prices will cause a rise in demand for funding and this, in turn, will cause an increase in interest rates, due to the increase in borrowing as a way to raise required capital. Rising interest rates will, correspondingly, attract further capital inflows, causing appreciation of the local currency (Frankel, 1983)

Despite numerous studies reported in the extant literature examining the relationship between stock prices and exchange rates, there is no consensus pertaining to the linkage between these two variables. Abdalla and Murinde (1997) examined the relationship between stock prices and exchange rates for Korea, Pakistan, India and Philippines. Their results indicate that there is a causality from exchange rates to stock prices in Korea, Pakistan, and India, while an opposite linkage is identified for Philippines. Granger et al. (2000) investigated the relationship between stock prices and exchange rates for nine East Asian countries. According to the results the authors reported, in Hong Kong, Malaysia, Singapore, Thailand and Taiwan, there is a bi-directional causality between stock prices and exchange rates, while, in Indonesia and Japan, no causal relationship between these two variables was found. The results also indicate that changes in exchange rates lead to movements in stock prices in S. Korea, whereas an opposite finding was reported for Philippines. Ajayi et al. (1998) examined seven developed and eight emerging markets, and reported that stock prices lead to exchange rates in developed economies, whereas there is no causality between the two variables in emerging Asian markets. Nieh and Lee (2001) studied the exchange rates-stock prices relationship for G-7 countries and found absence of significant any long-run relationship between the two variables, even though a significant linkage was found for single-day data in certain G-7 countries in the short-run. Tsai (2012) investigated six Asian countries, and found that, in the long-run, there is no significant relationship between exchange rates and stock prices. On the other hand, in the short-run, especially in periods of extreme price movements in foreign exchange rates,

there is causality from stock prices to exchange rates. Liu and Wan (2012) analyzed the relevant market data for China and found no long-term relationship between these two variables, while short-term causality from exchange rates to stock prices was noted after the recent mortgage crisis. Diamandis and Drakos (2011) examined four Latin American countries, revealing a uni-directional causality from exchange rates to stock prices in Brazil and Argentina, a bi-directional causality in Chile and uni-directional causality from stock prices to exchange rates in Mexico. Their results also indicate that a stable long-run relationship has not been found in any countries. Yau and Nieh (2009) analyzed Japan and Taiwan financial markets and their findings indicate that there is no short-run relationship between exchange rates and stock prices in these countries, even though long-term relationship is found in both. Additionally, Ajayi and Mougone (1996), as well as Bahmani-Oskooee and Domac (1997), found a long-run relationship between two variables, whereas Bahmani-Oskooee and Sohrabian (1992) and Zhao (2010) noted that there is no significant long-run relationship between exchange rates and stock prices

The aim of this study is to analyze the relationship between exchange rates and stock prices in some developed and developing countries, namely Japan, Canada, England, Switzerland, Germany, Australia, Singapore, S. Korea, and Turkey. The study examines the long-term relationship between these two market variables by using Johansen (1988) and Engle-Granger (1987) cointegration tests and short-term dynamic relationship by using Granger causality test, a variance decomposition analysis and an impulse response analysis.

The remainder of the paper is organized as follows. Section 2 describes the data and is followed by the methodology, given in Section 3. Section 4 presents the results analysis, and Section 5 concludes the paper

2. Data

The data set used in this study consists of monthly closing stock indices and exchange rates, and covers the period from April 1998 to April 2008. However, due to issues pertaining to data availability for some countries, the sample period starts on January 2000 for Canada and Turkey, and since the Euro came into existence on January 1999, the corresponding sample period starts on January 1999 for Germany**.** All data is obtained from Federal Reserve Bank and

Econstats. The detailed information related to the variables is presented in Table1.

Table 1: Variables

Country	Stock index	Exchange rates	Currency
Japan	Nikkei 225	JPY/USD	Japanese yen
Swtzerland	Zürih SMI	CHF/USD	Swiss franc
England	FTSE 100	GBP/USD	British pound
Canada	TSX Composite	CAD/USD	Canadian dollar
Germany	DAX 30	EUR/USD	Euro
Australia	All Ordinaries Index	AUD/USD	Australian dollar
Singapore	STI	SING$/USD	Singapore dollar
S.Korea	KOSPI	WON/USD	Korean won
Turkey	ISE100	TL/USD	Turkish lira

3. Methodology

In order to examine the stationary properties of the stock prices and exchange rates, four different unit root tests are employed, namely Augmented Dickey Fuller (ADF), Phillips Perron (PP), Kwiatkowski, Phillips, Schmidth and Shin (KPSS) and Elliot, Rothenberg and Stock's Dickey Fuller GLS (DF-GLS). All unit root tests are estimated in a form with constant and trend. The lag length for ADF and DF-GLS is selected using Akaike and Schwartz information criteria, while the lag length for PP and KPSS is chosen by applying Bartlett kernel spectral estimation method and Newey West Criteria**.**

Engle-Granger (1987) and Johansen (1988) cointegration methods are used to examine the possible long-term relationship between exchange rates and stock prices. Engle-Granger (1987) is a two-step approach, that stipulates that, if x and y time series are integrated of order one, I(1) and residuals obtained from their linear combination is stationary, I(0) then these two series are cointegrated. However, this cointegration test has some shortcomings. First, choice of dependent variable can affect the test's results. Second, the test can cause biased results when sample size is small (Enders, 1995). Thus, in order to mitigate these issues, in the work, Johansen (1988, 1991) cointegration test is also employed to examine the long-term relationship between stock prices and exchange rates**.**

Suppose that X_t is modelled as a vector autoregression model, VAR.

$$\mathrm{X}_t = \Pi_1 \mathrm{X}_{t-1} + \Pi_2 \mathrm{X}_{t-2} + \cdots + \Pi_k \mathrm{X}_{t-k} + \mu + \varepsilon_t \qquad (1)$$

This equation can be written in vector error correction form as

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_k \Delta X_{t-k} + \Pi X_{t-k} + \mu + \epsilon_t \qquad (2)$$

where,

$$\Gamma_i = -(I - \Pi_{1-} \ldots - \Pi_i \text{ ve } \Pi = -(I - \Pi_1 - \cdots \Pi_k)$$

Π is the long-term coefficients matrix, and if the rank (r) of Π matrix is smaller than the number of the variables in the equation (r < m), it implies potential existence of a cointegration relationship between the variables. Π can be written as, $\Pi = \alpha\beta'$, where elements of α are adjustment parameters and β represents the cointegrating vectors. In order to determine the number of cointegrating vectors, Johansen proposed two different likelihood ratio tests—trace and maximum eigenvalue tests

The study examines short-term dynamic relationship by using Granger causality test, according to which, if variable X (Granger) causes variable Y, any changes in X should precede the changes in Y. Therefore, in a regression of Y on other variables (including its own past values), if the inclusion of past or lagged values of X significantly improves the prediction of Y, we can say that X (Granger) causes Y (Gujarati, 2006, s. 697). Additionally, in order obtain robust results, following Pan et al. (2007) and Wu (2000), a variance decomposition analysis and an impulse response analysis are also employed.

4. Empirical results

All the series are transformed into natural logarithm form, after which ADF, PP and KPSS tests are employed to examine for unit roots, with the corresponding results presented in Table 2. ADF and PP unit root tests reveal that all variables are integrated of order one, I(1). KPSS unit root test also indicates the same results for all countries under study, except for Japan exchange rate. According to KPSS unit root test, Japan exchange rate is integrated of order zero. Because of this result, DF-GLS unit root test is also employed, and it is found that all series are integrated of order one[1]. In this context, it is concluded that Engle-Granger (1987) and Johansen (1988, 1990) cointegration tests can be conducted

1 Only DF-GLS test results for Japon are reported (see Appendix I).Results for other countries can be avaliable on request.

Table 2: Unit root tests results

Country	Series	ADF	PP	KPSS	Series	ADF	PP	KPSS
Japan	E	0.533(0)	0.366(2)	0.073(8)	ΔE	0.000*(0)	0.000*(0)	-
	S	0.881(0)	0.829(4)	0.258*(9)	ΔS	0.000*(0)	0.000*(3)	0.097(4)
Swtzerland	E	0.632(1)	0.769(0)	0.156**(9)	ΔE	0.000*(0)	0.000*(6)	0.070(3)
	S	0.707(1)	0.809(5)	0.253*(9)	ΔS	0.000*(0)	0.000*(9)	0.089(6)
England	E	0.570(0)	0.559(4)	0.214**(9)	ΔE	0.000*(0)	0.000*(4)	0.104(4)
	S	0.905(0)	0.904(1)	0.260*(9)	ΔS	0.000*(0)	0.000*(1)	0.101(1)
Canada	E	0.202(4)	0.227(1)	0.183**(8)	ΔE	0.000*(1)	0.000*(7)	0.081(1)
	S	0.849(0)	0.831(2)	0.253*(8)	ΔS	0.000*(0)	0.000*(5)	0.079(2)
Germany	E	0.294(1)	0.218(5)	0.154**(8)	ΔE	0.000*(0)	0.000*(10)	0.135(4)
	S	0.916(0)	0.901(2)	0.246*(9)	ΔS	0.000*(0)	0.000*(1)	0.120(1)
Australia	E	0.898(2)	0.719(4)	0.209**(9)	ΔE	0.000*(1)	0.000*(2)	0.094(3)
	S	0.762(0)	0.740(2)	0.271*(9)	ΔS	0.000*(0)	0.000*(5)	0.088(5)
Singapore	E	0.928(1)	0.96(12)	0.317*(9)	ΔE	0.000*(0)	0.000*(24)	0.069(16)
	S	0.686(0)	0.686(0)	0.189**(9)	ΔS	0.000*(0)	0.000*(7)	0.051(3)
S.Korea	E	0.488(1)	0.758(0)	0.201**(9)	ΔE	0.000*(0)	0.000*(8)	0.097(2)
	S	0.576(0)	0.412(4)	0.147**(9)	ΔS	0.000*(0)	0.000*81)	0.053(2)
Turkey	E	0.408(2)	0.477(1)	0.226*(8)	ΔE	0.000*(1)	0.000*(5)	0.098(2)
	S	0.242(1)	0.155(1)	0.214**(8)	ΔS	0.000*(0)	0.000*81)	0.131(1)

Figures in parentheses are lag length. S and E indicate stock indices and exchange rates, respectively. ΔS ve ΔE denote the first order differences. Figures for ADF and PP tests show the probability values. KPSS critical values are 0.216 and 0.1460 at 1% and 5% levels,respectively. * and ** denote significance at 1% and 5% levels.

Following the literature, equation below is used for both cointegration tests.

$$S_t=\beta_0+\beta_1*E_t+\epsilon_t \qquad (3)$$

where S_t is stock prices, E_t is exchange rates, β_0 is a constant, β_1 is a parameter and ϵ_t is an error term. Engle-Granger (1987) cointegration test results (Table 3) show that

Table 3: Engle-Granger cointegration test results

Country	ADF
Japan	-1.783(2)
Swtzerland	-1.673(1)
England	-1.346(0)
Canada	-1.767(0)
Germany	-1.107(0)
Australia	-2.816(9)
Singapore	-2.344(0)
S.Korea	-3.569(1)**
Turkey	-0.5348(1)

Figures in parentheses are lag length which is selected by AIC. MacKinnon (1991) critical values at 1% and 5% levels are -4.008 and -3.398 for Canada and Turkey , -3.996 and -3.391 for Germany ,and -3.988 and -3.387 for the rest of the countries. *,** denote the significance at 1% and 5%levels, respectively.

There is a long-term relationship between stock prices and exchange rates only for S. Korea. In other words, the hypothesis that there is long-term relationship between stock prices and exchange rates is rejected for all countries except S. Korea. However, due to the aforementioned shortcomings of the Engle-Granger (1987) cointegration test, Johansen cointegration test was also employed to examine the long-term relationship between stock prices and exchange rates for each of the studied countries.

Johansen cointegration test reveals the same results as Engle-Granger (1987) cointegration test, except for S. Korea and Singapore (Table 4).

Table 4: Johansen cointegration test results

Country	Ho	Trace	k
Japan	r =0 r≤1	10,9254 1,3652	1
Swtzerland	r=0 r≤1	5,2652 0,0005	1
England	r=0 r≤1	9,0821 1,7931	1
Canada	r=0 r≤1	11,3829 0,0081	2
Germany	r=0 r≤1	7,6787 0,3723	1
Australia	r=0 r≤1	5,700 0,5345	3
Singapore	r=0 r≤1	20,4867** 5,3495	7
S.Korea	r=0 r≤1	14,1063 2,486	1
Turkey	r=0 r≤1	14,49309 0,835011	4

k indicates the VAR lag length selected by AIC. r denotes the number of cointegrating vectors. *,** denote significance at 1% and 5% levels, respectively.

In other words, Johansen cointegration test results show that, there is a cointegration relationship between stock prices and exchange rates for Singapore, while there is no long-term relationship between stock prices and exchange rates for S. Korea. Because Johansen cointegration test is a more powerful method (Gonzalo, 1994), it is concluded that there is no long-term relationship between two variables in any country except Singapore. Thus, generally speaking, it can be said that exchange rates and stock prices are not cointegrated, which is in agreement with the findings reported by Bahmani-Oskooee and Sohrabion (1992) and Nieh and Lee (2002).

Short-term dynamic relationship between stock prices and exchange rates is examined using the Granger causality, variance decomposition and impulse response analysis. The results of Granger causality test, given in Table 5, indicate that, among developed countries, there is a casual relationship from stock prices to exchange rates in Canada and Switzerland, while there is no casual relationship between stock prices and exchange rates in Japan, England, Germany, and Australia. For developing countries, the analysis results indicate a significant causality from stock prices to exchange rates in Singapore and S. Korea, whereas an opposite significant causality was found for Turkey. In sum, changes in exchange rates affect stock prices in Canada, Switzerland and Turkey, while changes in stock prices affect exchange rates in Singapore and S. Korea

Table 5:Granger casuality test results

Country	Ho	k	Prob-value	ECT
Japan	$\Delta S \neq\rightarrow \Delta E$ $\Delta E \neq\rightarrow \Delta S$	1	0.2276 0.4870	-
Swtzerland	$\Delta S \neq\rightarrow \Delta E$ $\Delta E \neq\rightarrow \Delta S$	1	0.0322** 0.3020	-
England	$\Delta S \neq\rightarrow \Delta E$ $\Delta E \neq\rightarrow \Delta S$	1	0.8094 0.9631	-
Canada	$\Delta S \neq\rightarrow \Delta E$ $\Delta E \neq\rightarrow \Delta S$	2	0.0261** 0.9201	-
Germany	$\Delta S \neq\rightarrow \Delta E$ $\Delta E \neq\rightarrow \Delta S$	1	0.9797 0.5475	-
Australia	$\Delta S \neq\rightarrow \Delta E$ $\Delta E \neq\rightarrow \Delta S$	3	0.3047 0.1257	-
Singapore	$\Delta S \neq\rightarrow \Delta E$ $\Delta E \neq\rightarrow \Delta S$	7	0.0971 0.0254**	-.0049 -0.166*
S.Korea	$\Delta S \neq\rightarrow \Delta E$ $\Delta E \neq\rightarrow \Delta S$	1	0.0802 0.0015*	-
Turkey	$\Delta S \neq\rightarrow \Delta E$ $\Delta E \neq\rightarrow \Delta S$	4	0.0310** 0.3419	-

Symbol "$\neq\rightarrow$" means does not Granger cause. k is the lag length selected by AIC . ECT is error correction term. ΔS and ΔE indicates the stock indices and exchange rates.*,** denote significance at 1% and 5% levels, respectively.

The variance decomposition results with 10-month forecasting horizon are given in Table 6[2]. In Canada, stock price shock explains 17.3% of exchange rate total variation while exchange rate shock explains only 0.41% of stock price

2 Cholesky decomposition is used in VAR analysis. Granger casuality test results are taken into account while determining the order of variables . Lag length is selected by AIC ,then Breusch-Godfrey serial correlation LM test is employed ,and results show that residuals are not serially correlated (see Appendix II)

total variation. Similarly, in Switzerland stock price changes account for 12.8% of the observed exchange rate variation, whereas exchange rate shocks only account for 0.92% of the stock price variation. On the other hand, the results for other developed countries, namely Japan, England, Germany and Australia, show that shocks in both variables have minor effect on each other's variation.

The results corresponding to the emerging markets, namely Singapore, S. Korea and Turkey, reveal that exchange rate shocks respectively explain only 13.8%, 13.8% and 4.8% of stock price total variation, while stock price shocks explain about 10.1%, 2.35% and 32.4% of the observed exchange rate variation, respectively. In sum, these results indicate that variance decomposition results are consistent with the findings of Granger causality test.

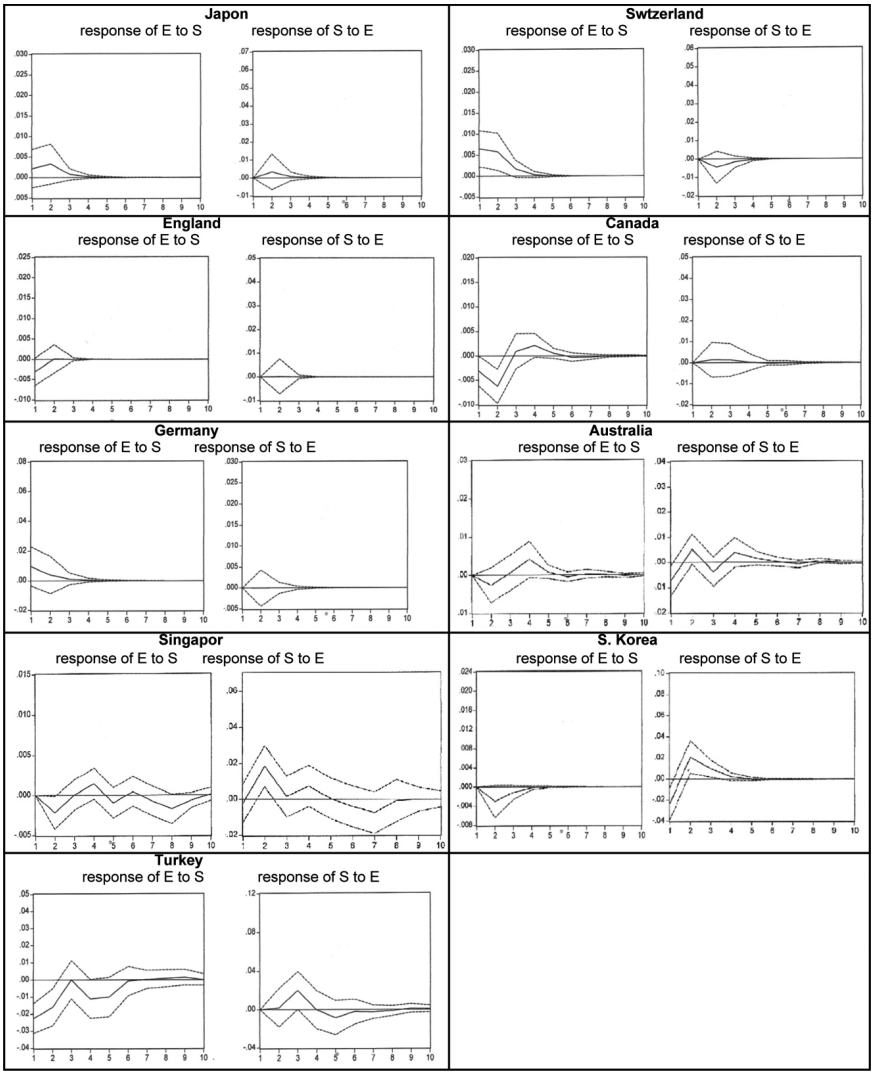
Table 6: Variance decomposition

Country	Period	Percentage of exchange rate variance explained by		Percentage of stock index variance explained by	
		E(%)	S(%)	E(%)	S(%)
Japan	1	99.26	0.73	0.00	100
	2	97.68	2.31	0.39	99.60
	5	97.60	2.39	0.41	99.58
	10	97.60	2.39	0.41	99.58
Swtzerland	1	92.45	7.54	0.00	100
	2	87.54	12.45	0.82	99.17
	5	87.14	12.85	0.92	99.07
	10	87.13	12.86	0.92	99.07
England	1	97.25	2.74	0.00	100
	2	97.28	2.71	0.01	99.99
	5	97.28	2.71	0.01	99.99
	10	97.28	2.71	0.01	99.99
Canada	1	95.92	4.07	0.00	100
	2	84.15	15.84	0.39	99.60
	5	82.68	17.31	0.41	99.58
	10	82.65	17.34	0.41	99.58
Germany	1	100	0.00	1.87	98.12
	2	99.99	0.01	2.17	97.82
	5	99.99	0.01	2.20	97.79
	10	99.99	0.01	2.20	97.79
Australia	1	100	0.00	5.03	94.96
	2	98.94	1.05	7.51	92.48
	5	96.40	3.59	10.03	89.96
	10	96.36	3.63	10.08	89.91
Singapore	1	100	0.00	0.72	99.27
	2	97.66	2.33	2.30	97.69
	5	96.20	3.79	4.26	95.10
	10	89.86	10.13	13.85	86.14
S.Korea	1	100	0.00	7.75	92.24
	2	97.94	2.05	12.73	87.26
	5	97.64	2.35	13.84	86.15
	10	97.64	2.35	13.85	86.14
Turkey	1	75.65	24.34	0.00	100
	2	72.67	27.32	0.04	99.95
	5	67.57	32.42	4.77	95.22
	10	67.50	32.49	4.85	95.14

S denotes the stock prices, and E indicates exchange rates.

The impulse response analysis results are presented in Table 7. Results for Canada and Switzerland show that one standard deviation shock in exchange rates has minor effect on stock prices, while a one standard deviation shock in stock prices causes statistically significant impact on exchange rates. On the other hand, results for Japan, England, Germany and Australia show that both variables' shocks have minor effect on each other's levels, implying that there is no a short-term relationship between these two variables in these countries. Emerging markets results, namely those for Singapore and S. Korea, reveal that shocks in stock prices have minor effect on the exchange rates, whereas shocks in exchange rates have statistically significant impact on stock prices. On the other hand, in Turkey, shocks in exchange rate have little effect on stock prices, while shocks in stock prices have statistically

Table 7 :Impulse response function



E indicates the response of exchange rates to one standart deviation shock in stock prices while S denotes the response of stock prices to one standart deviation shock in exchange rates

significant impact on exchange rates. In summary, impulse response analysis results reinforce the findings of Granger causality and variance decomposition results.

Lastly, it is important to explain why the relationship between exchange rates and stock prices varies across countries. The discrepancy noted in the results may be related to each country's differences in the size of equity and exchange rates markets, as well as stem from the differences in the trade size and structure (Nieh and Lee, 2001). Additionally, whether or not the exchange rate risk is hedged may also be among the factors affecting the relationship between exchange rates and stock prices. Furthermore, utilization rate of the local currency in foreign trade may also play a role in the relationship between the two examined variables (Pan et al., 2006)

5. Conclusion

This study analyzed the relationship between exchange rates and stock prices in some developed and developing countries. The findings reported here indicate that, except for Singapore, there is no long-term relationship between the two examined variables in any studied country. However, in the short-term, there is uni-directional causality from stock prices to exchange rates in Canada and Switzerland, while no significant causality was noted for Japan, Germany, England, and Australia. In addition, there is uni-directional causality from exchange rates to stock prices in Singapore and S. Korea, while there is uni-directional causality from stock prices to exchange rates in Turkey. These findings are robust with respect to various methods used.

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APPENDIX I: DF-GLS unit root test results

Country	Series	DF-GLS	Series	DF-GLS
Japon	E	-1.8230(0)	ΔE	-8.0999*(0)
	S	-1.2052(0)	ΔS	-9.8208*(0)

Figures in parentheses are lag length selected by SIC and AIC.DF-GLS critical values are -3.56 and -3.02 at 1% and 5% significance levels

APPENDIX II : LM test results

	LM(1)	LM(2)	LM(5)	LM(12)
Japon				
ΔE Equation	0.331	0.564	0.240	0.320
ΔS Equation	0.837	0.241	0.696	0.987
Swtzerland				
ΔE Equation	0.672	0.848	0.578	0.684
ΔS Equation	0.123	0.280	0.234	0.557
England				
ΔE Equation	0.143	0.156	0.261	0.585
ΔS Equation	0.921	0.982	0.944	0.889
Canada				
ΔE Equation	0.834	0.906	0.714	0.796
ΔS Equation	0.762	0.731	0.937	0.875
Germany				
ΔE Equation	0.373	0.414	0.457	0.365
ΔS Equation	0.428	0.315	0.645	0.372
Australia				
ΔE Equation	0.367	0.201	0.321	0.289
ΔS Equation	0.551	0.682	0.413	0.383
Singapore				
ΔE Equation	0.586	0.752	0.893	0.435
ΔS Equation	0.742	0.346	0.079	0.378
S.Korea				
ΔE Equation	0.228	0.328	0.515	0.762
ΔS Equation	0.419	0.714	0.332	0.520
Turkey				
ΔE Equation	0.482	0.126	0.209	0.391
ΔS Equation	0.915	0.963	0.976	0.658

Figures show the probability values for LM test . ΔS and ΔE indicate stock indices and exchange rates, respectively. * and ** denote significance at 1% and 5% levels

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DETERMINANTS OF FOREIGN PORTFOLIO INVESTMENTS IN TURKEY

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Abstract
Accelerating with financial globalization, foreign capital is increasingly becoming an important financing instrument as well as a source of financing for sovereign countries. Especially in the early 1990s, the rapid liberalization of national capital markets paved the path to the worldwide mobilization of capital factors. As an element of foreign capital, foreign portfolio investments provide debt-free sources of borrowing, facilitate the effective allocation of capital and expand local capital markets in developing countries.
The purpose of this study is to identify the determinants of foreign portfolio investments in Turkey. In this study, using monthly data for the period of 1998:01–2010:12, a regression analyses was carried out. As a result of the study, the greatest contribution of variables on foreign investors' buying and selling decisions are found to be the growth rate of ISE 100 index, the volume of foreign investors' buying and selling transactions in prior periods and finally the Gross Domestic Product.

Keywords: Foreign Capital, Foreign Portfolio Investments, Macroeconomic Variables, Country Risks, ISE.
JEL Classification: O16, F21

1. Introduction

Globalization, the very concept of which dates back to centuries, entered the academic literature in 1980s. The neoliberal policies coupled with especially rapidly developing technologies culminated in the fast paced development of globalization process. Today, globalization is progressing on a certain path. The first stage within this process is the free circulation of goods and services among countries,the second stage encompasses the international mobilization of money

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and capital and finally, the third stage constitutes of the freedom of movement for persons across borders. In the wake of attaining the free trade of goods and services, the size and speed of capital movements among countries picked up pace by virtue of technological developments. Consequently, capital began to flow from capital-rich regions with poor-returns towards capital-hungry regions with superior return prospects. The capital supplying countries benefit from rich returns during this process, which is also defined as financial liberalization, whereas the capital receiving countries fulfill their capital shortfalls. Thereby, all obstructive measures should be abolished for the purpose of achieving the unhindered flow of financial capital into those countries and sectors where the highest profits can be attained without encountering any barriers.

One of the fundamental factors behind the economical development of a country is the injection of domestic or foreign savings into the economy. Attracting savings of foreign nations into the country possessing a capital shortfall has significant implications on meeting capital and saving deficits. Especially after 1990s, intense capital movements took place from developed countries towards developing markets. The emerging capital mobility allowed the efficient distribution of savings and investments on a global scale. The international capital movements generally materialized in the form of foreign direct investments or foreign portfolio investments.

Regarding the investments into the stocks of a nonresident firm, acquiring a stake of 10% or higher of the firm's unpaid-in capital is deemed as a foreign direct investment, while a lesser investment is termed as a foreign portfolio investment. To put more extensively, a foreign portfolio investment is defined as the acquisition of stocks, bonds, real estate, or noncommercial bank loans that are not a part of their direct investments of a local firm by a nonresident firm, corresponding to a 10% or lesser stake of paid-in capital of the local firm (Gokkent; 1997; 6). The most substantial distinction between foreign direct investments from portfolio investments is that in the former case, the investing firms or individual(s) gain partial or full control over decision making and production processes.

Mainly, the benefits of foreign portfolio investments regarding the national economy are the provision of credit lines to a developing market without increasing the debt burden, in addition to augmenting the efficient allocation of capital. The last but the most important contribution is that it nurtures the development of local capital markets.

Foreign portfolio investments are consistently growing and being directed by especially USA and UK into the developed countries, which attract the largest portion of portfolio investments.

The purpose of this study is to determine the factors that influence foreign portfolio investments, which are continuously growing on a global scale and are crucial with respect to the development of macroeconomic structure and the capital markets of Turkey as well as the other emerging markets.

2. Literature Review

As a result of his study on 29 countries for the period of 1944-1959, Errunza (1977) suggested that portfolio diversification that is not confined to the security markets of developed countries is profitable. He demonstrated that such kinds of portfolio investments positively influence the international liquidity position of developing countries and hence contribute towards the development of national economies. It was also recorded that those countries which aim to attract portfolio investments into their markets must eliminate the existing controls and restrictions on capital flows, provide timely and accurate information, and demonstrate a long term effort to develop their equity markets.

Kreicher (1981) analyzed the relationship between long-term capital flows in the form of portfolio investments and the real interest rates for three European countries and USA. These capital flows were categorized with respect to type of assets and liabilities, and the non-private sector long-term portfolio flows originating from only England, West Germany, Italy and USA were investigated through quarterly data. As a result, the hypothesis that international investment decisions are sensitive and responsive to inflation and foreign exchange rate expectations as well as real interest rates was supported.

Pain (1993) attempted to explain the underlying factors for portfolio investments increasing in England since 1970. In his study, an empirical analysis was conducted to evaluate the determinants of foreign portfolio investments, in addition to determining especially the expected returns and the impact of financial liberalization. A change control index was utilized to support the hypothesis that financial liberalization gives way to rising levels of foreign portfolio investments. The presented evidences were found to be in conformity with the standard equation composed of asset demands, which underscores the importance of expected relative returns and the level and size of assets on determining the level of investments. The result of the study shows that

restriction on financial liberalization has a significant explanatory power on international portfolio investments.

Liljeblom and Loflund (2000) investigated the determinants of foreign portfolio investment flows in the stock exchange of Finland, where the restrictions on foreign investments were eliminated in 1993. During the course of their study, the relative share of foreign investments grew rapidly and reached 53% of total market capitalization of national stocks by December 1998. Analyses conducted by using company specific data in accordance to the level of foreign ownership showed that besides the variables used to represent restrictions on investments such as dividend yield, liquidity and firm size, foreign investment flows are significantly correlated with the variables associated with profitability and risk. Moreover, the other analyses conducted suggested that no information asymmetry exists between local and foreign investors and thereby, no systematic difference is present between their respective portfolio performances.

Aggarwal and others (2002) showed that the countries with higher level of economic development tend to exhibit more sophisticated capital markets as well as superior capabilities with respect to earning access to foreign capital. Besides, the researches asserted that the foreign capital situation of country is dependent on various factors associated with its economic development and the financial characteristics of firms. As a result, after controlling for the influence of foreign capital on the country, it was demonstrated that firms can attract greater amounts of foreign capital by attaining better accounting quality and corporate governance. In addition to these, it was set forth that the necessary measures that can be taken to create a more favorable environment towards foreign portfolio investments can be implemented at both national level and firm-level.

Pal (2006) studied the impact of foreign portfolio investments on the economy and industrial sector of India. He manifested that foreign portfolio investments affect the real sector fundamentally through the securities markets and propounded that this effect on economic development of a country can be explained by these investments. It can be inferred from the results of this study that inflow of foreign portfolio investments can facilitate the development a country's security markets and the economy in general, although recording that no such effect was observed in India indeed. On the other hand, it was concluded that the fluctuating levels of foreign portfolio investments in India's economy create some serious problems for the policy makers and macroeconomic administrators.

Lay and Wickramanayake (2007) examined the effect of a groups of economic variables comprised of interests rates and foreign exchange rates on foreign portfolio investments in Singapore for the period of 1972-1999. As a result of their analysis, it was revealed that a long-term balance exists between the entire set of economic variables and foreign portfolio investments. Besides, it was also found that the Gross Domestic Product of Singapore and its stock market indices are positively correlated with foreign portfolio investments, while US interest rates are negatively correlated. Finally, it was concluded that the local and external factors were equally important in determining the flow of foreign portfolio investments into Singapore.

In the study conducted by ISE (1994) encompassing the period of 1989-1994, the factors influencing the decisions of foreign portfolio investments were analyzed. The study showed that country related risks affect the decisions of foreign investment in Turkey. Additionally, it was also stated that net portfolio investments can be explained by variables of stock purchase, overnight interest rates and the ISE index.

Basoglu (2000) investigated in his theoretical study the macroeconomic imbalances in developing countries induced by portfolio investments. As a result of his study, it was revealed that the impact of international portfolio investments on national interest and foreign exchange rates do not culminate in a persistent macroeconomic stability, and in economies where pricing mechanism do not function sufficiently, it may even hinder the effects of economic policies developed to stimulate growth, production and employment. Besides, it was also suggested that a stabile macroeconomic environment and a persistence economic growth are prerequisites for attracting long-term direct and portfolio investments into the national economy. Lastly, it was recorded that these two pillars of a healthy economy, namely the macroeconomic stability and persistent growth, must be maintained before proceeding with uncontrolled financial liberalization.

In the study conducted by Balkan, Biçer ve Yeldan (2002), the determinants of short-term foreign capital inflows in the aftermath of liberalization of capital flows in 1989 were investigated. The study was limited to the analysis of portfolio investments by domestic and foreign investors and time series analysis was employed to determine the macroeconomic variables that best explain the behavior of capital inflows between 1992-2002 (exchange rate, real interest rate and real wages). The analysis showed that capital inflows exhibit negative correlation with industrial production index, while the correlation was found to

be positive and significant with real appreciation of the currency, foreign exposure, equity market index and 1-month lagged lenghts of capital inflows.

Demir (2007) studied the effect of international capital movements comprised of foreign direct and portfolio investments on the economic growth of Turkey. A time-series analysis of monthly data for the period of 1996:2-2005:9 was conducted within the study; as a result of which it was concluded that both foreign direct investments and foreign portfolio investments are positively correlated with economic growth.

The study conducted by Kandır (2008), which was conducted with the purpose of evaluating the investment preferences of foreign investors in Turkey, performed regression analyses on portfolio and cross section data for the period of 2000-2004 belonging to the largest 500 firms in Turkey compiled by Istanbul Chamber of Industry. The firm-based study showed that sales volume, profitability measures and export revenues of the companies are largely influential on the investments decisions of foreign investors in Turkey. In other words, these investors put a premium on firm size, foreign exposure and financial performance criteria.

Oztekin ve Eratas (2009) examined the relationship between the portfolio investments and real interest rates in Turkey. For the purpose of assessing this relationship, they built a model using the annual data for the period of 1990-2008. As a result, it was asserted that portfolio investments flowing into Turkey increased with rising cointegration between long term economic variables that is widening differences in real interest rates. Furthermore, the model results showed that short term imbalances between net portfolio investments and real interest rate differentials is removed in the long term via fluctuations. The conducted analysis indicated that the real interest rate in Turkey have a significant influence on net portfolio investments.

It was observed from the literature review that the effects of foreign portfolio investments (FPI) are measured from certain macroeconomic variables. The objective of this study is to determine the variables related to Turkish economy and the country-specific risks that would influence FPI, in addition to evaluating the factors that determine the buying and selling decisions of foreign portfolio investors in Turkey by multivariate analysis, i.e. the determinants of FPI. It is contemplated that the obtained findings will become indicative for other countries besides Turkey that aim to attract FPI.

3. Data And Methodology

For the purpose of determining what factors are taken into consideration by the portfolio investors investing Turkey to make their buying and selling decisions in Istanbul Stock Exchange (ISE), a regression analysis will be conducted on the financial, economic and political risk level data of Turkey that are compiled by International Country Risk Guide (ICRG) that engages in risk rating of sovereign countries, in addition to the volume of buying and selling transactions carried out by foreign portfolio investors in ISE and some macroeconomic variables belonging to the Turkish economy. The regression analysis will help to determine the variables affecting the buying and selling decision of foreign portfolio investors as well as the direction of influence these particular variables have on these decisions.

The period of study was established as 1998:01-2010:12. The types of data used in the analyses and their sources are listed in Table 1 below. The analyses were conducted by the assistance of Eviews 7 economic analysis software package.

3.1. Regression Analysis

Regression analysis is a statistical method developed to determine the relationship among two or more variables and then make predictions or forecasts regarding the particular subject based on this deduced relationship. In this technique, a mathematical model is built to explain the relationship between two or more variables, which is denominated as the regression model (Alma & Vupa, 2008).

Regression analysis is one o the statistical tools used to define the relationship between the dependant or explained variable (Y) and the independent or explanatory variables (X or Xs) and calculate the degree of this relationships (Tarı, 1999).

While working with time series data, it is strongly probable that the series exhibit nonstationarity. Besides, there is a great likelihood of encountering spurious regression in models built from nonstationary data, hence leading to the possibility that the prediction results reflect a spurious relationship. Thus, stationarity of the variables must be tested to begin with. In case of determining nonstationarity in the actual levels of time series, their 1^{st} differences are taken to obtain a stationary series. Thereby, the problem of spurious regression is addressed and it becomes possible to reach more reliable results (Ozer and others 2011). First of all, stationarity of the variables were tested in this study by the

assistance of Augmented Dickey-Fuller (ADF) unit root test. Results of the stationarity test are given in Table 2.

Table 1: List of Variables

Acronym of Variable	*Name of Variable*	*Source of Data*	*Unit*
LOGPURCH	Natural log of the volume of purchases by FPI	www.imkb.gov.tr (Data)	TL
LOGSALE	Natural log of the volume of sales by FPI	www.imkb.gov.tr (Data)	TL
BOT	Balance of Trade	www.imkb.gov.tr	%
INT	Interest on US$	www.imkb.gov.tr	%
LOGGDP	Natural log of Gross Domestic Product	www.imkb.gov.tr	TL
EXCH	US$/TL exchange rate	www.imkb.gov.tr	%
LOGFX	Natural log of FX reserves held by Central Bank of Turkey	www.imkb.gov.tr	TL
LOGBOP	Natural log of balance of payments	www.imkb.gov.tr	TL
CPI	Consumer Price Index	www.imkb.gov.tr	%
TD	Trade Deficit	www.imkb.gov.tr	%
FD	Financial Deficit	www.imkb.gov.tr	%
ISE	ISE 100 Index	www.imkb.gov.tr (Data)	%
ER	Economic Risk Level of Turkey	www.prsgroup.com/ICRG.aspx	
FR	Financial Risk Level of Turkey	www.prsgroup.com/ICRG.aspx	
PR	Political Risk Level of Turkey	www.prsgroup.com/ICRG.aspx	

Analyzing the regressions with constant and trend concerning the ADF unit root test results presented in Table 2 LOGPURCH, LOGSALE, LOGBOP, TD, FD, F/K, ER and FR variables were found to be stationary at level values, while BOT, INT, EXCH, REZERV, CPI, ISE and PR variables were stationary at 1^{st} differences and finally LOGGDP variable was stationary at 2^{nd} differences. In light of these findings shown in models number (1) and (2).

$$LOGPURCH = LOGPURCH(-1) + \Delta BOT + \Delta INT + \Delta LOGGDP + \Delta EXCH + \Delta REZERV + LOGBOP + \Delta CPI + TD + FD + \Delta ISE + ER + FR + \Delta PR \quad (1)$$

$$LOGSALE = LOGSALE(-1) + \Delta BOT + \Delta INT + \Delta LOGGDP + \Delta EXCH + \Delta REZERV + LOGBOP + \Delta CPI + TD + FD + \Delta ISE + ER + FR + \Delta PR \quad (2)$$

Table 2: Results of the ADF Unit Root Test

Variables	*Coefficient Value*		*Value of 1st Difference*	
	Intercept Only	*Intercept and Trend*	*Intercept Only*	*Intercept and Trend*
LOGPURCH	-1,64 (2)	-3,43 (1) [c]		
LOGSALE	-1,70 (2)	-4,34 (0) [a]		
BOT	-3,09 (1)	-3,10 (1)	-17,47 (0)[a]	-17,45 (0) [a]
INT	-2,11 (4)	-2,23 (4)	-5,51 (3)	-5,49 (3) [a]
LOGGDP	-2,92 (12) [b]	-2,64 (12)	-1,31 (11)	-2,05 (11)
LOGGDP*			-18,47(10) [a]	-18,42 (10) [a]
EXC	-2,10 (2)	-1,67 (2)	-8,52 (1) [a]	-8,63 (1) [a]
LOGFX	-3,01 (0) [b]	-2,11 (0)	-11,34 (0) [a]	-11,74 (0) [a]
LOGBOP	-9,53 (0)[a]	-9,81 (0) [a]		
CPI	-0,77 (1)	-1,38 (1)	-7,58 (0) [a]	-7,58 (0) [a]
TD	-3,09 (1) [b]	-3,44 (1) [b]		
FD	-9,50 (0) [a]	-10,34 (0) [a]		
ISE	-0,07 (0)	-2,10 (0)	-13,14 (0) [a]	-13,17 (0) [a]
E	-2,77 (0) [c]	-3,58 (0) [b]		
F	-3,47 (0) [b]	-3,54 (0) [b]		
P	-1,63 (0)	-1,66 (0)	-14,53 (0) [a]	-14,58 (0) [a]
Critical Values				
a=1%	-3,47	-4,01	-3,47	-4,01
b=5%	-2,88	-3,43	-2,88	-3,43
c=10%	-2,57	-3,143	-2,57	-3,14

The superscripts a= %1, b= %5 and c=%10 denote the critical values at the respective significance levels. The figures given in parentheses are the minimum lag lenghts as per the Akaike and Schwartz Information Criterion assuming no autocorrelation.
* Value of 2nd differences

From a statistical point of view, analyzing the validity of a model after its construction is an important part of regression analysis. In this context, it must be checked whether the method of least squares used to evaluate the validity of the devised model satisfies the assumptions of regression analysis. If the regression model built is not suitable to the data, the obtained results can be misleading (Alma and Vupa, 2008). The reliability of forecasts performed by

least squared methodology can only be achieved through ensuring that the specific assumptions of the method are adhered to. Prior to proceeding with the predictions using the devised model, validity of the three basic assumptions that are measurable and considered to be fundamental to the least squares method will be examined. Firstly, the proposition that no correlation exists among the independent variables, namely absence of multicollinearity, will be tested. Secondly, the assumption that the variance of error terms remains constant will be checked, and finally the assumption that no autocorrelation exists between the error terms will be examined (Tarı, 1999).

Table 3: Estimation Results of the Model for The Logpurch Dependent Variable

Dependent Variable: LOGPURCH				
Independent Variable	*Coefficient*	*Std. Deviation*	*T -Statistic*	*Significance*
C (Constant Term)	***+ 7,680***	***1,741***	***4,410***	***0,00***
LOGPURCH (-1)	***+ 0,815***	***0,041***	***19,764***	***0,00***
ΔBOT	***+ 0,015***	***0,007***	***2,135***	***0,03***
ΔINT	***- 0,272***	***0,089***	***-3,057***	***0,00***
ΔLOGGDP	***+ 0,553***	***0,217***	***2,541***	***0,01***
EXC	+ 0,093	0,970	0,096	0,92
REZERV	- 0,346	0,473	-0,730	0,47
LOGBOP	+ 0,031	0,021	1,473	0,14
ΔCPI	***+ 0,002***	***0,001***	***2,750***	***0,01***
TD	***- 0,062***	***0,038***	***-1,618***	***0,10***
FD	***+ 0,025***	***0,015***	***1,673***	***0,10***
ΔISE	***+ 5,998***	***1,854***	***3,236***	***0,00***
E	***- 0,040***	***0,021***	***-1,942***	***0,05***
F	***- 0,051***	***0,025***	***-2,057***	***0,04***
P	- 0,047	0,041	-1,138	0,26
R-squared	0,93	**F-statistic**		135
Durbin-Watson stat	2,33	**Probability (F-statistic)**		0,00

Note: The symbol "Δ" indicates that differenced values were used for the respective variable. The variables written in bold indicate statistical significance.

If there exists a perfect correlation between the independent variables; in other words, if the correlation coefficient between the variables is equal to 1, the regression parameters become undeterminable. That is, it becomes impossible to

assign distinct numerical values to each of the parameters and the method of least squares becomes inoperative (Koutsoyiannis, 1989). The first indicators examined in order to detect multicollinearity are the total correlation and partial correlation coefficients. A partial correlation of 0.85 or greater among two variables signals the presence of multicollinearity (Siklar, 2000, 81). A correlation analysis was conducted among the independent variables used in both of the devised models (1) and (2) and the obtained results are displayed in Addition 1. The analysis performed showed that the highest correlations are observed between the variables denoted by BOT and TD (0.59), followed by ER and PR (0.57). The fact that both of these coefficients are way below the 0.85 threshold was deemed as an evidence of no multicollinearity.

Autocorrelation, whose absence is one of the fundamental assumptions of regression model, is the presence of correlation between consecutive error terms (Tarı, 1999). In this study, Durbin-Watson test values *d* belonging to models (1) and (2) are calculated as 2.33 and 2.31, respectively. Durbin-Watson values decreased to undecided region, but the purpose of study is not to create a good model to predict the amount of the purchase and sale of foreign portfolio. The purpose of the study is to determine the effect of highlighted variables in theory to the decisions of buying and selling of foreign portfolio. For this reason, although the "sequential dependency" for this study is a significant econometric analysis it was carried out to show the generated models provides hypotheses.

After verifying that the fundamental assumptions are met by the regression models (1) and (2) that were adjusted after the unit root test, both models were estimated by least squared method and the results are presented in Tables 3 and 4.

Table 4: Estimation Results of The Model for Logsale Dependent Variable

Dependent Variable: LOGSALE				
Independent Variable	*Coefficient*	*Std. Deviation*	*T -Statistic*	*Significance Level*
C (Constant Term)	***- 6,887***	***1,580***	***-4,358***	***0,000***
LOGSALE (-1)	***+ 0,836***	***0,040***	***2,093***	***0,000***
BOT	- 0,006	0,007	-0,820	0,414
INT	+ 0,175	0,122	1,440	0,152
ΔLOGGDP	***- 0,473***	***0,212***	***-2,233***	***0,027***
EXC	+ 0,012	0,980	0,012	0,990
REZERV	+ 0,606	0,536	1,129	0,261
LOGBOP	- 0,030	0,026	-1,139	0,257
ΔCPI	***- 0,001***	***0,001***	***-1,965***	***0,052***
TD	+ 0,024	0,045	0,533	0,595
FD	- 0,023	0,019	-1,184	0,238
ΔISE	***- 3,977***	***2,385***	***-1,668***	***0,098***
E	***+ 0,042***	***0,021***	***1,998***	***0,048***
F	+ 0,034	0,031	1,090	0,278
P	+ 0,003	0,048	0,069	0,945
R-squared	0,93	**F-statistic**		125,73
Durbin-Watson stat	2,31	**Probability (F-statistic)**		0,00

Note: The symbol "Δ" indicates that differenced values were used for the respective variable. The variables written in bold indicate statistical significance.

Analyzing Table 4 that displays the estimation results for model (1), which was built to determine the factors explaining the purchasing decisions of foreign investors, it is seen that the determining variables are LOGPURCH(-1), INT, LOGGDP, CPI, ISE, BOT, ER, FR, TD and FD. Ranking the determinants of purchasing decisions given by foreign portfolio investors with respect to the magnitudes of their coefficients, they are listed as ISE (+5,998), LOGPURCH(-1) (+0,895), LOGGDP (+0,553), FD (+0,025), BOT (+0,015), CPI (+0,002), ER (-0,04), FR (-0,051), TD (-0,062) and INT (-0,272) in decreasing order. The influences of each of these variables on the buying transactions of foreign portfolio investors are separately analyzed and the related reasoning behind each factor is briefly discussed.

The variable of LOGPURCH is positively influenced by its one-period lagged lenght denoted as LOGPURCH(-1) at 1% significance level. Hence, it

can be stated that foreign portfolio investors are linearly affected by their purchasing decisions given during the previous period.

LOGPURCH variable is positively correlated to BOT variable at 5% significance level. That is, an increase in BOT escalates the buying decisions given by foreign portfolio investors. Increasing levels of BOT, which emphasize a more positive or less negative difference of exports minus the imports is an indication of a developing real sector and an associated acceleration in production, capacity utilization rates, profitability levels and market capitalizations of firms. In this regard, an increase in BOT is a signal for a rise in stock prices. As a conclusion, this expectation positively influences the stock purchases of foreign portfolio investors.

LOGPURCH variable is negatively influenced by INT variable at a significance level of 1%, which implies that a fall in interest rates lowers interest income, hence making the portfolio investments more attractive for foreign investors. For this reason, an interest rate hike reduces purchases by foreign portfolio investors, whereas declining rates have a positive influence on buying decisions.

LOGPURCH variable is positively correlated to LOGGDP variable, which represents the growth rate of the economy, at a significance level of 1%. Hence a rise in GDP is one the foremost indicators that the country's economy is growing, which naturally has a positive contribution on the buying decisions of foreign portfolio investors.

LOGPURCH variable is positively correlated to CPI variable, which represents the inflation rate, at a significance level of 1%. Although there is not a certainty in the literature regarding this relationship, some studies recorded that rising inflation levels positively influence stock prices [See Choudry (2001), Sangbae & In (2004); Ozer, Kaya & Ozer (2011)]. An increase in inflation will lead to drop in the net worth of individuals, which encourages them to boost their savings to attain their net worth levels prior to the onset of inflation. In the next stage, the accumulation of savings lead to renewed economic growth via decreasing the interest rates and increasing investments. In general, rising levels of forced savings in inflationary periods will stimulate economic growth (Kaya, Yilmaz; 2006; 65), which presumably translates to higher stock prices and thereby increased amount of purchases by foreign portfolio investors.

LOGPURCH variable is negatively correlated to TD variable at 10% significance level. Openness to trade denotes the elimination of government controls on the trade of goods and services, in addition to the presence of an

approach that aims to maintain international free trade. The foreign exchange obtained by exports which emerge in parallel to the adoption of openness to trade might ease the restrictions of foreign exchange in the country, in parallel to helping to escalate the imports of basic materials that cannot be domestically produced as well as productive intermediary goods such as capital goods (Yaprakli, 2007). Taking the fact that Turkish exports are dependent on imports and the sheer size of trade deficit into consideration, in case of Turkey, openness to trade rather leads to a greater emphasis on imports compared to exports, hence culminating in larger trade deficits. It is seen that this situation negatively influences the purchases of foreign portfolio investors.

LOGPURCH variable is positively correlated to FD variable at 10% significance level. Financial openness implies the free mobilization of transnational capital movements. It embraces the basic assumption that the distribution of savings and interest rates will equalize among different countries in the long run. The ensuing competitive environment will allow domestic firms to lower their cost of capital (Yaprakli, 2007). For this reason, financial openness increases the capital demand of domestic firms in addition the purchases by foreign portfolio investors.

LOGPURCH variable is positively influenced by ISE variable at a significance level of 1%. In light of the least squares estimations, ISE100 index, which is the main indicator for the performance of ISE, is the most critical factor regarding the purchasing decisions of foreign portfolio investors. A 1% change in ISE100 index translates to a 5.998% increase in the total volume of buying. Hence, foreign portfolio investors are affected positively from ISE 100 index.

LOGPURCH variable is negatively influenced at 5% significance level by E and F variables which stand for the economic and financial country risks, respectively. Foreign portfolio investors are influenced by the economic and financial risk ratins of the country while processing their buying decisions. A lower risk rating implies a low level of country-specific risk. In this context, foreign portfolio investors have a preference towards less risky countries. Thus, purchases by foreign portfolio investors rise as the economic and financial risks decline.

Analyzing Table 5 which gives the estimation results for model (2) that was built to determine the factors influencing the sales decision by foreign investors, it is inferred that the major determining variables are LOGSALE(-1), LOGGDP, CPI, ISE and ER. Ranking the determinants of sales decisions given by foreign portfolio investors with respect to the magnitudes of their coefficients, they are

listed as ISE (-3,977), LOGSALE (+0,836), LOGGDP (-0,473), ER (+0,042) and CPI (-0,001) in descending order. Brief information about the influences of each of the statistical significant variables on the dependent variable of LOGSALE is given.

LOGSALE(-1) variable, which is created by taking a lag-1 series of the sales volume of foreign portfolio investors is positively correlated with the dependant variable at 1% significant level. In other words, the sales decisions from prior periods are influential on the selling behavior of foreign portfolio investors in the following periods.

LOGGDP variable is correlated negatively with the dependent variable at a significance level of 5%. This finding shows that foreign portfolio investors tend to give selling decisions as the economic growth of the country being invested in slows down.

CPI variable is correlated negatively with the LOGSALE variable at a significance level of 10%. The negative correlation will cause a drop in inflation to result in a decline in stock prices and returns, which in turn will contribute towards a tendency of selling decisions.

The significance level of correlation of ISE100 variable with the dependent variable was found to be 10% and negative as well. A fall in ISE100 index induces the foreign portfolio investors to give selling decision. In the literature, it is asserted that foreign investors engaged in negative feedback trade in Turkey during periods of crisis. However, the fact that a rise in ISE100 index results in foreign portfolio purchases, whereas a drop in the index culminates in stock selling displays that the foreign portfolio investors generally perform positive feedback trade.

The E variable, which represents the economic risk of the country, positively affects the selling decisions of foreign portfolio investors at a significance level of 5%. Hence, foreign portfolio investors give selling decisions in order to refrain from risks when the economic risk level of a country increases.

Conclusion

The purpose of this study is to ascertain the determinants of the behavior of foreign portfolio investors. The data used in this study are obtained from the official websites of ISE, Central Bank of Turkey and International Country Risk Guide (ICRG). The study encompasses the period of 1998:01-2010:12.

For the purpose of determining which factors are taken into consideration by foreign portfolio investors in Turkey regarding their buying and selling decision in ISE, the total volume of their buy and sell orders in ISE were separately regressed against the factors indicated in the existing literature, the macroeconomic variables chosen in light of the current structure of Turkish economy, and the financial, economic and political risk ratings assigned by ICRG, which is a risk rating agency for sovereign countries. By virtue of the regression analysis, the variables that influence the buying and selling decisions of foreign portfolio investors as well as the direction of each of these influences were determined.

As a result of the analyses performed, it is seen that the determining variables for the purchasing decisions of foreign investors are LOGPURCH(-1), INT, LOGGDP, CPI, ISE, BOT, ER, FR, TD and FD. Ranking the determinants of purchasing decisions given by foreign portfolio investors with respect to the magnitudes of regression their coefficients, they are listed as ISE (+5,998), LOGPURCH(-1) (+0,895), LOGGDP (+0,553), FD (+0,025), BOT (+0,015), CPI (+0,002), ER (-0,04), FR (-0,051), TD (-0,062) and INT (-0,272) in descending order.

The determining variables of selling decisions by foreign investors were found to be LOGSALE(-1), LOGGDP, CPI, ISE and ER. Ranking the determinants of sales decisions given by foreign portfolio investors with respect to the magnitudes of their regression coefficients, they are listed as ISE (-3,977), LOGSALE(-1) (+0,836), LOGGDP (-0,473), ER (+0,042) and CPI (-0,001) in descending order of importance.

For the purpose of attracting foreign portfolio investments into Turkey and the similar developing countries that cannot accumulate the required level of savings and thus are in need of external savings, i.e. foreign capital, it is necessary to maintain a healthy level of inflation rate provided that it does not exceed a certain threshold, rein in trade deficit without increasing the general level of interest rates, and stimulate economic growth. In addition to these, the suitable environment must be created and precautions must be taken in order to keep the economic and financial risk of the country at a low level.

Results of the analyses showed that the determinants of foreign portfolio investments into Turkey are Trade Deficit, USD Interest Rate, Gross Domestic Product, Inflation Rate, Openness to Trade, Financial Openness, ISE 100 Index, and Economic Risk and Financial Risk Ratings. Development of policies in consideration of these aspects by the policy makers can be helpful in attracting

the required foreign capital into the national economy at greater amounts. As a conclusion, decisive implementation of the associated structural reforms within the framework of these policies is highly crucial concerning the preparation of economic, financial and political plans.

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Appendix 1: Table of Correlations for the Independent Variables

	ISE	E	F	P	BOT	LOGGDP	INT	EXC	LOGBOP	LOGFX	CPI	FD	TD
ISE	1.00												
E	0.04	1.00											
F	-0.02	0.57	1.00										
P	-0.07	-0.11	-0.09	1.00									
BOT	0.12	-0.03	0.20	-0.04	1.00								
LOGGDP	0.16	0.00	0.00	0.14	0.01	1.00							
INT	-0.09	-0.29	-0.24	0.12	-0.07	0.09	1.00						
EXC	0.04	0.08	0.30	0.06	0.14	0.07	-0.07	1.00					
LOGBOP	0.06	-0.21	-0.18	0.14	0.10	-0.05	0.09	-0.11	1.00				
LOGFX	-0.20	0.05	0.02	-0.02	-0.11	0.06	-0.02	0.06	0.01	1.00			
CPI	-0.06	0.19	0.26	-0.03	0.13	-0.03	-0.08	0.22	-0.17	-0.02	1.00		
FD	0.05	-0.30	-0.32	0.08	-0.28	-0.02	0.02	-0.25	0.15	-0.24	-0.21	1.00	
TD	0.08	0.44	0.41	-0.07	0.59	0.01	-0.12	0.19	-0.01	0.04	0.31	-0.47	1.00

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EFFECTS OF HORIZONTAL M&As TRADING VOLUME OF STOCK EXCHANGES

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Abstract
The ever increasing competition in the capital markets and globalization necessitated that structural changes taking place in stock exchanges, particularly M&As among them being watched closely by securities markets throughout the world. In this study effects of macroeconomic variables on trading volumes of 20 equity exchanges are examined by taking into account M&As that took place in the last 15 years. The exchanges include both the developed (eg. USA, UK, Japan) and developing (eg. Mexico, Korea, Poland) countries. The monthly data for period 1995-2010 is analysed using regression, taking the proper precautions for autocorrelation and heteroscedasticity problems, frequently encountered in time series data sets. The effects of macroeconomic variables on trading volume is observed though with a changing degree and results show that some of the M&As had positive effects on trading volume, whereas some did not.

Keywords: Stock exchanges trading volume, M&As
JEL Classification: C58, E44

1. Introduction

Local or regional competition is being replaced by global competition in many sectors due to the effects of globalization and technological advances. For long years exchanges have been operating within the country boundaries, enjoying a relatively protected, monopoly like structures, but today securities markets have been affected from international competition like any other part of the economy.

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The technological advances removed barriers to capital movements and together with financial liberalization greatly facilitated cross-border capital flows. This in turn with technological advances that eliminated the physical limitations on trading volumes started a new era in the capital markets (Ramos, 2003).

The size of equity markets in developing countries (mainly in terms of new shares issued) increased rapidly in the last decade, remarkably. Rapid growth and high returns in these markets closely watched by the portfolio investors, and the share of developing countries in the global stock market has been since then increasing. In 2010, more than one fifth of the total market value of companies traded on the stock markets, are of the companies from the emerging stock markets. Strong growth and financial developments in the economies of developing countries have been the most significant factors that support and accelerate the development of stock markets (Bailey, 2010).

Today, the primary goal of stock markets, themselves being listed companies, is to make profit. Despite many structural changes the capital markets went through, transaction commissions are still the primary revenue item of equity markets (WFE, 2012b). Transaction volume is significant on the macro level as an indicator of market depth and liquidity, at the same time it is also gaining importance on the micro level, because transaction volumes are directly related to the trading commissions which in turn are one of the primary revenue items.

In this article the effects of macroeconomic variables and merger and acquisitions on trading volume are investigated in the light of today's competitive capital markets environment. The paper is organized as follows: in Section 2 the basics of M&As among stock exchanges and related academic studies are presented from the perspective of competition in capital markets. The data set and method applied are described in the third section, followed by the findings of the study. The fifth and final section is the conclusion.

2 Literature Review

2.1 M&As Among Stock Exchanges

Efficient financial markets in general, is said to offer four main types of services; facilitating the movement and distribution of savings, enabling risk diversification and helping to keep track of the funding received from external sources (Muller, 2004). In recent years, the capital markets around the world have been undergoing a rapid and significant change due to the effects of the new regulations and globalization combined with technological developments[1].

According to Ramos (2003) the three factors driving this change are; liberalization of economies, changes in the market structure and progress in communication systems.

A report was prepared in 1988 by a group of experts directed by Paolo Cecchini, also known as Cecchini Report[2]. The report examined the benefits and costs of building a single market in Europe. According to the report the union would benefit from a full economic integration of the European Union (EU), up to a total of 4.5% of GDP[3]. For the 25 years that have passed since the report has been published, the benefits and costs of a single market in the capital markets has also been investigated by many academics. Malkamäki, (2000) investigated whether economies of scale exists in stock exchanges and if so examined the size and scope of the economies of scale for 38 stock exchanges in 32 countries on 4 continents. The study used panel data for the period 1989-1998, and both linear and non-linear cost functions are applied. The same year in another study Hasan and Malkamäki (2000) investigated whether expansion would create cost advantages for stock exchanges. They showed that the North American and European markets are more likely to benefit from the economies of scale created by expansion compared to the Asia-Pacific stock markets. On the other hand, it is noted that mergers among stock exchanges, exhibiting small and medium-sized scale of economies, might not create cost advantages.

McAndrews and Stefanadis (2002), investigated and compared the stock market M&As that took place in Europe and America, considering the reasons that triggered the mergers, strategies followed, the potential increase in efficiency and restrictions on mergers. Building compatible and shared trading platforms, increasing market liquidity while reducing fragmentation are among the benefits whereas product differentiation, legal and regulatory differences, information costs, and homeland bias, and segmentation in clearing and payment systems are considered to be among the blocking elements. Mergers in Europe is foreseen to be completed more quickly. Another study aiming to answer the question of how much progress actually has been achieved in integrating financial markets in Europe in terms of money markets, bank loans, other financial intermediaries (insurance and funds), capital markets, stocks,

1 Among the studies in this subject are (Smith, 1991) (Malkamäki and Topi, 1999b) , (Hasan and Malkamäki, 2000), (Hasan and Schmiedel 2004)

2 Report can be accessed at http://aei.pitt.edu/3813/1/3813.pdf

3 The report can be accessed at http://aei.pitt.edu/3813/1/3813.pdf

government bonds, corporate debt instruments, regarding institutional investors in financial and capital markets was carried out. The answer is highest level of integration of financial markets is achieved, but regarding retail financial markets they are still largely fragmented (Muller, 2004).

M&As among securities markets of Europe and America have been investigated by many whereas M&As in other parts of the world have attracted much less attention. One of the few studies that address M&As in other parts of world, examined the financial markets and the exchanges of the countries that make up Southern African Development Community (SADC[4]). It is seen that limited number of companies are listed on the majority of exchanges in the community, and those listed companies have low assets and liquidity. The study concludes that resulting benefits and costs of M&As are determined by the market macrostructure, size, scope, institutional and regulatory frameworks. In this respect unless exchanges provide an appropriate scale, liquidity, strong social and technological infrastructure, it will not be possible to achieve the expected strategic objectives of mergers (Okeahalam, 2005).

In another study the relationship between stock prices and macroeconomic variables among BRIC[5] countries is examined in terms of stock prices, exchange rates and oil prices using time series of monthly data for the period 1999-2006. Box-Jenkins ARIMA model was used to examine the relationship between stock prices, exchange rates, and oil prices. The study concluded that not being able to show a significant relationship between the current and past market returns and macroeconomic variables suggests that the BRIC markets exhibit weak form of market efficiency (Gay, 2008).

Among the studies investigating the effects of a single currency on exchange integration, in one of them whether the use of euro accelerated the compliance among stock exchanges in 15 member countries and the relationship between country markets are examined. Panel data unit root tests and panel data convergence are used and in case of old markets the compliance rate is seen to be higher than the others, and that the interdependence of the exchanges in European monetary union is found to be increasing since 2002 (Maraoub, 2008).

The change caused by mergers may sometimes hurt the competition by reducing the level of competition, which in turn decrease innovation level and slow down the development of services provided by stock exchanges. Kokkoris

4 Southern Africa Development Community, established in 1980.

5 Brazil, Russia, India and China

and Olivares-Caminal (2008) pointed out that robust and efficient competition plays a key role in development and integration of the global markets, additionally efficient regulation attracts the attention of investors due to the confidence it creates hence leads to growth of exchanges and interaction among exchanges.

The effects of global competition concept in capital markets require an understanding of the concept of the structure of capital markets, especially of stock markets. At the same time it is essential that the assessment of recent developments is made taking into account a forward-looking vision of both opportunities and threats. In recent years, the impact area of the structural changes in stock markets together with mergers and acquisitions, are not limited to the exchanges in this domain, but rather directly or indirectly expanded to all the world's capital markets. Exchanges were a priori non-profit membership organizations, then first they were transformed to for profit structures, then they became companies owned by investors, and then again in some countries the local exchanges and related institutions were gathered under one umbrella , in some other countries stock exchanges merged with other countries exchanges. The process of going public during the demutualization stage or right after it, made those exchanges advantageous by speeding up the decision-making processes during M&As , and also enabling the transfer of shares during M&As rather than cash.

Today, many countries exchanges have been demutualized. As of November 2012 76% of the World Federation of Exchanges (WFE) 's members have completed the demutualization phase, 44% went to public. The legal status of all the member exchanges can be seen in Table 1. ISE is shown under the "other" group in Table 1. For detailed description and the definition of groupings please refer to (WFE, 2012b).

Table 2.1. WFE member exchanges' legal status

Legal status	Number	%
Listed	23	44%
Demutualized	8	16%
Private	8	16%
Association	4	8%
Other	9	17%

Source : WFE, Cost and Revenue Survey, November 2012

One of the first requirements for M&As among international exchanges is demutualization of the exchanges. The delay of this process in a small number of exchanges including İMKB on one hand provides them an opportunity to monitor strategies and assess the outcomes of what other stock exchanges have done but on the other involves certain risks. In a period when almost all the capital markets are being through a rapid transformation all over the world, some of the opportunities that arise at this stage is critical. It would be beneficial to bear in mind that if missed such opportunities may not be compensated. It is not possible to consider achieving a capital market of $1 trillion without completing structural changes in the capital markets, increasing the number of publicly held companies and increasing the rate of going public levels of companies. The news about the merger of Istanbul Stock Exchange (İMKB), Turkish Derivatives Exchange (TURKDEX) and Istanbul Gold Exchange (IAB) in one has been closely watched by the market participants. Borsa Istanbul has been established with the new Securities Market Rule article 138 and the capital of the company, shares, principals for transfer of shares, privileges to be acknowledged in shares, liquidation, transfer, merger, dissolution, going public limitations, bodies, committees, including the rules on the organization of the accounts and the distribution of profits of the registration process of the main will be completed in the fist half of 2013. Defined by the law, İMKB's and the Istanbul Gold Exchange's all assets, debts and receivables, rights and obligations and all records will be transferred to Borsa Istanbul. In addition, 51% of the shares of Borsa Istanbul will be kept to itself, while 49% will be transferred to the Treasury as stated in the law.

In the last 20 years, the M&As among exchanges worldwide has shown no sign of a slowdown. The total size of M&As that took place during the decade between January 2000 and December 2010 was close to $ 1 billion. In February 2012, it was announced that Deutsche Börse was about to acquire NYSE Euronext forming the largest stock exchange in the world, but the European Commission vetoed the $ 9.6 billion deal, putting forward that it would harm the competition. The announcement of Intercontinental Exchange to buy NYSE Euronext for 8.2 billion dollars was made on 20 December 2012. Recently even though M&As are decreased in number, regarding the size in monetary terms of the recent single purchase it is seen that the latest one was more than 8 times of all M&As happened in the previous decade.

The development and continuity of exchanges depend on their ability to survive and succeed in an increasing competitive environment. In this era of

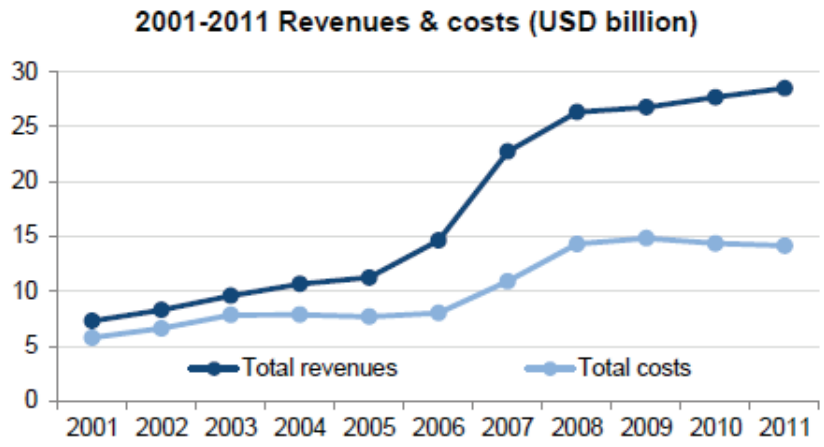
increased competitive pressure, the number of stock exchanges are being decreased by sometimes vertical more often horizontal mergers and meanwhile trading volumes, market shares and changes in profitability are being closely watched by market participants. Trading volume was an indicator taken into account only at the macro level during the period when there was no competition among exchanges. High trading volume, apart from being an indicator for liquidity and market depth was a “good to have” property. High trading volume became one of the important factors in attracting new companies to the exchange when companies had the freedom of choosing the exchange to be listed on. On the other hand, technological advances enabled investors to trade in other countries’ exchanges as well, and investors preferred to trade in highly liquid stock exchanges. During this period, the situation which can be summarized as 'liquidity attracts liquidity", similar to the saying 'money attracts money' attracted the attention of academics, and the factors effecting how stock markets attracted companies and investors became a subject of extensive number of studies.

The concept of network economy is used to explain the relation between liquidity, trading volume and competition in capital markets particularly among stock exchanges. Increased trading volume narrows the spread; smaller spreads decrease the transaction costs and help increase the trading volume. Lower transaction costs and higher trading volumes in turn increase profitability. On the contrary the profitability of an exchange is reduced with decreased trading volume. This circular impact of trading volume on profitability also explains why trading volume is a vital indicator for exchanges today.

A summary of stock exchanges’ profitability, revenue and costs in in the last two years will be given before proceeding to the effects of M&As among stock exchanges. According to WFE, Cost and Income Survey 2011, trading commissions and services constitute 84% of total revenues of the exchanges (WFE, 2012b). The revenue and costs of all member exchanges (including equities and derivatives) in the last year show that the revenues increased whereas the costs decreased, especially after 2008 as can be seen in Figure 2.1. Total transaction volume of WFE members has been decreasing since 2011; in the second half of 2011, a 4% decline has been seen in trading volume of all equity stock exchanges. In the first 6 months of 2012, the decrease was 14%. Among the regions, the sharpest decline was seen in America with 20%. According to 2012 figures , the decline in trading volume was 22.5% (WFE, 2013). Transaction volumes are watched anxiously, because of the direct link

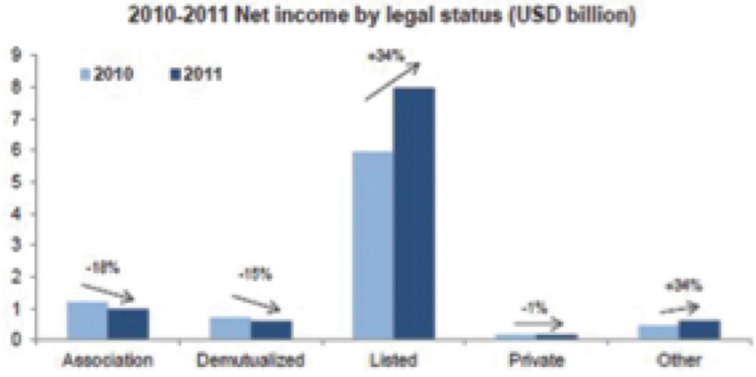
between transaction volume and revenue, making it the most important profitability indicator.

Graphic 2.1 The member exchanges of WFE revenue and costs in the last decade



Source : (WFE, 2012b)

Graphic 2.2 **Net Revenue Change in period 2010-2011 by Legal Status**

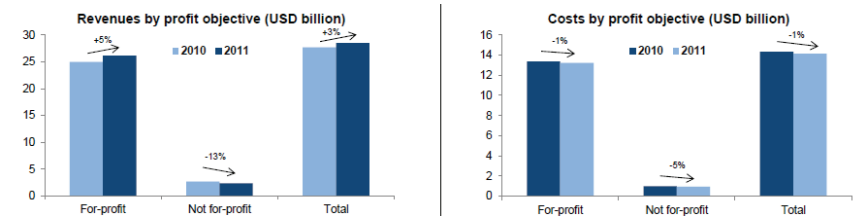


Source: (WFE, 2012b)

In 2011, increase in revenues of public exchanges has been 5% whereas net income increase was 34% (Figure 2.2 and Figure 2.3). In the same period,

revenues of demutualized but not went to public exchanges have been 15% (Figure 2.2 and Figure 2.3). It is possible to say that public stock exchanges are significantly ahead of other exchanges in terms of revenue and profitability.

Graphic 2.3 and Graphic 2.4 Revenue and cost change in for-profit and non-profit exchanges respectively



Source : (WFE, 2012b)

3. Data and Methodology

In this study, the effects of microeconomic variables on the trading volume of stock exchanges are examined by taking into account the horizontal mergers in which both sides are equity exchanges[6]. In capital markets horizontal mergers aim to take advantage of economies of scale by expanding the scope of similar work units (stock markets merging with other stock markets). Vertical integration, on the other hand is about the integration of the stock exchanges with different sections in order to create value; listing, trading, clearing and settlement services combined under one roof (Hart and Moore, 1996).

The sample includes exchanges taking part in M&A as well as those that do not. Seven[7] of the 20 stock markets examined in this context didn't take part in a horizontal M&A during the period of 1995-2011 as described above. Sample includes exchanges from both developed and developing countries. Geographically, exchanges in the sample are from Europe, north and south America, Far East and Asia regions.

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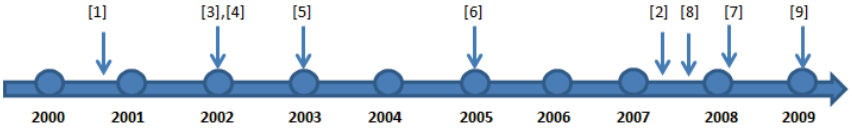
6 In some countries, M&As took place among equity and future or derivative exchanges. For example, Vienna stock exchange, merged with futures exchange creating the Wiener Börse AG in December 1997. Stock market data of Wiener Börse has been published under this new name since January 2003. M&As with only one party being equity exchange is not included as a M&A in the scope of this study. M&A with both parties being equity exchanges are considered.

7 Austria, Germany, Luxembourg, Japan, Korea, Mexico, Poland stock exchanges

The timeline of 9 mergers[8] examined in this study is shown in Figure 1. As can be seen from the table M&As among national or international exchanges in Europe are completed in the early 2000s paving the way for the intercontinental M&As in the late 2000s. At the beginning of the period the number of stock exchanges examined was 13, as a result of these M&As, the number gradually decreased to 5

Graphic 2.1- Historical Timeline of Stock Exchanges' m&As



Source: (Yobaş, 2012)

Brussels (Belgium), Paris (France) and Amsterdam (Netherlands) stock exchanges took part in two historic M&As between 1995 and 2001. First, in September 2000 M&A of the three stock exchanges [1] formed the first stock exchange of the European Union; Euronext NV. Lisbon Stock Exchange joined the union in February 2002. The second M&A[2] during this period was between Euronext and the NYSE Euronext Group in April 2007. As a result of this M&A, NYSE-Euronext the first global, transatlantic stock exchange was established.

Among stock exchanges examined, the two countries in which M&As took place among the local exchanges within the country boarders were Canada and Spain. Restructuring of Canadian capital markets Montreal Stock Exchange became a derivatives exchange in 1999, Vancouver and Atlanta exchanges merged forming the Canadian Venture Exchange (CDNX). In 2001, Toronto Stock Exchange acquired CDNX and in 2002 the name was changed to TSX Venture[3]. In the same year in Spain, Madrid, Valencia, Barcelona and Bilbao stock exchanges merged and established BME[4]. Following the merger of these four stock exchanges data continued to be published separately for each stock exchange.

Helsinki (Finland), acquired Stockholm stock exchange in 1998, but the data of both has continued to be published separately. Helsinki stock exchange

8 Refer to (Yobaş, 2012) for detailed information on these M&As.

merged with OM in 2003, forming Helsinki OMX [5]. In January 2005, OMX
first acquired Copenhagen (Denmark) stock exchange [6], and then acquired Iceland stock exchange in September 2006. Other acquisitions of stock exchanges in the Nordic and Baltic countries, Copenhagen, Stockholm, Tallinn, Riga, and Vilnius stock exchanges formed the OMX Exchange Group. In February 2008 Nasdaq acquired OMX forming NASDAQ OMX Group [7]. In October 2007, NASDAQ Exchange acquired Boston followed by the acquisition of Philadelphia stock exchange[8] in November the same year. Frankfurt Stock Exchange has been published under the name of Deutsche Börse since 1998, but this change is not caused by a M&A investigated in the scope of this study.

Borsa Italiana (Italy) was acquired by London SE (England) in October 2003, but its data has been published under its name until 2009. Only since January 2009 the data has been published under the heading of LSE Group[9].

In this study the relationship between trading volume and macroeconomic variables are investigatd using monthly data for the period between 1995 and 2011. Macroeconomic variables used as explanatory variables are national income, money supply, long-term (10 years) government bond yield, unemployment rate changes and inflation. National accounts data was not available monthly therefore monthly production data showing high correlation with national income and available on a monthly basis is used instead. In terms of money supply both M1 and M3 are experimented with and the one with a higher explanatory power is preferred. The main index of the stock exchange is also used in the equation as an explanatory variable, stock exchange M&As took place in the analysis as dummy variables. Dummy variables are assigned a value of zero during the pre-merger and value one in the period post-merger. The number of M&As the stock market participated (i) defined the number of the dummy variables (D_i) used.

The trading volume and market data of the stock exchanges are taken from World Federation of Exchanges (WFE) site, the macroeconomic variables are taken from the International Monetary Fund (International Finance Corporation - IFS), the OECD and the World Bank databases.

Equation estimated for each exchange examined in general is as follows;

$$\ln V_{it} = \beta_{0i} + \beta_{1i} \ln G_{it} + \beta_{2i} I_{it} + \beta_{3i} \ln E_{it} + \beta_{4i} Enf_{it} + \beta_{5i} \ln M_{it} + \beta_{6i} Y_{it} + \beta_{7i} D_{it} \ln G_{it} + \varepsilon_{it}$$

i = 1, 2, 3 ... 20 ve t = 1, 2 ... 200.

V: Trading volume (USD), G: National income, I: unemployment rate change, E : market index, Enf : inflation rate, M : Money supply, Y : 10 years government bond yield, D : M&A dummy

The exchanges not participated to a M&A doesn't include a dummy variable in their equations. For those that participated in M&As equations include in addition to the dummies the product of the dummies and macro variables. Initially the product of the dummy M&A variables and macro-economic variables are all included in the equation, then according to the t and / or F test results those that are not statistically significant are removed from the equation.

The equations are estimated separately even though the data is available in form of panel reason being the presence of the exchange-specific time based dummy variables. For all variables used in estimating equations ADF and KPSS unit root tests are performed and they are all found to be integrated at first degree, technically I (1). Since long-term relationships between the variables and the possible changes in these relations are being investigated all variables are used in the logarithmic level. In order to test whether the estimated equation is showing a long-term relationship, following Engle-Granger approach, whether the error terms were stationary was examined. Depending on the ADF and KPSS unit root tests performed on the error terms of the estimated equations, the error terms are concluded to be stationary, technically I(0).

4. Empirical Results

The results are presented in several tables since a single table would be too complicated and be neither clear nor easily understandable. In doing so, exchanges examined are grouped under specific headings. All coefficients are significant at the 95%[9]. The first group consists of seven stock exchanges that did not take part in a horizontal M&A in the period under review. This group is considered as the control group and included in the study in order to show the relationship of macro variables that affect and influence the direction of the transaction volume without the effects of a M&A. The results of stock exchanges forming this control group are presented in Table 4.1

9 Those significant at 90% are explicitly indicated.

Table 4.1. Findings for stock exchanges that were not part of any M&A

Exchange (Country)	Production$_1$ (1)vpvobarsa (2)indprod	Unemp.	Money supply$_2$	Interest rate	Inflation	Market index	Trading Volume (prev. period)	AR(1)$_3$	Constant	Adj. R^2
Wiener Borsa (Austria)	-1.25E-05 [-3.28]	-	0.85 [3.24]	-	-	0.54 [5.19]	0.77 [17.28]	-0.26 [-3.06]	-2.59 [-4.57]	0.9462
Deutsche Börse (Germany)	0.01 (2) [5.84]	0.03 [2.80]	0.50 [4.02]	-	-	0.14 [4.97]	0.53 [7.01]	-	0.90 [1.05]#	0.7954
Tokyo SE (Japan)	-	-	0.94 [5.73]	0.08 [1.33]#	-	0.51 [4.03]	0.56 [7.92]	0.27 [3.68]	-2.56 [-3.20]	0.9482
Korea Exc. (Korea)	-3.16E-06 [-1.58]#	-	1.90 [2.11]	-	-0.06 [-1.88]*	1.70 [7.82]	-0.09 [-0.73]#	-5.09 , 0.29 [-1.87] , [3.84]	0.51 [3.44]	0.9408
Luxembourg SE (Luxembourg)	-9.34E-05 [-2.87]	-0.10 [-2.93]	0.65 [2.82]	-	-	0.14 [2.72]	0.69 [11.13]	-0.25 [-4.61]	0.01 []#	0.6321
Mexican Exc. (Mexica)	2.7E-06 [2.35]	0.06 [2.32]	-0.35 [-1.98]	-	-	-	0.70 [8.19]	-0.25 [-1.69]	0.81 [3.12]	0.7104
Warsaw SE (Poland)	-1.82E-05 [-3.84]	-0.04 [-2.30]	3.93 [4.67]	-0.06 [-1.71]*	0.07 [2.22]	1.60 [15.34]	-	-	-17.44 [-6.24]	0.9351

1 Production : Coefficients are given in Deutsche Börse for indprod in others for vpvobarsa.
2 Money Supply : Coefficients are given in Deutsche Börse and Tokyo SE for M1 others for M3.
3 AR() : Coefficients are given in Tokyo SE for AR(3), Korea for AR(1) and AR(3) others for AR(1).
* significant at 10%
# Not significant even at 10%

Wiener Börse Money supply and index affected trading volume positively, whereas the production (vbvobarsa) affected negatively.

Deutsche Börse unemployment rate, production (indprod), money supply (M1) and index all had positive effects on the trading volume.

Tokyo SE Money supply (M1) and index both effected positively. No other macroeconomic variables were seen to have a significant effect.

Korea Money supply (M3) and index affected positively, whereas inflation had a decreasing effect on trading volume.

Luxemburg SE production (vpbobarsa), money supply (M3), index and unemployment rate all had significant effects; production and unemployment rate had a negative effect, others had positive effects on trading volume.

Mexican Exchange The effects of production (vpbobarsa) and unemployment rate were positive, money supply (M3) was negative.

Warsaw SE Money supply (M3), inflation and index all affected positively, unemployment rate and the 10 years government bond yield affected negatively.

The second group was consisted of European stock exchanges;Brussels, Paris, Amsterdam, Helsinki, Borsa Italiana and LSE and the results are presented in Table 4.2.

Brussels it is seen that both of the M&As (dated 2001 and 2007) had significant effects on trading volume. Among the macroeconomic variables production (indprod) and index have positive, money supply (M3) had negative impact. After both mergers the index affected trading volume in a negative way. Production (indprod) had a positive effect after the NYSE-Euronext merger.

Paris Similar to Brussels stock exchange, Paris stock exchange was also affected from both of the M&As (in 2000 and 2007) positively. The macroeconomic variables also exhibit similar effects, production (indprod) and index had positive influence. After the first merger, index and unemployment rate affected trading volüme negatively.

Table 4.2. The findings of European stock exchanges

Exchange / Explanatory Var.	Brussels	Paris	Amsterdam	Copenhagen	Helsinki	Borsa Italiana	LSE
First M&A - D1	7.57 [4.75]	4.33 [3.29]	31.29 [10.16]	1.46 [6.89]	-10.53 [-5.00]	-0.10 [-1.38]	--
Second M&A -D2	6.76 [3.81]	0.11* [1.91]	28.37 [4.81]	-0.02 [-0.39]	23.88 [3.97]	18.58 [4.54]	1.43 [2.42]
Production$_1$	0.01 [3.42]	0.01 [3.04]	2.41e-05 [38.94]	2.90e-05 [6.48]	--	0.01 [8.81]	0.01 [6.13]
Money Supply$_2$	-1.79 [0.24]	--	--	--	1.12 [4.42]	1.39 [8.01]	0.23 [2.66]
Unemp.	--	--	0.10 [6.21]	--	--	--	--
Gov. Bond Yield (10 years)	--	--	--	--	--	-0.05 [-2.71]	--
Market index	1.66 [9.78]	1.47 [20.34]	--	0.30 [5.53]	0.48 [5.66]	1.14 [9.33]	0.25 [2.83]
Mrk ind*D1	-0.35 [-1.99]	-0.37 [-2.53]	--	--	--	--	--
Mrk ind*D2	-0.78 [-3.64]	--	--	--	--	--	--
Production*D2	0.01 [1.97]	--	--	--	--	--	-0.01 [-2.14]
Unemp*D1	--	-0.15 [-5.39]	--	--	0.06* [1.92]	--	--
Unemp*D2	--	--	0.31 [2.05]	--	--	--	--
Money sup*D1	--	--	-7.16 [-9.80]	--	2.24 [5.11]	--	--
Money sup*D2	--	--	-6.24 [-4.66]	--	-5.00 [-4.00]	-3.57 [-4.28]	--
Trading Volume (t-1)	--	--	--	0.30 [3.17]	--	--	0.75 [13.27]
AR(x)$_3$	0.35 [4.36]	--	0.45 [6.48]	--	0.40 [4.03]	0.35 [3.96]	--
Adj. R^2	0.9934	0.9027	0.9764	0.9826	0.9757	0.9615	0.8531

* significant at 10%
Coefficients are given in the cells with t-values in brackets.

$_1$ Indprod : The coefficients are for indprod in case of Brussels, Paris, Borsa Italiana and LSE, and for vpvobarsa in sace of Amsterdam and Kopenhag.

$_2$ Money supply : In Brüksel and LSE for M3, Helsinki and Borsa Italiana for M1.

$_3$ indicates the coefficient for AR(1).

Amsterdam Similar to Brussels and Paris stock exchanges, Amsterdam stock exchange was also affected from both of the M&As (respectively D1 and D2) positively. Production (vpbobarsa) and unemployment rate both had positive effects on trading volume. The interaction of M&As with the macroeconomic

variables reveal that the money supply (M1) affected negatively after both of the M&As whereas unemployment rate had a positive effect after the second M&A.

Copenhagen, among three M&As (respectively D1, D2,and D3) only the one took place in 2005 (D1) is found to to have significant effect on Copenhagen trading volume. While the establishment of OMX Group had an increasing effect, the acquisition by Nasdaq had no significant effect. Production (indprod) and index had a positive effect.

Helsinki was a part of two M&As dated January, 2005 and February, 2008 (D1 and D2 respectively). Although the first had a negative effect on trading volume, the second found to have positive effect. Money supply (M1) and index had positive effects. Following the first M&A both unemployment rate and money supply (M1) had positive effects. After the second M&A Money supply (M1) had a negative effect on trading volume.

Borsa Italiana The acquisition in October 2003 found to have no significant effect on trading volüme, but only after January 2009. Money supply (M1), index and production (indprod) all affected positively, but the 10 years government bond yield had a negative effect. Money supply (M1) had a negative effect after the acquisition by LSE.

LSE the M&A had affect on trading volume after January 2009..Money supply (M3), production (indprod) and market index had all positive effects but it is seen that production (indprod) changed its sign after the merger.

Table 4.3. Findings of American and Canadian Stock Exchanges

Exchange / Explanatory Var.	Nasdaq	NYSE	Toronto
M&As –D1	6.80 [3.82]	0.27 [5.56]	-3.23 [-3.30]
Production[1]	--	6.54e-07 [8.00]	0.01 [5.44]
Money supply[2]	--	-1.73 [-6.12]	--
Market index	0.60 [7.86]	--	1.02 [7.62]
Inflation	0.04 [3.51]	-0.02 [-2.10]	--
Gov. Bond Yield (10 years)	-0.06 [-4.41]	--	--
Interest*D1	0.21 [2.43]	--	--
Mkt ind*D1	-0.96 [-3.66]	--	-0.20* [-1.95]
Money sup* D1	--	--	1.16 [6.37]
Trading Volume (t-1)	0.57 [11.29]	0.37 [5.63]	0.24 [3.69]
AR(x)[3]	-0.25 , 0.29 [-2.62] , [3.49]	--	--
Adj. R^2	0.9434	0.9570	0.9706

* significant at 10%
Coefficients are given in the cells with t-values in brackets.

[1] Indprod : coefficients are given in Nasdaq and NYSE for vpvobarsa, in Toronto for indprod.

[2] Money supply : In NYSE given for M3 in others for M1.

[3] In Nasdaq indicates the coefficients for respectively AR(1), AR(3).

Among the stock exchanges on America the estimated regression results for Nasdaq, NYSE and Toronto are presented in Table 4.3.

Nasdaq The acquisition of OMX on 27 February 2008 (D2) is found to have a positive effect on trading volume. Inflation and index had positive, 10 year government bond yield had negative effect. Coefficients of both government bond yield and index have been changed signs after the M&A and have been positive and negative respectively.

NYSE the acquisition of Euronext had a positive effect on trading volume. Production (indprod) had positive, inflation and money supply (M3) had negative effects.

Toronto The reorganization of 1999 seemed to decrease the trading volume of Toronto stock exchange, which used to have the highest trading volume of all the Canadian exchanges. Prod (indprod) and market index both had positive effects. After the reorganization, money suppy (M3) had a positive effect, whereas the effect of market index changed to negative after the reorganization.

Finally, findings regarding the local exchanges of Spain are presented in Table 4.4.

Tablo 4.4. The results relating to the Spanish exchanges which went through local M&As

Exchange / Explanatory Var.	Barcelona	Bilbao	Madrid
M&A - D1	0.37 [2.20]	-2.59 [-2.60]	-4.39 [-3.35]
$Indprod_1$	0.01 [4.90]	0.01 [5.67]	0.01 [6.65]
Market index	0.72 [3.82]	0.63 [3.98]	0.95 [6.32]
Unemp.	--	--	-0.04 [-2.37]
Unemp*D1	0.03 [3.58]	0.04 [6.22]	0.08 [4.40]
mkt ind*D1	--	0.42 [3.07]	0.52 [3.05]
Trading Volume (t-1)	0.45 [4.35]	0.33 [4.45]	--
$AR(x)_2$	0.05 , 0.36 [0.52] , [3.24]	--	0.19 [2.32]
Adj. R^2	0.9422	0.9414	0.8917

* significant at 10%
Coefficients are given in the cells with t-values in brackets.

[1] Indprod : coefficients are for indprod.

[2] Coefficient of Barcelona are respectively for AR(1), AR(3).

Barcelona The merger dated 2002 affected the trading volume of Barcelona stock exchange positively. Unemployment rate, production (indprod) and market index had a positive effect on trading volume.

Bilbao, similar to Barcelona, Bilbao stock exchange is also affected positively from the merger of the national stock exchanges. Macroeconomic variables' effects were also similar, production (indprod) and market index had both positive effects. Following the merger the effect of unemployment rate was positive.

Contrary to Barcelona and Bilbao, Madrid had been affected negatively from the merger. Production (indprod) and market index both had positive effects, unemployment rate had a negative effect. After the merger effects of market index was positive, Unemployment rate also had positive effect, the merger changing its sign.

5. Conclusion

In this study, effects of macroeconomic variables on stock market trading volumes are examined, taking into account the effects of horizontal M&As among exchanges. In general trading volume is seen to have been affected by macroeconomic variables, thus the macroeconomic variables vary depending on the country being examined.

All stock exchanges except for Tokyo, Helsinki and NASDAQ industrial production was seen to be effective on trading volume. Unemployment was affective in Luxembourg, Mexico, Warsaw, Amsterdam and Madrid stock exchanges. Money supply, which was effective in 12 stock exchanges but not in Spanish exchanges, Paris, Amsterdam, Copenhagen, Nasdaq and the Toronto Stock Exchange. Ten-year government bond yields was affective on the trading volume only in four stock exchanges; Tokyo, Warsaw, Nasdaq and Borsa Italiana. Among 20 stock markets being examined market index was in all but Mexico and Amsterdam effective on the transaction volume. Inflation was seen to be affective only in Warsaw, Korea, Nasdaq and NYSE stock exchanges.

Market index, production and money supply were found to be effective together in seven of the stock exchanges. Macroeconomic variables were seen to be affective following the merger in 11 of the stock exchanges, and in only two stock exchanges, namely Copenhagen and NYSE there was no interaction between the macroeconomic variables and the dummy M&A variables. In some

stock exchanges, the macroeconomic variables which were effective on the volume in the pre-merger period, have seen to lose their affect after the merger. For example, some of the stock market indexes appeared to be effective only after mergers.

When examining the effects of M&As among stock exchanges considering the effects of macroeconomic variables enable a healthier evaluation in our opinion. In recent past the assessment of capital markets and the macroeconomic indicators separately, keeping capital markets apart from economic developments, ignoring the link between economy and the capital markets has prevented a healthy evaluation.

In an intense competitive environment of today's capital markets the formation of deep markets with high trading volumes and liquidity are vital for stock exchanges in order to survive and increase their profitability. All over the world stock exchanges are trying to increase profitability, reduce costs, increase productivity; to achieve this they are all trying to take advantage of economies of scale at the highest rate. From stock exchanges perspective fulfilling these market conditions means investing in high costs of information processing infrastructures. The high costs of such investments inevitably lead exchanges to M&As. Achieving high trading volumes and consequently high profits following such M&As depends not only on macroeconomic variables alone but also completing the process of going public by the stock exchanges themselves, the ratio of public offerings in the market, attractive liquidity and market depth for institutional investors and having latest technological infrastructure. Regarding the global competitive environment and current conditions it seems it is inevitable for İMKB to be a part of such a M&A soon. In the near future İMKB will possibly be able to evaluate potential options by using its regional advantage. One option is to be a bridge between east and west, and the second M&As within the current stock markets of the Europe, and the third attracting the attention of the investors in Gulf region by M&As in this region. The fourth option may be to participate to a M&A stock exchanges of far east. While determining a strategy it will be beneficial to consider the outcomes of previous M&As in prior periods, the value created will be higher by a M&A with developed capital markets, and the network effect will be effective only if a certain size is reached.

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