VAR Analysis of the Determinants of the Foreigners' Transactions in Istanbul Stock Exchange

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Abstract

Increasing amounts of capital flows to developing countries and emerging markets tend to stimulate economic activity in these countries on one hand, and lead to serious macroeconomic fluctuations on the other hand. Foreign investors' activities in an emerging market, specifically in a stock market can have serious implications over the stock market as well as the overall economy of that country. The primary purpose of this research is to analyze the causes of capital inflows by a VAR model, specifically monthly transactions by foreigners in Istanbul Stock Exchange (ISE), for the period January 1997 through December 2011. The model investigates the effects of Foreign Direct Investment, ISE Index, NYSE Index, US Treasury Bill and US Industrial Production over sales, purchases and net transactions of foreigner investors in ISE.

Keywords: capital flows, foreigners' transactions, VAR Model

JEL Classification: C32; F32; F36

1. Introduction

The discussion of capital flows to developing countries has been one of the most popular topics in economics since the emerging markets attract more and more investments every day. Capital flows can be considered as indicators of the overall economic performance for that particular country. Capital flows may help developing countries in several ways. They can provide extra funds available for investment or be in the form of direct investment, and contribute to national production. In addition, if domestic saving is insufficient, the governments can borrow easier in the presence of foreign capital flows. Moreover, capital flows enable developing country households to smooth out their consumption over time. On the other hand, international investors can benefit from capital flows, such that, their investments bring higher returns in developing countries than in industrial countries. In general, international borrowers use capital flows to finance economic growth, and international lenders use capital flows to make profits. Actually, there is no strict definition of capital flows in the international economics literature. Definition and measurement of capital flows can have slight differences among the records of international institutions, such as the World Bank and the IMF, through time. Calvo, Leiderman and Reinhart (1994) define capital flows as the increase in net international indebtedness of a country at a given period of time. Capital flows are calculated as the surplus in the net capital account item of the balance of payments identity. Balance of payments identity indicates that, if errors and omissions are excluded, the capital flows will be equal to the summation of current account deficit and the increase in the net international reserve holdings of the country. The determinants of capital flows can be divided into two groups: domestic and external factors (Kara, 2007). Domestic factors are based on the economic environment of the developing country that receives the flow of foreign capital. These factors are the factors that "pull" capital flows, so called "pull factors", as well. Pull factors are assumed to be under the control of policy makers. External factors are based on the economic environments of the industrial countries and other developing countries, and are beyond the control of domestic policy makers (i.e. debt sustainability; structural policies that increases the efficiency of resource allocation; policies that shape the level of domestic absorption and its components relative to national income). If favorable, external factors "push" capital flows to the developing countries, and they are known as "push factors", as well (i.e. foreign interest rates; recessions in developed countries; bandwagon and contagion effects in international capital movement).

The remainder of this paper proceeds as follows. Section two reviews the literature related to capital flows. Section three introduces the selected data. Section four describes the development of the VAR model and the empirical results of this study. The final section is the conclusion.

2. Literature Review

The effects of the capital flows over the economic performance of that country has been discussed in many literature like Calvo, Leiderman and Reinhart (1993, 1996), Hoggarth and Sterne (1997), Lopez-Mejia (1999), Fernandez-Arias and Montiel (1996), Balkan, Biçer and Yeldan (2002), Alper and Saglam (2001), Yentürk (1999), Celasun, Denizer and He (1999).

The findings of these papers suggest that a surge in capital inflows leads to a rise in consumption and investment. A rise in the capital inflows increases the amount of bank credits extended to the private sector, since resident banks often appear to act as intermediaries between international capital markets and domestic borrowers. This in turn raises domestic consumption and investment demand given the increase in available funds. This development gives rise to inflationary pressures in the economy led by the boost in total aggregate domestic demand. Therefore, countries that receive large capital inflows experience a considerable expansion in their services sectors.

The reasons behind capital flows from developed countries to developing countries have also been topics of several research like Mody, Taylor and Kim (2001), Dasgupta and Ratha (2000), Ying and Kim (2001), Taylor and Sarno (1997), Calvo, Leiderman and Reinhart (1993). These papers mostly examine the push-pull factors of the capital flows. Push factors are the external determinants of capital flows from the developed countries to emerging economies such as the interest rates and economic activities in the developed countries. Pull factors are the domestic determinants of capital inflows in a particular emerging market economy such as domestic interest rates, stock market prices, macroeconomic stability, exchange rate regime, inflation, domestic credit level, creditworthiness and industrial production. These studies show that the pull factors have greater effects than the push factors.

3. Overview of Data

Studies on capital flows mostly use data of Foreign Direct Investments and long-term capital flows. This paper examines a more liquid data; monthly transactions realized on behalf and account of foreign banks/brokerage houses or individuals in Istanbul Stock Exchange (ISE) between January 1997 and December 2011. The data consists of both purchases and sales in that particular month in US Dollars.

When controls over foreign exchange lifted in Turkey in 1980's, foreign investments to Turkey steadily increased. According to Central Bank of Turkey, foreign portfolio investments into Turkey have increased from annual average of $1,163 million in 1986-1995 to $7,230 million in 2003-2005. A considerable portion of the portfolio investment went to ISE. The share of foreign ownership in the Istanbul Stock Exchange (ISE) went up from 37.9% in 2000 to over 60% in 2006. This is why foreigner's transactions have very important implications in ISE as well as the overall Turkish economy.

4. Methodology and the Empirical Results

The VAR model, originally introduced by Sims (1980), is used in this paper. This model helps us interpret the dynamic relationship between the foreigners' transactions in ISE and ISE Index, NYSE Composite Index, Foreign Direct Investment to Turkey, Interest rate on 3-month US Treasury Bill and US Industrial Production Index.

The estimation of a VAR model requires two steps. First, a vector of economic variables (dated at time t) is regressed on several lags of itself. The residuals from these regressions are interpreted as innovations - new information about the economic variables that became available during period t. In the second step of estimation, the innovations are regressed on themselves, using one of several statistical procedures. The second-stage regressions are often given a structural or behavioral interpretation. Thus, the residuals from the second-stage regressions are often viewed as structural shocks - the unexpected component of a behavioral relationship.

A rise in ISE stock market index is expected to positively affect capital inflows, since it indicates an improvement in the investment opportunities and improved economic fundamentals in the country. A rise in NYSE index is expected to negatively affect capital inflows. A rise in foreign direct investment is expected to positively affect capital inflows. US 3-month Treasury bill rates indicate borrowing costs and alternative rates of return for the investors in capital exporting countries. Therefore, a rise in this variable is expected to have a negative impact on capital flows into Turkey. US industrial production growth implies an increase in the funds available for investment abroad, thus it may have a positive effect on capital inflows.

4.1 Tests for Stationarity

Before applying the model, it is important to check whether the variables are stationary or not. To check this, we performed Augmented Dickey-Fuller Test on all the variables using EViews. Our findings are reported in Table 1.

Table 1. Augmented Dickey-Fuller Test Results

	ADF Test Statistics	
Variables	Level	1st Difference
Purchases	-1.566979	-14.51796
Sales	-1.62396	-14.01792
Net	-11.38546	-17.61634
FDI	-1.979841	-14.28844
ISE	-1.783601	-13.48228
NYSE	-2.313706	-11.18543
TBILL	-1.536614	-4.4707
USIP	-2.810718	-3.115138
Test critical values:	1% level	-3.467418
	5% level	-2.877729
	10% level	-2.57548

The results show that all series except for Net (Purchases – Sales); Purchases, Sales, ISE, NYSE, TBILL and USIP are non-stationary. If we use the first difference they became stationary. 1st differences of Purchases, Sales, ISE, NYSE and TBILL and USIP are used in the VAR Models in the paper.

4.2 Tests for Causality

Granger (1969) developed a test approach to prove that a time series X contribute to the prediction of another series Y. In this section the relationship between Sales, Purchases, Net Purchases, ISE, NYSE and USIP is investigated using Granger Causality test using EViews.

Table 2. Granger Causality Tests

Null Hypothesis:	F-Statistic	Probability
DPURCH does not Granger Cause DISE	2.50455	0.08469
DISE does not Granger Cause DPURCH	11.3373	2.40E-05
DSALES does not Granger Cause DISE	2.44441	0.08979
DFDI does not Granger Cause DISE	2.53349	0.08234
DSALES does not Granger Cause DFDI	4.44745	0.01309
DISE does not Granger Cause DSALES	26.0424	1.30E-10
DTBILL does not Granger Cause DISE	2.39635	0.09408
DISE does not Granger Cause DTBILL	3.63674	0.02838
DUSIP does not Granger Cause DISE	4.92163	0.00835
NET does not Granger Cause DISE	2.43677	0.09046
DISE does not Granger Cause NET	3.72419	0.0261
DNYSE does not Granger Cause DPURCH	10.8172	3.80E-05
DSALES does not Granger Cause DNYSE	4.16309	0.01716
DNYSE does not Granger Cause DSALES	12.9734	5.70E-06
DPURCH does not Granger Cause DSALES	2.66142	0.07273
DTBILL does not Granger Cause DPURCH	3.57958	0.02998
DUSIP does not Granger Cause DPURCH	2.58822	0.07808
DPURCH does not Granger Cause DUSIP	5.66186	0.00416
DTBILL does not Granger Cause DSALES	4.16476	0.01713
DSALES does not Granger Cause DTBILL	3.32534	0.03829
DUSIP does not Granger Cause DSALES	2.44369	0.08985
DSALES does not Granger Cause DUSIP	4.82836	0.00912
DUSIP does not Granger Cause NET	2.78464	0.06454

Table 2 shows the rejected hypothesis that a variables Granger causes another variable. The table actually has interesting implications; US Industrial Production and T-bill Granger cause ISE index, purchases and sales. NYSE Granger causes only purchases and sales not the ISE index. Neither **one** Granger causes FDI however FDI Granger causes only ISE. Sales of foreigners in Istanbul Stock Exchange Granger cause T-bill, USIP, NYSE, ISE and FDI. This is interesting because which might mean that when foreigners sale their shares at ISE, it has direct effects on all other variables since this liquidated money can be easily transferred across the globe. Purchases, on the other hand, Granger causes only ISE, Sales and USIP.

4.3 Estimation

The coefficient values of the VAR model using Purchases and 5 other variables are listed in **Table 3**. **Table 4** shows the same VAR model using Sales data and **Table 5** shows the model using the Net purchases which is calculate as Purchases minus Sales.

Table 3. The Coefficient Values of VAR (1) Model For Foreigners Purchases

	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
DPURCH(-1)	**-0.733119**	-0.108397	-6.47E-09	4.35E-08	**-5.19E-11**	**1.36E-10**
	-0.07819	-0.08145	-1.70E-08	-2.80E-08	**-1.70E-11**	**-5.50E-11**
	[-9.37653]	[-1.33078]	[-0.38942]	[1.54832]	**[-2.99687]**	**[2.46082]**
DPURCH(-2)	**-0.346576**	0.070743	1.10E-08	**5.56E-08**	**-5.38E-11**	5.51E-11
	-0.0801	-0.08345	-1.70E-08	**-2.90E-08**	**-1.80E-11**	-5.70E-11
	[-4.32688]	[0.84777]	[0.64512]	**[1.92950]**	**[-3.02843]**	[0.97194]
DFDI(-1)	0.068904	**-0.705706**	-1.74E-08	-3.16E-08	7.44E-13	1.94E-11
	-0.06781	**-0.07065**	-1.40E-08	-2.40E-08	-1.50E-11	-4.80E-11
	[1.01609]	**[-9.98911]**	[-1.20418]	[-1.29555]	[0.04948]	[0.40484]
DFDI(-2)	0.084403	-0.46673	8.99E-09	-2.84E-08	1.76E-11	-2.73E-11
	-0.06755	-0.07037	-1.40E-08	-2.40E-08	-1.50E-11	-4.80E-11
	[1.24950]	[-6.63231]	[0.62660]	[-1.16699]	[1.17590]	[-0.57071]
DISE(-1)	**1043715**	137869.8	-0.10859	-0.2133	**0.000191**	-0.000409
	-442600	-461097	-0.09406	-0.15922	**-9.80E-05**	-0.00031
	[2.35815]	[0.29900]	[-1.15453]	[-1.33966]	**[1.94705]**	[-1.30762]
DISE(-2)	625001.7	**-1219964**	0.005229	-0.20618	2.29E-05	-0.000389
	-446539	**-465200**	-0.09489	-0.16063	-9.90E-05	-0.00032
	[1.39966]	**[-2.62245]**	[0.05511]	[-1.28355]	[0.23181]	[-1.23304]
DNYSE(-1)	**478812.1**	124412.2	**0.110356**	**0.182661**	7.85E-05	0.000102
	-244089	-254290	**-0.05187**	**-0.08781**	-5.40E-05	-0.00017
	[1.96163]	[0.48925]	**[2.12750]**	**[2.08026]**	[1.45009]	[0.59077]
DNYSE(-2)	153631.7	**766991.4**	-0.02751	-0.06399	**0.000136**	**0.000556**
	-244259	**-254467**	-0.05191	-0.08787	**-5.40E-05**	**-0.00017**
	[0.62897]	**[3.01411]**	[-0.52993]	[-0.72829]	**[2.51185]**	**[3.21718]**
DTBILL(-1)	4.56E+08	-2.12E+08	-0.7832	-34.2029	**0.326134**	-0.020539
	-3.40E+08	-3.50E+08	-72.1319	-122.103	**-0.07524**	-0.24007
	[1.34233]	[-0.59857]	[-0.01086]	[-0.28011]	**[4.33431]**	[-0.08556]
DTBILL(-2)	-1.68E+08	40502129	96.07295	-19.7386	0.07509	**0.590347**
	-3.30E+08	-3.50E+08	-71.0119	-120.207	-0.07408	**-0.23634**
	[-0.50258]	[0.11634]	[1.35291]	[-0.16420]	[1.01368]	**[2.49788]**
DUSIP(-1)	1.01E+08	57669019	**50.49185**	**141.5653**	0.0358	**0.141771**
	-1.00E+08	-1.10E+08	**-22.1422**	**-37.4818**	-0.0231	**-0.07369**
	[0.97125]	[0.53128]	**[2.28035]**	**[3.77691]**	[1.54992]	**[1.92382]**
DUSIP(-2)	-12311781	-51270846	-3.02682	58.64388	-0.010189	**0.231428**
	-1.10E+08	-1.10E+08	-22.6675	-38.371	-0.02365	**-0.07544**
	[-0.11542]	[-0.46139]	[-0.13353]	[1.52834]	[-0.43092]	**[3.06766]**

Table 4. The Coefficient Values of VAR (1) Model For Foreigners Sales

	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
DSALES(-1)	**-0.649529**	-0.066486	-1.80E-08	3.45E-08	**-5.35E-11**	**1.18E-10**
	-0.07573	-0.08322	-1.70E-08	-2.90E-08	**-1.80E-11**	**-5.70E-11**
	[-8.57654]	[-0.79889]	[-1.05206]	[1.19128]	**[-2.98141]**	**[2.05383]**
DSALES(-2)	**-0.249311**	**0.168113**	7.90E-09	**6.61E-08**	**-4.95E-11**	8.63E-11
	-0.07348	**-0.08074**	-1.70E-08	**-2.80E-08**	**-1.70E-11**	-5.60E-11
	[-3.39302]	**[2.08205]**	[0.47584]	**[2.35472]**	**[-2.84373]**	[1.55050]
DFDI(-1)	**0.117041**	**-0.696759**	-1.81E-08	-2.22E-08	-5.91E-12	4.51E-11
	-0.06389	**-0.07021**	-1.40E-08	-2.40E-08	-1.50E-11	-4.80E-11
	[1.83176]	**[-9.92341]**	[-1.25544]	[-0.90804]	[-0.39013]	[0.93189]
DFDI(-2)	0.109351	**-0.449718**	1.19E-08	-1.88E-08	1.26E-11	-1.35E-11
	-0.06362	**-0.06991**	-1.40E-08	-2.40E-08	-1.50E-11	-4.80E-11
	[1.71888]	**[-6.43292]**	[0.83076]	[-0.77301]	[0.83526]	[-0.28026]
DISE(-1)	**1951316**	69992.71	-0.1058	-0.14664	0.000137	-0.000223
	-400410	-440007	-0.09042	-0.15306	-9.50E-05	-0.0003
	[4.87330]	[0.15907]	[-1.17014]	[-0.95807]	[1.44781]	[-0.73542]
DISE(-2)	**877015.7**	**-1089420**	0.048722	-0.20042	3.80E-05	**-0.000534**
	-418819	**-460237**	-0.09458	-0.1601	-9.90E-05	**-0.00032**
	[2.09402]	**[-2.36708]**	[0.51515]	[-1.25185]	[0.38302]	**[-1.68360]**
DNYSE(-1)	219982.3	152856.1	**0.110458**	**0.185937**	7.16E-05	8.94E-05
	-227871	-250406	**-0.05146**	**-0.0871**	-5.40E-05	-0.00017
	[0.96538]	[0.61043]	**[2.14659]**	**[2.13463]**	[1.32578]	[0.51779]
DNYSE(-2)	148823.1	**725553.2**	-0.02677	-0.06323	**0.000138**	**0.000577**
	-227832	**-250362**	-0.05145	-0.08709	**-5.40E-05**	**-0.00017**
	[0.65322]	**[2.89801]**	[-0.52031]	[-0.72607]	**[2.55795]**	**[3.34241]**
DTBILL(-1)	4.84E+08	-1.93E+08	1.330878	-29.0015	**0.331078**	-0.000313
	-3.20E+08	-3.50E+08	-71.7532	-121.461	**-0.07531**	-0.24078
	[1.52267]	[-0.55409]	[0.01855]	[-0.23877]	**[4.39645]**	[-0.00130]
DTBILL(-2)	-3.59E+08	-64330692	96.23229	-34.4201	0.076266	**0.566732**
	-3.10E+08	-3.50E+08	-71.0846	-120.329	-0.0746	**-0.23853**
	[-1.14040]	[-0.18597]	[1.35377]	[-0.28605]	[1.02228]	**[2.37591]**
DUSIP(-1)	29781353	57772631	**49.76927**	**137.141**	0.034064	**0.12061**
	-9.60E+07	-1.10E+08	**-21.6748**	**-36.6902**	-0.02275	**-0.07273**
	[0.31028]	[0.54773]	**[2.29618]**	**[3.73781]**	[1.49745]	**[1.65827]**
DUSIP(-2)	25539825	-54555893	-3.9742	56.70083	-0.004681	**0.240332**
	-9.80E+07	-1.10E+08	-22.2126	-37.6005	-0.02331	**-0.07454**
	[0.25964]	[-0.50471]	[-0.17892]	[1.50798]	[-0.20081]	**[3.22433]**

Table 5. The Coefficient Values of VAR (1) Model For Foreigners Net (Purchases – Sales)

	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
NET(-1)	**0.374698**	-0.341791	**1.07E-07**	**1.66E-07**	-6.94E-13	**3.27E-10**
	-0.09527	-0.23008	**-4.60E-08**	**-8.00E-08**	-5.10E-11	**-1.60E-10**
	[3.93321]	[-1.48551]	**[2.30414]**	**[2.07800]**	[-0.01362]	**[2.08025]**
NET(-2)	-0.073743	-0.331345	-9.53E-09	-4.32E-08	-7.01E-12	-2.10E-10
	-0.09757	-0.23565	-4.80E-08	-8.20E-08	-5.20E-11	-1.60E-10
	[-0.75579]	[-1.40610]	[-0.20023]	[-0.52880]	[-0.13433]	[-1.30096]
DFDI(-1)	**-0.081374**	**-0.724695**	**-2.94E-08**	**-5.06E-08**	2.95E-12	-4.54E-12
	-0.02999	**-0.07244**	**-1.50E-08**	**-2.50E-08**	-1.60E-11	-5.00E-11
	[-2.71300]	**[-10.0039]**	**[-2.01059]**	**[-2.01813]**	[0.18388]	[-0.09158]
DFDI(-2)	-0.035954	**-0.463111**	4.19E-09	-2.69E-08	1.11E-11	-8.33E-12
	-0.02889	**-0.06977**	-1.40E-08	-2.40E-08	-1.50E-11	-4.80E-11
	[-1.24453]	**[-6.63742]**	[0.29739]	[-1.11222]	[0.71728]	[-0.17457]
DISE(-1)	**-909000.1**	367114	**-0.2588**	**-0.36107**	0.000128	-0.00054
	-213743	-516226	**-0.10426**	**-0.17881**	-0.00011	-0.00035
	[-4.25278]	[0.71115]	**[-2.48230]**	**[-2.01927]**	[1.12171]	[-1.53028]
DISE(-2)	204932.7	-735652	0.072218	0.004354	-6.81E-05	7.44E-05
	-226985	-548208	-0.11072	-0.18989	-0.00012	-0.00037
	[0.90285]	[-1.34192]	[0.65227]	[0.02293]	[-0.56111]	[0.19840]
DNYSE(-1)	**274131.3**	217686.1	**0.119699**	**0.190983**	8.21E-05	9.10E-05
	-104572	-252560	**-0.05101**	**-0.08748**	-5.60E-05	-0.00017
	[2.62146]	[0.86192]	**[2.34668]**	**[2.18310]**	[1.46867]	[0.52711]
DNYSE(-2)	-9935.524	**714316.1**	-0.04678	-0.07657	**0.000122**	**0.000564**
	-104728	**-252938**	-0.05108	-0.08761	**-5.60E-05**	**-0.00017**
	[-0.09487]	**[2.82408]**	[-0.91575]	[-0.87400]	**[2.17118]**	**[3.26339]**
DTBILL(-1)	-9819874	-2.96E+08	-9.91819	-46.4754	**0.331916**	0.001015
	-1.50E+08	-3.50E+08	-70.74	-121.324	**-0.07753**	-0.23945
	[-0.06771]	[-0.84580]	[-0.14021]	[-0.38307]	**[4.28111]**	[0.00424]
DTBILL(-2)	1.45E+08	94631378	95.01812	9.084098	0.033995	**0.613061**
	-1.40E+08	-3.40E+08	-69.1206	-118.547	-0.07576	**-0.23397**
	[1.02670]	[0.27650]	[1.37467]	[0.07663]	[0.44874]	**[2.62030]**
DUSIP(-1)	**1.02E+08**	1.47E+08	**58.65122**	**151.3279**	0.035317	**0.132625**
	-4.40E+07	-1.10E+08	**-21.3175**	**-36.5612**	-0.02336	**-0.07216**
	[2.34521]	[1.39457]	**[2.75132]**	**[4.13904]**	[1.51162]	**[1.83799]**
DUSIP(-2)	-12844722	-99645291	-10.8937	43.09285	-0.002657	**0.224456**
	-4.50E+07	-1.10E+08	-21.9268	-37.6061	-0.02403	**-0.07422**
	[-0.28574]	[-0.91781]	[-0.49682]	[1.14590]	[-0.11055]	**[3.02419]**

When Table 3, 4 and 5 are examined in detail, it is seen that all variables have direct delayed effect on themselves. The tables also show that there is a positive delayed effect of ISE index over foreigners' sales and purchases. However the effect is negative over net transactions. This might show a reversal behavior of foreigners in Istanbul Stock Exchange. When ISE index increases, foreigners tend to increase their sales the following month. We can also see this trend when we look at the coefficient of the net purchases in **Table 4** and net transactions in Table 5. When ISE increases, net purchases tend to increase the following month however the sales tend to be larger than the purchases therefore net transactions are negative. This shows that when ISE Index increases, foreigners tend to realize their profits and sell more than they purchase. When the market index goes down, that's when foreigners tend to invest more in Istanbul stock exchange, taking positions opposite of the stock market. When we look at the net transactions of foreigners in Istanbul Stock Exchange in Table 5, we can see positive delayed effects of NYSE and USIP and negative delayed effects of FDI and ISE.

4.4 Variance Decomposition

The variance decomposition analyses the impact of unexpected shocks on the variables in a more convenient and comprehensive way. Variance Decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Therefore, the variance decomposition provides information about the relative

importance of each random innovation in affecting the variables in the VAR. Variance decomposition determines how much of the forecast error variance of each of the variable can be explained by exogenous shocks to the other variables.

Table 6. Variance Decomposition

Variance Decomposition of DSALES:						
Period	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	100	0	0	0	0	0
2	83.91123	0 0.215273	14.5699	0.458836	0.814178	0.030578
3	81.51097	0.834021	14.42944	0.810885	1.531234	0.883452
4	80.95927	0.822242	14.70766	0.792032	1.85958	0.859217
Variance Decomposition of DFDI:						
Period	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	0.119566	99.88043	0	0	0	0
2	0.15287	99.48245	0.080932	0.092619	0.088631	0.102501
3	3.521745	92.12181	1.676356	2.347674	0.090512	0.241903
4	5.246779	87.79813	3.092712	3.286835	0.19632	0.379219
Period	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	1.659786	2.329466	96.01075	0	0	0
2	2.416144	3.012885	89.90293	2.089666	0.036143	2.542233
3	3.807558	4.372235	86.39208	2.041537	0.83775	2.548837
4	4.134953	4.552867	84.90256	2.119094	1.288763	3.001759
Variance Decomposition of DPURCH:						
Period	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	100	0	0	0	0	0
2	91.38041	0.046206	5.941726	1.582972	0.727877	0.320808
3	90.72291	0.158414	6.015218	1.543111	1.104232	0.456113
4	89.97375	0.188414	6.438207	1.529334	1.333847	0.53645
Variance Decomposition of DFDI:						
Period	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	0.23276	99.76724	0	0	0	0
2	1.170234	98.46445	0.109137	0.053887	0.105424	0.096872
3	2.973256	92.01697	2.153083	2.499162	0.102733	0.254794
4	3.185265	89.77143	2.898599	3.53883	0.157174	0.448704
Variance Decomposition of DISE:						
Period	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	11.30942	2.568244	86.12234	0	0	0
2	11.04466	3.037563	81.20597	2.109645	0.024217	2.577949
3	11.93148	4.109767	78.3577	2.066852	0.895784	2.638418
4	12.34552	4.199419	76.87734	2.175952	1.269054	3.132721
Variance Decomposition of NET:						
Period	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	100	0	0	0	0	0
2	86.92468	1.389648	6.202023	3.088361	0.002986	2.392304
3	86.28529	1.413305	6.156877	3.105904	0.622779	2.415845
4	85.19404	1.398299	6.185232	3.151269	0.797526	3.273637
Variance Decomposition of DFDI:						
Period	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	2.562726	97.43727	0	0	0	0
2	4.482016	94.03479	0.469656	0.188435	0.210407	0.6147
3	4.625491	90.82693	0.855391	1.959097	0.27946	1.453636
4	5.122558	88.61223	0.987248	3.278773	0.267033	1.732157
Variance Decomposition of DISE:						
Period	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	28.18175	3.787449	68.03081	0	0	0
2	26.20343	4.538059	63.21261	2.539726	0.000472	3.505708
3	26.13201	5.407535	61.47247	2.564308	0.9884	3.435274
4	25.70294	5.537511	60.61557	2.675842	1.32104	4.147093

Table 6 shows the results of the variance decomposition up to 4 periods because after 4 periods the variance percentages have been found approximately steady. The table shows that sales, purchases and net transactions are completely explained (100%) by their innovations in the first period, but in second period it drops to 83.91%, 91.38% and 86.92% respectively.

The interesting result is that shocks to Istanbul Stock Exchange explain 14.57% of the forecast error variance in sales in the second period. Other variables like NYSE, TBILL and USIP do not have much effect. When it comes to purchases and net transactions, shocks to ISE explain only 5.94% and 6.20% respectively of the forecast error variance in the second period. Shocks to the other variables like NYSE and USIP explain more.

4.5 Impulse-response Analysis

A shock to any variable not only directly affects that variable but also is transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. Therefore, one can detect the dynamic relationships over time.

Table 7. Impulse Response of DSALES

Period	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	1	0	0	0	0	0
2	-0.64953	0.117041	1951316	219982.3	4.84E+08	29781353
3	0.114893	-0.08996	-561115	317574.1	-5.39E+08	1.60E+08
4	0.190345	-0.00915	-522888	-9581.937	3.44E+08	1445576

Table 8. Impulse Response of DPURCHASES

Period	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	1	0	0	0	0	0
2	-0.73312	0.068904	1043715	478812.1	4.56E+08	1.01E+08
3	0.187622	-0.04568	-300518	59890.11	-3.87E+08	68612118
4	0.179514	-0.04343	-557156	37624.41	2.76E+08	54712861

Table 9. Impulse Response of DNET (Purchases – Sales)

Period	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	1	0	0	0	0	0
2	0.374698	-0.08137	-909000	274131.3	-9819874	1.02E+08
3	0.076085	0.00489	-85880.6	27136.32	1.59E+08	14997457
4	0.001683	0.003891	37834.52	47571.73	75629704	63235725

Table 7, Table 8 and Table 9 report the impulse response coefficients of sales, purchases and net transactions. Figure 1, 2 and 3, on the other hand shows the effects of one standard deviation shocks to T-Bill and US Industrial production over Purchases, Sales, Net Transactions, FDI and ISE.

Table 7 and Table 8 show that the foreigners' sales and purchases respond positively to shocks to ISE in the second period however the response becomes negative in period 3. When it comes to NYSE, the response is also positive however it becomes negative only after 3rd period for Sales only.

Table 9 shows that net transactions respond negatively for the second and third periods to ISE however the response becomes positive in the fourth period. The response is always positive to NYSE.

The graphs of the impulse response coefficients provide a better picture to analyze the shocks. Figure 1, 2 and 3 show responses of each variable over 10 periods to a one standard deviation shock.
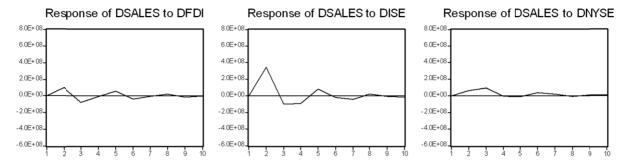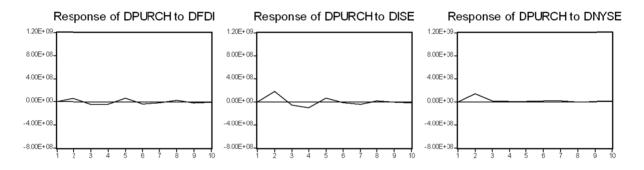
Figure 1. Response of DSALES to DFDI, DISE and DNYSE (Response to Nonfactorized One S.D. Innovations)

Figure 1 shows the response of one standard deviation shock to FDI, ISE and NYSE over sales. There is a positive effect of FDI over Sales in the second period but this effect becomes negative in the third period, and then back to positive in the fifth period before it levels. The positive effect of ISE and NYSE over Sales becomes negative in the third period and then back to positive in the fifth period before it levels.

Figure 2. Response of DPURCH to DFDI , DISE and DNYSE (Response to Nonfactorized One S.D. Innovations)

Figure 2 shows the response of one standard deviation shock to FDI, ISE and NYSE over purchases. We can see that there is a positive response in the second period; this response becomes negative in the third period and then levels.

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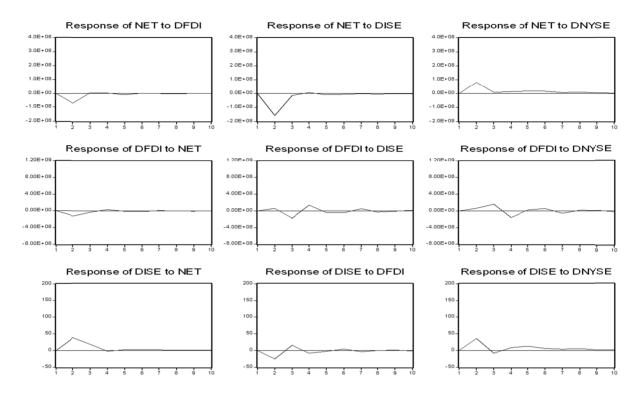Vol. 4, No. 10; 2012

Figure 3. Response of NET to DFDI, DISE, and DNYSE; DFDI to NET, DISE, and DYNSE; DISE to NET, DFDI and DNYSE (Response to Nonfactorized One S.D. Innovations)

Figure 3 shows the response of one standard deviation shock to FDI, ISE and NYSE over net transactions, one standard deviation shock to NET, ISE and NYSE over FDI and one standard deviation shock to NET, FDI, and NYSE over ISE. There is a negative response of both FDI and ISE over net transactions in the second period and then levels. This again shows that when ISE Index decreases, foreigners tend to invest more by taking positions opposite of the stock market. However, the story is different when it comes to NYSE. When NYSE Index increases, foreigners also tend to increase their investments at ISE. We can also see in **Figure 3** that there is a negative effect of foreigners' net transactions over FDI in the first three periods.

5. Conclusion

Increasing amounts of capital flows to developing countries and emerging market economies tend to stimulate economic activity in these countries on one hand, and lead to serious macroeconomic fluctuations on the other hand. Foreigners' activities in an emerging market, specifically in a stock market can have serious implications over the stock market as well as the overall economy of that country.

This paper analyzes the causes of capital inflows by a VAR model; specifically monthly transactions by foreigners in Istanbul Stock Exchange (ISE). The model investigates the effects of Foreign Direct Investment, ISE index, NYSE index, US Treasury Bill and US Industrial production over sales, purchases and net transactions of foreigners in Istanbul stock market.

In addition, the relationship between Sales, Purchases, Net Purchases, ISE, NYSE and USIP is investigated using Granger Causality test. Results show that US Industrial Production and T-bill Granger cause ISE index, purchases and sales. NYSE Granger causes only purchases and sales not the ISE index. Neither one Granger causes FDI; however FDI Granger causes only ISE. Sales of foreigners in Istanbul Stock Exchange Granger cause T-bill, USIP, NYSE, ISE and FDI. Purchases, on the other hand, Granger causes only ISE, Sales and USIP.

Variance decomposition analysis also reveals that shocks to Istanbul Stock Exchange explain only 14.57% of the forecast error variance in sales in the second period. Other variables like NYSE, TBILL and USIP do not have much effect.

Impulse response analysis shows that a one standard deviation shock to ISE has a positive effect in the second period over foreigners' purchases and sales but this effect becomes negative in the third period. The response is always positive to NYSE. There is a negative response of both FDI and ISE over net transactions in the second period and then levels. This shows that when ISE Index decreases, foreigners tend to invest more by taking positions opposite of the stock market. However, the story is different when it comes to NYSE. When NYSE Index increases, foreigners also tend to increase their investments at ISE.

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Notes

Note 1. Istanbul Stock Exchange was established in 1985 and its importance in Turkish capital markets as well as other regional markets has been increasing ever since. As of December 2009, its market capitalization was USD 236 billion with 315 listed companies which ranked 10th among emerging markets. It is the most developed and

liquid stock market in the region. It is ranked 7th, ahead of Bombay behind South Africa, in the developing countries as far as the trading volume is concerned. Turkey being the 16th largest economy in the world, ISE is a rising financial center. Only 20% of the largest industrial enterprises are listed in the stock markets, which show a huge potential for future listings.