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The determinants of stock prices: Evidence from the Turkish banking sector

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Abstract. *This study examines the causality relationship of the stock prices of 10 deposit banks traded in Borsa Istanbul with industrial production index, exchange rates and money supply using monthly observations and focusing on the period between June 2007 and October 2016. The panel causality test is used to examine the causality relationship between variables. The analyses showed that the industrial production index is not one of the determinants of the stock prices of the banks examined.*

Keywords: Panel causality, Turkish banking industry, Stock price, Money supply, Exchange rates.

JEL Classification: C33, E40, G21.

1. Introduction

The financial crisis that started in the United States towards the end of 2007 and that grew into a global crisis within a short period of time had a negative impact on global economic activities. These developments also had an impact on the Turkish economy that had integrated with international markets and interrupted the process of finding low-cost funds and financing development. The reason for this is the fact that the amount of domestic savings that would accelerate economic growth and contribute to the accumulation of capital is low. These negative developments had an impact also on the banking sector that plays a major role in transforming savings in the monetary, loan and capital markets into capital. In 2010, there were even banks that suffered from liquidity shortage and the liquid assets/short term liabilities ratio was an important early warning indicator (Bektaş and Gökçen, 2011). Providing finance for sustainable economic growth by investing in capital market tools became popular. As it is known, there are numerous banks traded in Borsa Istanbul (BIST) and the capital market provides funding by exporting stocks. Taking into account that the amount of domestic savings is low, it is important for sustainable economic growth to examine the determinants of the stock prices of the banking sector that is the engine of any country's economy.

This study examines the determinants of the stock prices of 10 deposit banks that have got at least five years of regular data and that are traded under the banks and private financial institutions sector in BIST. The literature examination shows that industrial production index, real exchange rate and money supply (M2) are generally taken as the variables as the determinants of stock prices of banks. Therefore, this study is going to examine the relationship between stock prices and the three variables in question. To this end, the characteristics of the data matrix are taken into account and the panel data analysis techniques are used.

A literature summary is provided in the second part of the study and the third part focuses on econometric methodology. The fourth part focuses on the findings of the application and the last part is the conclusions part.

2. Literature summary

Literature study shows that there are numerous studies carried out in various countries to find the determinants of stock prices.

The study carried out by Shiller and Grosman in 1980 examines the determinants of variables in stock prices. The findings showed that there were more data available with respect to consumption and that would lead to a change in expected real interest rates. They concluded that the changes in real interest rates needed to be taken into account in order to evaluate changes in stock prices (Shiller and Grosman, 1980).

The study by Narayan and Singh in 2014 examines the determinants of the stock prices for the banking system in India via the panel data technique. It was found for 13 banks that there was a cointegration relationship between stock prices, economic activities, interest rates and exchange rates. According to the findings, it was concluded that while economic activity level and exchange rate increased stock prices, the increase in interest rates decreased stock prices of banks (Narayan et al., 2014).

The study by Hartono in 2004 analyses the impact of revenue and profit share distributions on stock prices between 1979 and 1993. According to the findings of the study, while positive revenue data obtained after negative dividend data increased stock prices, positive dividend data obtained after negative revenue data decreased stock prices (Hartono, 2004).

According to the study conducted by Tandon and Malhotra in 2013 using the data of the New York Stock Exchange between 2007 and 2012, the sampling included 95 companies and the linear regression model used showed that there was a significant positive relationship between stock prices and book value, revenue per stock and price earnings ratios. They also found that there was a reverse relationship between dividend yield and stock prices (Tandon and Malhotra, 2013).

In 2011, Nisa and Nishat applied the General Dynamic Panel Method to 221 companies listed in the Pakistan Karachi Stock Exchange and tried to project productive parameters between stock price changes and macroeconomic indicators and basic financial data. According to the findings of this study, the past price movements, company size and yield by share were identified as the factors that had the greatest impact on stock prices (Nisa and Nishat, 2011).

The study by Hussainey and Ngoc in 2016 showed that the price levels in the Vietnamese stock market moved in the same direction with industrial production but also concluded that short and long term interest rates used as monetary indicators had a reverse impact on stock prices (Hussainey and Ngoc, 2009).

The study by Greogoriou, Healy and Gupta carried out in 2015 in order to identify the determinants of stock prices in the telecom sector concentrated on the data from 160 countries and 45 companies between the years 2000-2011 using the panel data analysis. According to the results obtained based on the analysis of financial and non-financial results at the company level, they concluded that capital expenditures and book value had got the most impact on stock prices (Gregoriou et al., 2015).

The study by Rahman, Sidek and Tafri (2009) concentrated on identifying the relationship between stock prices and macroeconomic indicators of the companies operating in Malaysia by using the Vector Autoregression (VaR) methodology. According to the results obtained by the Vector Error Correction Model (VECM), the changes in the Malaysian stock index were in integration with the money supply, interest rate, exchange rate and industrial production changes. According to the results of the lag test and variance decomposition analysis, it was concluded that the macroeconomic factors in question had a strong dynamic interaction with stock prices (Rahman et al., 2009).

The study by Maysami, Howe and Hamzah (2004) identified that the Singaporean stock exchange and real estate index had a relationship of integration with short and long term interest rates, industrial production, general price levels, exchange rate and money supply (Maysami et al., 2004).

The study by Hsing (2011) examined the relationship between the Hungarian stock index and macroeconomic variables by using the GARCH model. According to the findings, while the factors that had a positive impact on the stock index were real GDP, the ratio of

state debt stock to the GDP, nominal effective exchange rate and the German stock index, the factors that had a negative impact were the real interest rate, expected inflation rate, the Euro zone bond yield and the M2 money supply (Hsing, 2011).

3. Econometric methodology

The panel causality test introduced to literature by Kónya (2006) is the test used for the causality analysis that is the main area of examination of this study. This test seems to be a causality test based on the unrelated regression (GIR) technique. Contrary to the panel causality tests that exist in literature, the critical values used in the Kónya (2006) panel causality test are critical values with bootstrap produced specially for each and every horizontal cross unit.

The Kónya (2006) panel causality test offers more advantages compared to others given the fact that it can make projections that do not take into consideration the horizontal cross dependency that exists in panel data models and as it can make the causality analysis for series that are not unit root or cointegrated. This eliminates the need to conduct a priori tests such as unit root and cointegration (Kónya, 2006, p. 991).

The equilibrium system that will be used for the Kónya panel causality test is as follows (Kónya, 2006: 981):

$$Y_{1,t} = \alpha_{1,1} + \sum_{i=1}^{ly_1} \beta_{1,1,i} Y_{1,t-i} + \sum_{i=1}^{lx_1} \delta_{1,1,i} X_{1,t-i} + \varepsilon_{1,1,t}$$

$$Y_{2,t} = \alpha_{1,2} + \sum_{i=1}^{ly_1} \beta_{1,2,i} Y_{2,t-i} + \sum_{i=1}^{lx_1} \delta_{1,2,i} X_{2,t-i} + \varepsilon_{1,2,t}$$

$$\vdots$$

$$\vdots$$

$$Y_{N,t} = \alpha_{1,N} + \sum_{i=1}^{ly_1} \beta_{1,N,i} Y_{N,t-i} + \sum_{i=1}^{lx_1} \delta_{1,N,i} X_{N,t-i} + \varepsilon_{1,N,t}$$

$$X_{1,t} = \alpha_{2,1} + \sum_{i=1}^{ly_2} \beta_{2,1,i} Y_{1,t-i} + \sum_{i=1}^{lx_2} \delta_{2,1,i} X_{1,t-i} + \varepsilon_{2,1,t}$$

$$X_{2,t} = \alpha_{2,2} + \sum_{i=1}^{ly_2} \beta_{2,2,i} Y_{2,t-i} + \sum_{i=1}^{lx_2} \delta_{2,2,i} X_{2,t-i} + \varepsilon_{2,2,t}$$

$$\vdots$$

$$\vdots$$

$$X_{N,t} = \alpha_{2,N} + \sum_{i=1}^{ly_2} \beta_{2,N,i} Y_{N,t-i} + \sum_{i=1}^{lx_2} \delta_{2,N,i} X_{N,t-i} + \varepsilon_{2,N,t}$$

The l in the equilibrium shows the length of lag (Kónya, 2006, p. 982-983). While N indicates the number of horizontal cross units $(j = 1,..,N)$, t shows the time dimension $(t = 1,..,T)$. The Kónya (2006) panel causality test is based on the Wald test statistics.

As different bootstrap critical values are used for each and every horizontal cross units used in the equation, it is not necessary that the series for which causality analysis will be conducted are stationary. Therefore, the causality analysis could be conducted based on the level values of variables (Kónya, 2006, p. 979).

The Granger causality test is tested via different alternatives for the Kónya panel causality test. These are as follows: While the $\delta_{1,j,i}$ variable is not equal to zero for all units, if the $\beta_{2,j,i}$ variable is equal to zero for all variables, then the causality is unilateral, from X to Y only. If it is the opposite, then the causality is from Y to X. If none of the $\delta_{1,j,i}$ and $\beta_{2,j,i}$ variables are equal to zero, then there is a two-way causality between X and Y. If both of the $\delta_{1,j,i}$ and $\beta_{2,j,i}$ variables are equal to zero, then there is no causality between X and Y.

4. The findings of the application

The monthly observation values for the 2007:06-2016:10 period was used in the empirical part of the story and the variables of the monthly geometrical mean of daily stock closing prices, the industrial production index (2010=100), the real effective exchange rate based on consumer price index (2003=100) and money supply were examined. These data were obtained from the Central Bank of the Republic of Turkey (TCMB) Electronic Data Distribution System (EVDS) and the Borsa Istanbul (BIST) database.

The main purpose of the study is to examine the causality analysis between the stock prices of banks and exchange rate, money supply and industrial production index. This analysis is carried out by making use of the Kónya (2006) panel causality test. As the Kónya panel causality test is not sensitive to the stationarity and cointegration levels of the series, the causality test can be conducted based on the level values of the series without any need for a priori test. The results obtained for the Kónya panel causality test are provided in the tables.

Table 1. *The causality between exchange rate and stock prices of banks*

		H_0: Exchange Rate does not cause Stock Prices of Banks.		
		Bootstrap Critical Values		
Banks	**Wald Sta.**	**1%**	**5%**	**10%**
Akbank	4.97937***	11.65834	6.88091	4.81850
Finansbank	3.96569	10.21269	6.03131	4.28804
Garanti Bank	3.61845	11.68188	6.84584	4.84750
Halkbank	0.58957	11.84783	6.85713	4.80089
ICBC Bank	6.66667**	11.08715	6.65919	4.87185

		H_0: Exchange Rate does not cause Stock Prices of Banks.		
		Bootstrap Critical Values		
Banks	**Wald Sta.**	**1%**	**5%**	**10%**
İş Bank	1.16943	11.58401	6.94754	4.92937
Şekerbank	3.50519	11.41903	6.73060	4.84289
Vakıfbank	2.52543	11.48155	6.66139	4.76698
Yapı ve Kredi Bank	0.40044	11.33119	6.94233	4.88012
Denizbank	3.49501	10.76521	6.06521	4.37681

Note: ** and *** indicate the rejection of main hypothesis at 5% and 10% significance levels, respectively.

According to the findings of the causality analysis, the causality relationship from exchange rate to stock prices had a significance level of 10% for Akbank and 5% for the ICBC Bank. In this regard, it could be said that the exchange rate provides useful information for the stock prices of the bank in question.

Another causality analysis examines the existence of causality from industrial production index to stock prices. The findings are tabulated in Table 2. This table indicates that there is no causality relationship from industrial production index to stock prices. This could be interpreted as industrial production index has got no impact on these banks' stock prices.

Table 2. *The causality between industrial production index and stock prices of banks*

		H_0: Industrial Production Index does not cause Stock Prices of Banks.		
		Bootstrap Critical Values		
Banks	**Wald Sta.**	**1%**	**5%**	**10%**
Akbank	2.35791	11.85322	6.92368	5.00336
Finansbank	0.51081	10.37212	5.94715	4.30132
Garanti Bank	2.43581	11.97232	7.17594	5.13268
Halkbank	0.06003	12.08553	7.05418	5.14414
ICBC Bank	2.77138	12.08356	7.37127	5.15721
İş Bank	1.56856	12.03231	7.16260	5.18540
Şekerbank	1.82060	12.05072	7.21437	5.14097
Vakıfbank	1.22530	12.16399	7.17454	5.17596
Yapı ve Kredi Bank	0.56876	11.71123	6.98578	4.91095
Denizbank	0.07977	9.89323	6.13609	4.56335

The findings of the panel causality test that examines causality between money supply and stock prices are tabulated in Table 3. According to this table, there is a causality relationship from money supply to stock prices with a significance level of 10% for Akbank and Garanti Bank. This could be interpreted as, similar to previous findings, money supply provides useful information for the formation of stock prices for the banks in question.

Table 3. *The causality between money supply and stock prices of banks*

		H_0: Money Supply does not cause Stock Prices of Banks.		
		Bootstrap Critical Values		
Banks	**Wald Sta.**	**1%**	**5%**	**10%**
Akbank	7.68120***	14.35967	8.69578	6.37848
Finansbank	2.64232	12.60932	7.20197	5.23588
Garanti Bank	7.20454***	15.82047	9.90945	7.12553
Halkbank	0.10964	15.44828	9.77356	7.02080
ICBC Bank	3.69700	15.75587	10.2469	7.72581
İş Bank	2.94148	15.49848	9.50588	6.92059
Şekerbank	0.89879	15.46148	9.98591	7.55696
Vakıfbank	3.69748	15.18643	9.17950	6.73177
Yapı ve Kredi Bank	0.82954	13.95300	8.62271	6.24622
Denizbank	1.69516	13.03049	8.06046	5.83457

Note: *** indicate the rejection of main hypothesis at 10% significance level.

The findings of the causality analysis are summarized in Table 4. According to these findings, the direction of causality for Akbank and the ICBC Bank is from exchange rate to stock prices. The causality from money supply to stock prices is true for Akbank and Garanti Bank. Finally, no causality relationship has been observed from money supply to stock prices.

Table 4. *Kónya panel causality test results*

Banks	$E.R. \rightarrow S.P.$	$I.P. \rightarrow S.P.$	$M.S. \rightarrow S.P.$
Akbank	✓	X	✓
Finansbank	X	X	X
Garanti Bank	X	X	✓
Halkbank	X	X	X
ICBC Bank	✓	X	X
İş Bank	X	X	X
Şekerbank	X	X	X
Vakıfbank	X	X	X
Yapı ve Kredi Bank	X	X	X
Denizbank	X	X	X

Note: E.R., S.P., I.P. and M.S. indicate the Exchange Rate, Stock Prices, Industrial Production Index and Money Supply, respectively.

5. Conclusion

Panel data analysis techniques were used in this study in order to examine the determinants of the stock prices of 10 deposit banks that are traded in BIST under the banks and private financial institutions sector and that have got at least five years of regular data. To this end, the causality relationship between the stock prices of these banks and industrial production index, Consumer Price Index based real effective exchange rate and money supply was examined via the Kónya Panel Causality Test. The causality test was used to investigate the causality relationship between the stock prices of the banks and exchange rate, money supply and industrial production index. It was found that there was a causality relationship with a significance level of 10% for Akbank and 5% for the ICBC Bank from exchange rates to stock prices. In addition to this, the causality relationship from money supply to stock prices had a significance level of 10% for Akbank and Garanti Bank. No causality relationship was identified for any banks between industrial production index and stock prices.

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