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Impacts of Macroeconomic Factors on the Stock Market in Estonia

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Abstract

This paper finds that the Estonian stock market index is positively affected by the debt/GDP ratio, real GDP and the German stock market index and is negatively associated with the exchange rate, the domestic interest rate, the expected inflation rate, and the euro area government bond yield. To promote a robust stock market, the authorities are expected to pursue sustainable fiscal policy, economic growth, a stronger currency, and a relatively low interest rate or expected inflation rate.

Keywords: Stock market index, government debt, exchange rate, foreign stock market

JEL Classification: E44, E52, F31

1. Introduction

Like many other stock markets suffering from significant declining stock values during the global financial crisis, the Estonian OMX Tallinn stock index had dropped 76.5% from February 2007 to March 2009, compared with the 56.6% decline of the S&P 500 index during the period of the financial crisis. Although the index has shown an upward trend, as of May 9, 2014, it was still below the all time high. The substantial decline in stock values would affect consumption spending due to the liquidity and wealth effects and investment spending due to the balance sheet effect and Tobin's q theory.

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While firm specific factors may affect individual stock prices, the overall stock market index is expected to be influenced by the macroeconomic factors such as monetary policy, fiscal policy, the exchange rate, the inflation rate, the foreign stock market index, etc.

This paper examines the relationship between the Estonian stock market index and relevant macroeconomic variables and has several focuses. First, the paper studies whether more government debt may affect the Estonian stock market index positively or negatively. More debt-financed government spending is expected to raise aggregate expenditures, create more business opportunities, and increase the demand for stocks due to the portfolio adjustment, which would increase stock prices. On the other hand, more debt-financed government spending would raise the interest rate crowding out private spending, the price level, and the future tax burden, which would reduce stock prices. Second, other relevant variables such as the exchange rate, the interest rate, the foreign stock market index and other relevant variables are considered in order to estimate their respective impacts on the Estonian stock market index. Third, the GARCH model is applied in empirical work to yield consistent and unbiased estimates.

2. Literature Survey

Most previous studies examining the effect of macroeconomic variables on the stock market focus on the U.S. or other advanced countries (Fama, 1981, 1990; Campbell and Shiller, 1988; Fama and French, 1989; Chen, Roll and Ross, 1986; Darrat, 1990a, 1990b; Bulmash and Trivoli, 1991; Abdullah and Hayworth, 1993; Dhakal, Kandil and Sharma, 1993; Cheung and Ng, 1998; Kim, 2003; Chaudhuri and Smiles, 2004; Ratanapakorn and Sharma, 2007; Humpe and Macmillan, 2009; and others). Variables considered by these studies include real GDP or industrial production, the money supply, interest rates, exchange rates, the consumer price indexes or inflation rates, foreign stock market indexes, etc. Their findings suggest that most of these macroeconomic variables have significant impacts on the stock market indexes to varying degrees.

Several previous works analyze the subject for Estonia and the neighboring countries. Mäkelä (2009) finds lack of evidence of the random walk hypothesis for stock returns in Estonia and Lithuania, suggesting that these stock markets are not efficient and may exhibit extra stock returns for investors to explore.

Pilinkus (2009) shows that the Lithuanian stock market index (OMXV) generally has a positive relationship with gross domestic product and the M1 money supply and a negative relationship with the unemployment rate, the exchange rate, the interbank offered rate, and both positive and negative relationships with the harmonized consumer price index.

Pilinkus (2010) considers the impacts of ten major macroeconomic variables on the stock markets in Estonia, Latvia and Lithuania and shows that the Estonian stock market index has a positive relationship with imports, the harmonized CPI and foreign direct investment, a negative relationship with real GDP, exports, the M1 money supply, the unemployment rate and the government debt, and is not affected by the trade balance and the short-term interest rate.

Lee and Stewart (2010) examine the volatility and its spillovers for the stock markets in Estonia, Latvia, Lithuania, Denmark, Norway and Sweden and show that stock returns and volatility exhibit interdependence among these stock markets and that there is evidence of spillovers from external markets especially the German DAX index to these stock markets.

Aktan, Korsakienė and Smaliukienė (2010) examine the Baltic stock markets in Estonia, Latvia and Lithuania based on the GARCH-type models and reveal that the GARCH-type models can better capture the behavior of stock returns and complex time series properties and that a higher risk does not necessarily leads to a higher stock return.

Syllignakis and Kouretas (2010) indicate that the CEE stock markets including the Estonian stock market are integrated partially, that linkages between the CEE and U.S. and German stock markets have risen after the EU accession, that the recent financial crisis has slowed down the integration process, and that except for Estonia, there is evidence of a common permanent component between the CEE stock markets and the U.S. and German stock markets.

These previous studies have made significant contribution to the understanding of the behavior of the Estonian stock market. This paper examines the impact of selected macroeconomic variables on Estonia's stock market index and focuses on the nonlinear relationship between the Estonian stock market index and the money supply or the government debt.

3. The Model

Extending previous studies, we can express the Estonian stock market index as:

$$E = f(D, \varepsilon, Y, R, \pi^e, S', R') \qquad (1)$$
$$\quad ? \quad ? \quad + \quad - \quad - \quad + \quad ?$$

where

E = the Estonian stock market index,
D = the government debt,
ε = the exchange rate measured as the number of units of the Estonian currency per U.S. dollar (An increase means a depreciation of the Estonian currency.)
Y= real output,
R = the domestic interest rate,
π^e = the expected inflation rate,
S' = the foreign stock market index, and
R' = the foreign interest rate.

We expect that the Estonian stock market index is positively affected by real output and the foreign stock market index, is negatively influenced by the domestic interest rate and the expected inflation rate, and may be positively or negatively associated with the government debt, the exchange rate or the foreign interest rate.

More government debt is expected to increase aggregate expenditures (AE) creating more business opportunities at least in the short run, the demand for stocks (S) due to the portfolio adjustment, the interest rate, the price level (P), and the future tax (T) burden (Darrat, 1990a, 1990b; Ardagna, 2009; Barro, 1974):

$$\frac{\partial E}{\partial D}=\left(\frac{\partial E}{\partial AE}\times\frac{\partial AE}{\partial D}\right)+\left(\frac{\partial E}{\partial S}\times\frac{\partial S}{\partial D}\right)+\left(\frac{\partial E}{\partial R}\times\frac{\partial R}{\partial D}\right)+\left(\frac{\partial E}{\partial P}\times\frac{\partial P}{\partial D}\right)+\left(\frac{\partial E}{\partial T}\times\frac{\partial T}{\partial D}\right)>or<0 \quad (2)$$

Where

$$\frac{\partial AE}{\partial D}>0,\frac{\partial S}{\partial D}>0,\frac{\partial R}{\partial D}>0,\frac{\partial P}{\partial D}>0,\frac{\partial T}{\partial D}>0.$$

The sign of the first two terms is positive whereas the sign of the remaining terms is negative. Hence, the net impact is unclear.

A depreciation of the Estonian currency would reduce international capital inflows and increase exports, import costs and domestic prices (Choi, 1995; Ajayi and Mougoue, 1996; Abdalla and Murinde, 1997; Nieh and Lee, 2001; Ratanapakorn and Sharma, 2007). Increased exports would raise stock prices whereas reduced international capital inflows and higher import costs and domestic prices would reduce stock prices. Therefore, the net impact of currency depreciation is ambiguous.

4. Empirical Results

E is represented by the share price index with 2005 as the base year. D is measured by the ratio of the government debt to nominal GDP. ε is measured by the units of the Estonian currency per U.S. dollar. An increase means a depreciation of the Estonian currency. Y or real GDP is represented by an index number with 2005 as the base year. R is measured by the lending rate. The expected inflation rate is calculated as the average inflation rate of the last four quarters. The German stock market index with 2005 as the base year is selected to represent the foreign stock market index. The euro area government bond yield is chosen to represent the foreign interest rate. Except for the expected inflation rate with negative values, other variables are measured in the logarithmic scale. The sample ranges from 2000.Q1 to 2013.Q3 with a total of 55 observations. The data for the government debt are not available before 2000.Q1. All the variables were collected from the *International Financial Statistics* published by the International Monetary Fund.

The estimated coefficients and related statistics are presented in Table 1. Figures in the parenthesis are z-statistics. The GARCH model is employed in empirical work. Approximately 93.6% of the change in the Estonian stock market index can be explained by the right-hand side explanatory variables. The estimated value of F statistic suggests that the whole regression is significant at the 1% level.

All the coefficients are significant at the 1% level. The Estonian stock market index is positively affected by the debt/GDP ratio, real GDP and the German stock market index, and is negatively influenced by the exchange rate, the domestic interest rate, the expected inflation rate and the euro area government bond yield. The positive significant coefficient for the government debt/GDP ratio suggests that the government debt/GDP ratio has a positive impact on the Estonian stock market index. The impacts of real GDP, the exchange rate, the lending rate, and the German stock market index on the Estonian stock market index in percent are larger than the impacts of the debt/GDP ratio and the euro area government bond yield.

To test if the above regression outcomes may be spurious, the Augmented Dickey-Fuller (ADF) test on the regression residuals is applied. Using the Schwarz information criterion, a lag length of two is selected. The estimated test statistic of -4.247 is greater than the critical value of -3.568 in absolute values at the 1% level. Hence, the regression results are not spurious, and these time series variables have a stable long-term relationship.

Table 1: Estimated regression of the Estonian stock market index: 2000.Q1-2013.Q3

	Coefficient	z-statistic
Debt/GDP ratio	0.361	17.076
Exchange rate	-0.756	-15.599
Real GDP	2.335	60.382
Domestic interest rate	-0.675	-12.305
Expected inflation rate	-0.026	-4.652
German stock market index	0.623	14.385
Euro area government bond yield	-0.212	-8.209
Constant	-7.027	-813.076
R-squared	0.948	
Adjusted R-squared	0.936	
Akaike information criterion	-1.013	
Schwarz information criterion	-0.612	
F-statistic	80.497	
Estimation method	GARCH	
Sample period	2000.Q1 - 2013.Q3	
Sample size	55	

Notes: The exchange rate refers to the units of the Estonian currency per U.S. dollar.

5. Summary and Conclusions

This paper has examined the impact of selected macroeconomic variables on the Estonian stock market index based on a sample during 2000.Q1-2013.Q3. A higher debt/GDP ratio, appreciation of the Estonian currency, a higher real output, a lower domestic interest rate, a lower expected inflation rate, a higher German stock market index or a lower euro area government bond yield would increase the Estonian stock market index. Real GDP has the largest percent impact whereas the euro area government bond yield has the smallest percent impact.

There are several policy implications. To maintain a healthy stock market, the authorities need to pursue a stronger currency, economic growth, and a relatively low interest rate or inflation rate.

The positive impact of the government debt/GDP ratio on the Estonian stock market index may apply when the debt/GDP ratio is within certain reasonable range. However, if the authorities would like to raise the government debt/GDP ratio beyond a certain threshold, a negative relationship may exist.

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