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Short Note

Effects of Fiscal Policy and Monetary Policy on the Stock Market in Poland

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Abstract: The focus of this paper is to examine potential impacts of fiscal and monetary policies on stock market performance in Poland. Applying the GARCH model and based on a sample during 1999.Q2 to 2012.Q4, this paper finds that Poland's stock market index is not affected by the ratio of government deficits or debt to GDP and is negatively influenced by the money market rate. The stock index and the ratio of M3 to GDP show a quadratic relationship with a critical value of 46.03%, suggesting that they have a positive relationship if the M3/GDP ratio is less than 46.03% and a negative relationship if the M3/GDP ratio is greater than 46.03%. Furthermore, Poland's stock index is positively associated with industrial production and stock market performance in Germany and the U.S. and negatively affected by the nominal effective exchange rate and the inflation rate.

Keywords: stock market index; fiscal policy; monetary policy; macroeconomic variables; GARCH

1. Introduction

The 2008–2009 global financial crisis caused severe recessions in many countries as evidenced by sharp decline in output, employment, stock prices. Poland is no exception. During the worst time period of 2007.M7–2009.M2, the general stock market index plunged 65.20%, and the WIG20 also declined 62.08%. During 2008.Q4–2009.Q2, real GDP declined 9.83% after rapid economic growth before the financial crisis. During 2008–2009, the zloty exchange rate against the U.S. dollar depreciated 22.76%. To rescue the economy, Polish authorities increased deficit spending from 41,021.9 million zloty to 77,100.0 million zloty and raised government gross debt from 691,449 million zloty to 781,859 million zloty [1].

This paper attempts to analyze the impacts of fiscal policy, monetary policy and other relevant macroeconomic and global variables on stock market performance in Poland. The paper has several different aspects. First, relevant macroeconomic and global variables are included in the paper in order to formulate the model properly. Second, the GARCH model is applied in empirical work so that any violation of classical properties of the residual will be corrected. Third, the sample includes more recent data and ends in 2012.Q4, suggesting that empirical results are more reliable and applicable in policy analysis.

2. Literature Survey

Several seminal articles have examined the relationship between stock returns or prices and relevant macroeconomic factors for advanced countries [2–8]. There are recent articles studying the relationship between stock market indexes and macroeconomic and global factors for Poland and related countries.

Samitas and Kenourgios [9] presented several findings of stock markets for the Czech Republic, Hungary, Poland and Slovakia: first, domestic economic activities in these countries and the German factor are more important in influencing the stock index than the U.S. global factor; second, domestic industrial production has more effect on the stock index than the domestic interest rate; and third, the U.S. interest rate has more impact on the stock index than U.S. industrial production.

Hanousek and Filer [10] revealed that based on the contemporaneous or lagged values, Poland's stock index is not correlated with the U.S. DJIA or German DAX. Wang and Moore [11] found significant correlation between the stock markets in the Czech Republic, Hungary Poland and the eurozone market during and after the financial crises. The accession to the European Union has strengthened the linkage. Dajcman, Festic and Kavkler [12] showed that the Central and Eastern European (CEE) stock markets exhibited a lower degree of comovement between themselves and were less interdependent than European stock markets in the developed countries (France, the UK, Germany and Austria). Kizys and Pierdzioch [13] reported that long-run linkages between stock markets in CEE countries and the U.S. stock market intensified in both fundamentals and speculative bubbles during the financial crisis in 2008.

Morales [14] showed that for four CEE countries including Poland, there is lack of support for significant spillovers from exchange rate changes to stock returns or from stock returns to exchange rates. Yartey [15] indicated that the ratio of stock market capitalization to GDP for 42 emerging markets including Poland during 1990–2004 had a positive relationship with per capita GDP, investments and capital flows and is not affected by the real interest rate and the inflation rate.

Horobet and Dumitrescu [16] showed the real stock index for Poland has a positive relationship with real GDP, the CPI and the real interest rate and a negative relationship with M1 money supply and the real effective exchange rate. Tangjitprom [17] indicated that although the results of reviewed articles are mixed, most studies have shown evidence that there are significant relationships between macroeconomic variables and stock returns.

Charpe *et al.* [18] presented an integrated macroeconomic model with a focus on the financial markets and showed that unconventional monetary and fiscal policies need to be applied to pursue a stable macroeconomy.

3. Theoretical Model

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

$$SP = f(FP, IR, MY, OP, EX, INF, SPG, SPUS) \quad (1)$$

where SP = the stock market index in Poland; FP = fiscal policy; IR = the policy interest rate; MY = the money supply as a percent of GDP; OP = real output; EX = the nominal effective exchange rate; INF = the inflation rate; SPG = the stock market index in Germany; and SPUS = the stock market index in the U.S.

We expect that Poland's stock market index has a positive relationship with real output, the German stock market index and the U.S. market index [19], a negative relationship with the policy interest rate and the inflation rate, and an unclear relationship with fiscal policy, the ratio of the money supply to GDP and the nominal effective exchange rate.

To provide adequate services and stimulate an economy, many central governments rely on deficit spending by selling government bonds in the open market. If government deficits are relatively small and within internationally accepted standard, government deficits should not cause any adverse effect on stock market performance. However, if government deficits are huge, selling of large amount of government bonds will raise bond yields and long-term interest rates, causing investment spending in the private sector to decline, business activities to slow down, and profits and stock prices to decline [20,21].

In the quantity theory of money, if we assume that the velocity is a constant, we can show that the inflation rate is equal to the difference between the percent increase in the money supply and the percent increase in real GDP. Proper increase in the money supply to accommodate economic growth would not cause too much concern. However, if the money supply rises far greater than economic growth, we will face high inflation. A higher inflation results in a higher interest rate, which is expected to reduce the value of financial stocks [3,6,7,22].

As the zloty depreciates, the potential positive impact includes more exports. On the other hand, there are potential negative effects including higher import costs, higher domestic inflation, and capital outflows to other countries [23,24].

4. Data Sources and Results

All the data were collected from the July 2013 issue of the *International Financial Statistics*, International Monetary Fund. SP is represented by the share price with 2005 as the base year. The ratio of government deficits to GDP is used as a proxy for fiscal policy. The money market rate is selected to represent the policy interest rate. The ratio of M3 money to GDP is chosen to represent MY. Industrial production is used to represent real output because real GDP and some variables have a high degree of multicollinearity, resulting in a change in signs and the insignificance of some coefficients. EX is represented by the nominal effective exchange rate. An increase means appreciation, and *vice versa*. INF is measured by the percent change in the consumer price index (CPI). The share price in Germany (SPG) and the share price in the U.S. (SPUS) are selected to represent two major global stock market indexes. The sample period ranges from 1999.Q2 to 2012.Q4.

An analysis of the sample data finds that the stock index and the ratio of the money supply to GDP exhibit a bell-shaped quadratic relationship, meaning that a higher ratio of the money supply to GDP would initially raise the stock index and then reduce the stock index after a critical value of the ratio of the money supply to GDP is reached. Hence, MY and MY^2 are used to capture the possible quadratic relationship.

The augmented Dickey-Fuller test is performed to determine whether these variables are cointegrated. The value of the test statistic is -5.5708 , and the critical value is -3.5627 at the 1% level. Hence, these time series variables are cointegrated and have a stable long-term relationship.

The GARCH process is employed in estimating regression parameters. Table 1 presents estimated coefficients, Z-ratios, and other related statistics. As shown, the value of adjusted R -squared is 0.971, suggesting that 97.1% of the variation in the stock index can be explained by the right-hand side variables with significant coefficients. Fiscal policy as represented by the ratio of government deficit spending to GDP has an insignificant positive coefficient, suggesting that more government deficits as a percent of GDP would not cause Poland's stock index to decline. Two monetary policy variables are significant at the 1% level. A higher money market rate will reduce the stock index. The quadratic relationship between the M3/GDP ratio and the stock market index indicates that if the M3/GDP ratio is less than 46.03%, a higher M3/GDP ratio would increase the stock market index. On the other hand, if the M3/GDP ratio is greater than 46.03%, a higher M3/GDP ratio would reduce the stock market index. The validity of the quantity theory is not required.

Table 1. Estimated regression of Poland's stock market index.

Variable	Coefficient	Z-Statistic
Constant	-600.5863	-119.0127
Deficits/GDP ratio	0.1227	0.4334
Money market rate	-4.7592	-19.6520
M3/GDP ratio	24.0992	236.3954
(M3/GDP ratio) ²	-0.2618	-84.5856
Industrial output	0.6953	6.0625
Nominal effective exchange rate	-0.2228	-3.5473
Inflation rate	-4.7392	-9.2078
Stock index in Germany	0.9100	24.4260
Stock index in the U.S.	0.4430	4.6456
Adjusted R -squared	0.971	
AIC	47.8179	
Schwarz criterion	7.1530	
F -statistic	165.9291	
Sample period	1999.Q2–2012.Q4	
Sample size	55	

Notes: Except for the insignificant coefficient of the ratio of government deficits to GDP, all other coefficients are significant at the 1% level.

In addition, the stock index is positively associated with industrial production and stock market indexes in Germany and the U.S. and negatively influenced by the nominal effective exchange rate and the inflation rate. The significant negative sign of the nominal effective exchange rate indicates that

depreciation of the zloty would help Poland's stock market performance because positive effects of zloty depreciation would be greater than its negative impacts. Poland's stock market is closely related to the two major global stock markets. The German stock market has a greater impact on Poland's stock market performance than the U.S. stock market mainly because Poland is a member state of the EU and the proximity of the two countries.

Several other versions were examined and estimated. When real GDP replaces industrial production, the coefficients of real GDP, the nominal effective exchange rate and the inflation rate are insignificant because of a high degree of multicollinearity among these variables. When we substitute the ratio of government debt to GDP for the ratio of government deficits to GDP, the coefficient is insignificantly negative, and other results are similar. If the zloty exchange rate *versus* the U.S. dollar (PLN/USD) is chosen to replace the nominal effective exchange rate, the coefficient of the PLN/USD exchange rate is positive but insignificant. An analysis of the scatter diagram between these two variables indicates that they have a nonlinear relationship, which may not be captured by a linear relationship in regression analysis. In comparison with the estimated regression reported in Table 1, the regression with real GDP has a slightly smaller value for the AIC but a slightly higher value for the Schwarz criterion, and the regressions with the debt/GDP ratio and the zloty/USD exchange rate have greater values for the AIC and Schwarz criterion. These results will be made available upon request.

5. Conclusions

The paper has examined the impacts of fiscal policy, monetary policy and other related macroeconomic and global variables on Poland's stock market performance. The GARCH process is applied. Fiscal policy as measured by the ratio of government deficits or debt to GDP does not have any significant impact on the stock index. Monetary tightening based on a higher policy interest rate has a negative impact on the stock index. Monetary easing based on the ratio of M3 to GDP has a positive or negative impact on the stock index, depending on whether the ratio is less or greater than the critical value of 46.03%. Furthermore, Poland's stock market index has a positive relationship with output and stock market performance in Germany and the U.S. and a negative relationship with the nominal effective exchange rate and the inflation rate.

There are several policy implications. Poland's stock market is affected by domestic and external factors. Polish authorities have some discretion to determine the magnitude of some of the domestic factors such as the amount of government debt and deficits, the interest rate level, the money supply, output, *etc.* External factors such as global stock market movements and exchange rates are beyond the control of Polish authorities. During the financial crisis of 2008.Q3–2009.Q4, the Bank of Poland lowered the money market rate from 6.01% to 2.77% and the refinancing rate from 8.5% to 6.0%. The expansionary monetary policy is expected to stimulate the stock market. Expansionary fiscal policy in the form of more government deficit spending during 2008–2010 increased aggregate demand and real GDP. Although the ratio of government deficit spending to GDP rose from 3.22% in 2008 to 5.75% in 2009 and 5.38% in 2010, it dropped to the pre-crisis level of 3.34% in 2011 and 3.17% in 2012.

Although the coefficient of the deficit/GDP or debt/GDP ratio is insignificant, it may become significant if the deficit/GDP or debt/GDP ratio rises rapidly. The nonlinear relationship between the stock market index and the M3/GDP ratio suggests that a rapid increase in the money supply relative to GDP beyond a certain critical value would be harmful to the stock market.

Conflicts of Interest

The author declares no conflict of interest.

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