

# The Stock Market and Macroeconomic Variables in New Zealand and Policy Implications

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**Abstract:** This paper examines the effects of selected macroeconomic variables on the New Zealand stock market. The exponential GARCH (Nelson, 1991) model is applied. It finds that New Zealand's stock market index is positively influenced by real GDP and the world stock market index and negatively affected by the ratio of the government debt to GDP, the domestic real interest rate, the nominal NZD/USD exchange rate, the domestic expected inflation rate, and the U.S. government bond yield. There is a structural break for the relationship between the stock market index and the M3/GDP ratio, being positive during 1994.Q1-2007.Q4 and negative during 2008.Q1-2010.Q2. Therefore, to maintain a robust stock market, the authorities are expected to pursue economic growth, fiscal prudence, a proper ratio of the money supply to GDP, a lower real interest rate, appreciation of the New Zealand dollar, and/or a lower expected inflation rate.

**Keywords:** Stock market, Monetary policy, Fiscal policy, Interest rates, Exchange rates, Inflation

**JEL Classification:** E44, G15

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## 1. Introduction

The recent global financial crisis had caused New Zealand to suffer a substantial decline in the value of financial assets including stocks. The NZX 50 index dropped 44.2% during October 2007 – March 2009, which was better than the 56.8% decline of S&P 500 during its recent worst-performing period. By March 2012, the NZX 50 index was still 20.4% below the pre-crisis high. The substantial decline in stock prices is expected to result in negative impacts on household consumption spending through the wealth effect, business investment spending through Tobin's q theory and the balance-sheet effect, international capital flows, the demand for money, and other business and economic variables.

This paper examines the impacts of selected economic variables on the New Zealand stock market with the following focuses. First, the paper presents theoretical analysis to find the possible relationship between the stock market index and the government debt, the money supply or the exchange rate. Second,

this study incorporates the world stock market index and the world interest rate as the New Zealand stock market is expected to be affected by the world stock market and as international investors compare the attractiveness of financial assets in different countries in order to increase the rate of return on their financial assets. Third, the exponential GARCH (Nelson, 1991) model is applied in empirical work in order to estimate the variance equation properly.

## **2. Literature Survey**

Several recent studies have examined the impacts of selected macroeconomic variables on the stock market index for New Zealand and related countries. Durham (2001) studies the relationship between stock market performance and monetary policy for 16 countries including New Zealand. He shows that the effect of monetary policy changes is less sturdy, becomes weaker and is diminishing when alternative measures of monetary policy is considered.

Studying the long-term relationship between real stock returns and inflation for 16 industrial countries including New Zealand, Rapach (2002) reveals that there is lack of evidence of a negative response of real stock returns to a permanent shock to inflation and that there is support for a neutral relationship between real stock returns and inflation.

Eichengreen and Tong (2003) investigate stock market volatility and selected macroeconomic variables for 12 industrial countries including New Zealand and 11 emerging markets. They show that for New Zealand, stock return volatility decreases initially, rises later, and then declines again. There is unit root before spline, and there is no unit root after spline. They also indicate that stock market volatility is associated with monetary policy volatility and that a fixed exchange rate system results in a lower stock market volatility than a flexible exchange rate system.

Based on the Johansen test, Narayan and Smyth (2005) report that New Zealand's stock market and any of the stock markets in Australia and the G7 countries do not have a long-term relationship, suggesting that international investors may engage in portfolio diversification in order to reduce the risk.

Gan, Lee, Yong and Zhang (2006) examine the New Zealand stock index based on seven macroeconomic variables and a sample during 1990-2003. They find lack of support for the argument that the stock index is a leading indicator for other macroeconomic factors. They show that most of the variance in the stock index can be explained by the lagged stock index, the interest rates, the M1 money supply and real GDP whereas the exchange rate, the inflation rate and the domestic retail oil price play minor roles after two years.

Maghrebi, Holmes and Pentecost (2006) analyze stock market and exchange market volatility for the Pacific Basin countries including New Zealand. They find that stock market volatility is more sensitive to currency depreciation than appreciation and more sensitive to bad news about stocks than good news and

that currency depreciation combined with bad news about stocks are expected to produce higher volatility in the currency market.

Choi, Fang and Fu (2007) show that before the 1997 stock market crash, a higher exchange rate volatility is associated with a lower stock market volatility whereas after the 1997 stock market crash, these volatility spillovers changed to a positive relationship. Before the 1997 stock market crash, stock market volatility spillovers significantly to NZD foreign exchange market but not after.

Kim and Nguyen (2009) study the impacts of monetary policy news of increased interest rates on returns and return volatility for 12 Asia-Pacific countries. For New Zealand, the Fed news does not affect stock returns but increases return volatility whereas the ECB news reduces stock returns but increases return volatility.

### 3. The Model

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

$$N = Z(Y, D, M, R, \varepsilon, \pi^e, S^*, R^*) \quad (1)$$

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where

- N = the stock market index in New Zealand,
- Y = real output,
- D = the government debt,
- M = the money supply,
- R = domestic real interest rate,
- $\varepsilon$  = the NZD/USD exchange rate (An increase means a depreciation of the New Zealand dollar.),
- $\pi^e$  = the expected inflation rate,
- $S^*$  = the world stock market index, and
- $R^*$  = the world interest rate.

We expect that in the long run, the New Zealand stock market index has a positive relationship with real output and the world stock market index, a negative relationship with the domestic real interest rate, and an unclear relationship with the government debt, the money supply, the NZD/USD exchange rate, the expected inflation rate or the world interest rate.

More government debt or deficit is expected to increase aggregate expenditures (AE) and business opportunities at least in the short run, the price level (P) and the nominal interest rate (r), the demand for financial assets including stocks (E) due to the theoretic portfolio approach, and raise tax liabilities (T) in the

future (Brunner, 1961; Cagan, 1972; Barro, 1974; Feldstein, 1982; Hoelscher, 1986; Darrat, 1990a, 1990b):

$$\frac{\partial N}{\partial D} = N_{AE}AE_D + N_P P_D + N_r r_D + N_E E_D + N_T T_D > \text{or} < 0 \quad (2)$$

where

$$AE_D > 0, P_D > 0, r_D > 0, E_D > 0, T_D > 0.$$

Because the sign of the first and fourth terms is positive whereas the sign of the remaining terms is negative, the net impact of more government deficit is unclear.

More money supply tends to change the nominal interest rate (r), increase output, the demand for stocks (E) due to the portfolio adjustment, the price level and the expected inflation rate (Bulmash and Trivoli, 1991; Abdullah and Hayworth, 1993; Dhakal, Kandil and Sharma, 1993; Mukherjee and Naka, 1995; Cheung and Lai, 1999; Wongbangpo and Sharma, 2002; Chaudhuri and Smiles, 2004; Ratanapakorn and Sharma, 2007; Humpe and Macmillan, 2009):

$$\frac{\partial N}{\partial M} = N_r r_M + N_Y Y_M + N_E E_M + N_P P_M + N_{\pi^e} \pi_M^e > \text{or} < 0 \quad (3)$$

where

$$r_M > \text{or} < 0, Y_M > 0, E_M > 0, P_M > 0, \pi_M^e > 0.$$

The sign in the first term may be negative or positive depending upon whether the liquidity effect would dominate other effects. The sign of the second and third terms is positive whereas the sign of the remaining terms is negative. Therefore, the net effect is ambiguous.

A depreciation of the New Zealand dollar is expected to increase exports (X), import costs (C) and domestic prices, and reduce international capital inflows (CI) to New Zealand (Abdullah and Hayworth, 1993; Mukherjee and Naka, 1995; Choi, 1995; Ajayi and Mougoue, 1996; Abdalla and Murinde, 1997; Nieh and Lee, 2001; Wongbangpo and Sharma, 2002; Kim, 2003):

$$\frac{\partial N}{\partial \varepsilon} = N_X X_\varepsilon + N_C C_\varepsilon + N_P P_\varepsilon + N_{CI} CI_\varepsilon > \text{or} < 0 \quad (4)$$

where

$$X_\varepsilon > 0, C_\varepsilon > 0, P_\varepsilon > 0, CI_\varepsilon < 0.$$

Since the sign of the first term in equation (4) is positive whereas the sign of the remaining terms is negative, the net impact is uncertain.

A higher expected inflation rate may increase stock prices as stocks are a hedge against inflation or reduce stock prices due to the negative impact of a higher inflation rate on economic and business activities (Fisher, 1930; Fama, 1981; Rapach, 2002). A higher world interest rate is expected to cause the New Zealand dollar to depreciate and increase its exports but reduce international capital inflows to New Zealand and the demand for financial assets including stocks.

A preliminary analysis of the data indicates that the New Zealand stock market index and the ratio of the money supply to GDP exhibit a structural break after 2007.Q4. Hence, the following equation including the intercept and interactive binary variables is estimated in empirical work:

$$N = Z(Y, D, B, M, B \times M, R, \varepsilon, \pi^e, S^*, R^*) \quad (5)$$

where B is a binary variable with a value of 0 during 1994.Q1-2007.Q4 and 1 during 2008.Q1-2010.Q2.

#### 4. Empirical Results

All the data were collected from the *International Financial Statistics* (IFS). N is represented by the share price index for New Zealand with 2005 as the base year. Y is represented by real GDP measured as an index at the 2005 price. D is measured by the government debt as a percent of GDP. M is represented by the M3 money supply as a percent of GDP. R is measured by the difference between the money market rate and the inflation rate.  $\varepsilon$  is represented by the NZD/USD exchange rate. An increase means a depreciation of the NZD versus the U.S. dollar.  $\pi^e$  is measured by the average inflation rate of the past four quarters derived from the consumer price index.  $S^*$  is represented by the U.S. or U.K. share price index with 2005 as the base year.  $R^*$  is represented by the 10-year U.S. government bond yield. Except for the domestic real interest rate, the expected inflation rate and the binary variable with potential negative or zero value, the logarithmic scale is used. The sample ranges from 1994.Q1 to 2010.Q2. Quarterly data for M3 before 1994.Q1 are not available.

The ADF unit root test shows that except for the ratio of the government deficit to GDP, the ratio of M3 to GDP and the U.S. stock market index, all other variables in level do not have unit roots and that all the variables in first difference are stationary at the 1% or 5% level. In order to determine whether the regression may be spurious, the ADF test on the regression residuals is performed. Based on the AIC, a lag length of 0 is selected. The critical value at the 1% significance level is -2.584, and the test statistic is -2.983. Hence, these time series variables are cointegrated and have a long-term stable relationship.

The exponential GARCH or EGARCH (Nelson, 1991) model is applied in empirical work in order to estimate the variance equation properly. Table 1 presents estimated parameters and related statistics. Figures in the parenthesis

are z-statistics. In Version (a), the value of adjusted  $R^2$  is 0.941, suggesting that 94.1% of the variation in the New Zealand stock market index can be explained by the right-hand side variables. All the coefficients are significant at the 1% level. The New Zealand stock market index is positively influenced by real GDP, the ratio of the M3 money supply to GDP during 1994.Q1-2007.Q4 and the U.K. stock market index and negatively associated with the government debt/GDP ratio, the M3/GDP ratio during 2008.Q1-2010.Q2, the domestic real interest rate, the NZD/USD exchange rate, the expected inflation rate, and the U.S. government bond yield. The negative sign of the U.S. stock market index is attributable to multicollinearity.

The New Zealand stock market index appears to be more sensitive to a percent change in real GDP or the M3/GDP ratio during 2008.Q1-2010.Q2 than other variables. If real GDP rises 1%, the New Zealand stock market index will rise by 1.809%. A 1% increase in the M3/GDP ratio during 2008.Q1-2010.Q2 will reduce the New Zealand stock market index by 1.715%.

The significant negative coefficient of the government debt/GDP ratio suggests that negative impacts on higher prices, interest rates and future tax burdens outweigh positive impacts on increased aggregate expenditures and the demand for stocks. The significant negative coefficient of the NZD/USD exchange rate indicates that the negative impacts on increased import costs and domestic prices and reduced international capital inflows dominate the positive impact on increased exports.

In Version (b), the U.S. stock market index is deleted from the regression due to its unexpected sign. The sign and significance of other coefficients remain unchanged. The value of adjusted  $R^2$  is 0.940, suggesting that the removal of the U.S. stock market index would not change the explanatory power much. In Version (c), if the intercept and interactive binary variables are not included, the negative coefficient of the M3/GDP ratio is significant at the 1% level, indicating that the positive significant relationship found in Version I during 1994.Q1-2007.Q4 will be overlooked. The value of adjusted  $R^2$  is 0.917. Except that the negative coefficient of the U.S. government bond yield is insignificant at the 10% level, other results are similar.

## **5. Summary and Conclusions**

This study has examined the relationship between the New Zealand stock market index and selected macroeconomic variables. The EGAECH model is employed in estimating the variance equation. More real GDP, a lower ratio of the government debt to GDP, a lower domestic real interest rate, appreciation of the NZD, a lower expected inflation rate, a higher U.K. stock price, or a lower U.S. government bond yield would help the New Zealand stock market. A higher ratio of M3 to GDP will help the stock market during 1994.Q1-2010.Q2 whereas a lower ratio of M3 to GDP will help the stock market during 2008.Q1-2010.Q2.

In comparison, none of the surveyed studies has examined the effect of the ratio of the government debt to GDP on the stock market index and the nonlinear relationship between the stock market index and the ratio of the money supply to GDP. The results for real GDP, the exchange rate and the expected inflation rate in this study are consistent with Gan, Lee, Yong and Zhang (2006). The negative significant coefficient of the domestic real money market rate is consistent with Eichengreen and Tong (2003) but different from Gan, Lee, Yong and Zhang (2006), who find a positive response of the stock market index to a shock to the short-term interest rate in the long run. The finding of a negative significant coefficient of the expected inflation rate is different from that of Rapach (2002). The cointegrated long-term relationship among the variables including the U.S. and U.K. stock market indexes is in contrast with Narayan and Smyth (2006). Some of the different results are attributable to different measures of the variables, methodologies, sample periods, and model specifications.

There are major policy implications. Macroeconomic policies are expected to affect the New Zealand stock market. To maintain a robust stock market, the authorities are expected to pursue economic growth, fiscal discipline, a proper ratio of the money supply to GDP, a lower real interest rate, appreciation of the NZD and/or a lower inflation rate. The authorities need to monitor the developments in the world financial market such as movements in major world stock markets and interest rates since they also affect the New Zealand stock market performance.

## Endnotes

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**Table 1.** Estimated regressions of the New Zealand stock market index: 1994.Q1-2010.Q2

<b>Explanatory variables</b>	<b>(a)</b>	<b>(b)</b>	<b>(c)</b>
Log(Real GDP)	1.809* (26.985)	1.344* (17.444)	2.072* (16.291)
Log(Government debt/GDP ratio)	-0.469* (-22.763)	-0.484* (-20.284)	-0.425* (-10.257)
Intercept binary variable	7.415* (8.025)	5.369* (7.598)	
Log(M3/GDP ratio)	0.809* (10.348)	0.687* (7.134)	-0.558* (-4.791)
Binary variable x Log(M3/GDP ratio)	-1.715* (-8.321)	-1.233* (-7.185)	
Domestic real interest rate	-0.007* (-7.864)	-0.004* (-3.237)	-0.004* (-2.958)
Log(NZD/USD exchange rate)	-0.334* (-30.802)	-0.415* (-21.325)	-0.343* (-12.324)
Expected inflation rate	-0.074* (-14.351)	-0.044* (-4.431)	-0.032* (-1.933)
Log(U.S. stock market index)	-0.401* (-21.486)		
Log(U.K. stock market index)	0.612* (26.373)	0.242* (12.365)	0.182* (6.419)
Log(U.S. government bond yield)	-0.158* (-7.506)	-0.097* (-3.570)	-0.006 (-0.096)
Constant	-6.369* (-18.095)	-3.933* (-48.426)	-1.944* (-2.227)
Adjusted R <sup>2</sup>	0.941	0.940	0.917
F-statistic	74.776	79.652	66.244
AIC	-2.686	-2.263	-2.206
SC	-2.188	-1.798	-1.808
Estimation method	EGARCH	EGARCH	EGARCH

Notes:

The dependent variable is log of New Zealand stock market index.

The asterisk \* means that the coefficient is significant at the 1% level.