Do Macroeconomic Fundamentals Matter for Stock Returns in Australia and New Zealand?

Carol Cheong, Faculty of Agribusiness and Commerce, Lincoln University,
P O Box 85084, Lincoln 7647, New Zealand
Tel: +(643) 423 0289, E-mail: carol.cheong@lincoln.ac.nz

Sazali Abidin, Faculty of Agribusiness and Commerce, Lincoln University,
P O Box 85084, Lincoln 7647, New Zealand
Tel: +(643) 423 0286, E-mail: sazali.abidin@lincoln.ac.nz

Abstract

In modern financial theory, macroeconomic fundamentals play an important part in the value of stock prices. This paper investigates the relationship between macroeconomic fundamentals and stock prices in the Australasian context, analysing both the Australian and New Zealand stock markets. The data set contains monthly observations from 1995 to 2017 and as such, the macroeconomic conditions of the Global Financial Crisis are taken into account in our analysis. Vector Auto Regressions (VAR) were used to examine the sensitivities of the macroeconomic variables to the stock price indices. From the analysis, it was found that both New Zealand and Australia have fundamental economic variables that explain stock returns. However, none of the lags of the variables were found to be statistically significant in any of the models. This conforms to financial theory. Efficient markets adjust to information quickly and the intrinsic value of shares on the two exchanges are affected by current and future expected macroeconomic factors. While the length of the study provides many different stock market conditions, extreme market conditions such as the Global Financial Crisis (GFC) limit the power of the regressions.

JEL Classification - G15 - International Financial Markets

Keywords: Macroeconomic; Vector Auto Regressions; stock returns; Global Financial Crisis

1.0 Introduction

In modern financial theory, macroeconomic fundamentals play an important part in the value of stock prices. Using traditional equity valuation models, such as the dividend discount model, the overall health of the wider economy has a direct effect on the future free cash flows of companies. Variability in market interest rate, as well as inflation and the risk premium, affects the discount rate of firms' cash flows. Thus, the changes in these macroeconomic variables should be directly related to changes in stock prices in efficient market, but does this classical financial theory hold in reality?

This paper investigates the relationships between macroeconomic fundamentals and stock prices in the Australasian context, analysing both the Australian and New Zealand stock markets based on the methodology of Laopodis, Merika, and Triantafyllou (2013) and their application to various world economies. The aim of the paper is to gain unique results to the two economies and compare them to existing literature to see whether there is a significant difference between economies. The data set contains monthly observations from 1995 to 2017 and as such, macroeconomic conditions of the Global Financial Crisis are taken into account in the analysis. Vector Auto Regressions (VAR) are used to examine the sensitivities of the macroeconomic variables to the stock price indices. The regression uses proxies for the economic activity variables, employing consumer and business confidence indices as well as proxies for industrial production and Real GDP to gain an overview of the activity of the economy. Both long term and short term interest rates will be used in the regression as well as CPI inflation to represent the discount factor of the equity models.

Both Dickey-Fuller unit root testing and Johansen Cointegration testing will take place to test for stationarity and non-stationary data series will be converted using quarterly growth rates or absolute changes. Diagnostic testing will be used to test the appropriateness of the model, in particular, testing for heteroskedasticity, structural breaks and parameter adequacy issues of the model.

The paper is presented in the following manner. A literature review will investigate various academics opinions on macroeconomic fundamentals relationships with stock prices. The data set constituents as well as results of the stationarity tests are then discussed. This is followed by a presentation on the method of the study, the results of the VAR analysis, and the different sensitivities of the macroeconomic fundamentals discussed in relation to financial theory. Finally, the study is summarised and a conclusion is presented on how macroeconomic fundamentals are empirically linked to stock market returns in New Zealand and Australian markets.

2.0 Literature Review

Stock markets are highly complex and evolved platforms where investors buy and sell various types of assets. In theory, stock market returns should be highly correlated with economic fundamentals. However in reality this might not be the case due to the complex

nature of stock returns and the multiple factors that affect its return. This review will look at various economic fundamental variables to determine if a correlation exists with the stock market. Lastly, a conclusion will be drawn to try and determine how strong the correlation exists between fundamentals and stock returns.

Corporate earnings are a strong fundamental economic factors that directly affect stock returns. According to Baresa (2013), high corporate earnings can indicate a firm is in a strong financial position, is being managed effectively and is on the right path for the future. As a result, when firms are experiencing increasing profits, it is a strong indication that the company is a good investment for potential investors. This is positive news for investors as investors generally invest in stocks that are financially sound and has a strong dividend payout. As a result, a positive correlation between positive earnings and positive stock returns should exist. Empirically evidence is able to show this direct relationship. In addition to strong corporate earnings positively impacting stock returns, economic growth is also a strong fundamental economic factor that can affect stock returns.

Economic growth refers to an increase in the production of goods and services in an economy. This factor can be used to help explain a relationship between fundamentals variables and stock returns. Economic growth occurs when consumption, investment and government spending along with export receipts are high and increasing (Engale, Ghysels, & Sohn, 2013). When these four factors are increasing, firms experience increased revenue and profit. This is because consumers are purchasing more goods, businesses are investing, governments are spending on infrastructural projects, and foreigners are purchasing more which means more is being purchased from firms in the economy. As a result, with increased revenue and profit for firms, stock prices are expected to increase as these firms appear to be financially sound and well managed. Secondly, high economic growth leads to high employment rates as firms hire more employees to meet the higher demand for their goods and services (Baresa, 2013). With more of the work force employed and earning higher incomes, household have more disposable income to invest in the stock market which leads to higher prices. Empirically this correlation can be seen. In Australia the years that reported the highest economic growth rates also posted the strongest ASX200 returns. For example in 2009 Australian GDP was 3.4% while the ASX200 reported a return of 26% (Australian Stock Market 2012). Economic growth inflationary and deflationary pressures can also significantly impact stock market returns.

Inflationary pressures is a strong economic factor that explains variations in stock market returns. According to Fama (1989), when inflation is high business profit margins generally are squeezed resulting in lower profitability. When input costs such as oil increase, firms may find it difficult to pass the costs on to consumers due to fear in loss of sales. Therefore firms in the short term absorb the increase in cost of production. As a result, profit diminishes which makes stocks of firms less attractive. Secondly, when deflationary environment exists consumers hold of purchasing goods as they will become cheaper in the future thanks to deflation (Fama, 1989). With consumption spending low firms revenues and profit are negatively affected. This leads to investors avoiding purchasing these stocks due to lower profits which ultimately impacts the stock market negatively. This empirically can be seen with the Nikkei 225. Japan after their 1989 stock market crash

experienced deflationary pressures for over a decade. Unsurprisingly the Nikkei 225 over this time averaged annual returns of -5.6% (Japan Stock Market, 2012). In addition to inflation, Consumer confidence can be used to help explain stock returns.

Consumer confidence is an index that try to gauge how optimistic consumers are about the current and future state of the economy (Adama, 2008). When consumer confidence is high it indicates consumers are confident. With high consumer confidence consumers are more likely to spend as issues like job security are not prevalent. When consumers are spending money, firms stand to benefit. In this situation, businesses can expect higher revenues and a stronger bottom line. As a result with firms earning higher profits shares in these companies stand to benefit. In addition when consumers are more confident about the future they generally are more likely to invest in stocks (Adama, 2008). The three highest monthly readings for the Australian stock market were also the same three months where consumer confidence was at its highest (Australia Stock Market, 2012). Alongside consumer confidence, interest rates can help explain stock returns.

When central banks increase their corresponding official cash rate all interest rates from mortgage repayments to credit card payments increase. This leads to consumers having less discretionary income as more income goes to paying higher interest payments (Largani et al., 2013). With consumers having less discretionary income less good and services will be purchased by consumers. Secondly higher interest payments affect businesses directly in the form of higher loan payments. As a result of these two effects businesses top and bottom line are impacted. Stock prices can be thought of as future cash flow payments from the business. With the two effects listed above future cash flows will be downgraded leading to lower stock market prices. Additionally when interest rates increase the risk free rate, which is usually a treasury bill, increases its return (Fama, 1989). With risk free rate of returns increasing in value stock returns have to increase in value to compensate for this increased safe return. As a result some stocks will now be perceived as too risky for the given return they provide. As well as interest rates oil prices can also lead to crowding out of discretionary spending.

World economies are highly dependent on the price of oil. When the price of oil increases both energy and transportation costs rise for consumers. A major expense households face is the cost of petrol as the majority of households use cars as their main form of transportation. This increase in expenses leads to less funds available for consumers to purchase other discretionary goods (Daly, 2011). For firms, higher oil prices leads to higher transportation and shipping costs. This impact can be particularly hard on firms such as FedEx or Amazon who derive majority of their income from shipping goods. Both of these factors leads to a decrease in the revenue and profit for firms in the economy. Some industries are more susceptible than others to increased oil prices such as the airline industry. In 2008 when the price of oil reached $148 US a barrel stocks worldwide and particularly airline stocks plummeted shortly after (Daly, 2011). As a result a negative correlation exists between oil prices and stock returns as oil erodes firm's profitability.
It is clear that there are many different factors that impact expected returns on stocks. Corporate earnings, economic growth and inflation expectations, consumer confidence, interest rates and oil are all clear examples of economic fundamentals that shows a strong

correlation with stock returns. All six fundamental variables can show this relationship with empirical evidence on multiple occasions in different countries. However while a relationship between these fundamental variables and stock returns exist the strength of the relationship is less known. Studies such as Largani et al., (2013) show a correlation between economic variables and stock returns at 0.25. While other studies from (Engale et al., 2013) show a higher correlation of 0.30. While these are only a couple of results, it shows that economic variables may not be the only factor in explaining stock returns. More research needs to be done to try and determine to a higher degree what correlation between fundamentals and stock returns exists.

3.0 Data and Methodology

The time series used in the analysis are sourced from DataStream. They are calculated on a quarterly basis, allowing real GDP to be used as an exogenous variable in the analysis. This does create some problems as the data set is relatively small and will create large standard errors in the regression analysis. Therefore a level of 10% significance is used throughout the time-series analysis. The data set contains observations from the second quarter of 1995 to the second quarter of 2017. Therefore, the analysis covers several market conditions which include the 1997 Asian financial crisis, the dot-com bubble in 2000 to 2001 and the global financial crisis from 2007 to 2008.

The variables in the data set have been included because of the theoretical link to share prices. The Consumer Confidence/Consumer Sentiment Indices (CC/CS), Real GDP (GDP), the Unemployment Rate (UR), and the Industrial Production Index (IPI), as well as the Trade Weighted Index (TWI) have been used as an indication of the current macroeconomic climate. These factors should effect both the future cash flows of listed companies as well as the risk premium on the discount rate of the stocks. The Official Cash Rate (OCR), the 10 year government bond yield (GBY) have been used as a proxy for the market interest rate in the economy. This should provide insight into changes in the discount factor in the equity valuation models. Lastly, the NZX/ASX All index (NZX/ASX) is used as a proxy for stock market returns. These indices are value weighted and dividend adjusted, and therefore will provide a good insight to movements in the stock market.

3.1 Stationarity Testing

For the Ordinary Least Squares assumptions to hold, the data series' must be stationary. To test for this, the Augmented Dickey Fuller (ADF) test was used on all the time-series to see if they contained unit roots. The number of lags in the analysis was based on the BIC information criterion. The test has a null hypothesis of non-stationarity and the 10% level of significance was used because of the number of observations discussed earlier. Stationarity was tested in both levels and first differences to examine whether the variables where I(0), I(1), or I(2). The findings of the test are displayed in Table 1 and Table 2. For New Zealand, all the variables apart from the consumer confidence index and CPI inflation % were found to be non-stationary. In addition all these variables were found to contain one unit root as expected so are not mean reverting.

The Australian time series had the same ADF results. All the time series were found to be I(1) apart from consumer confidence and CPI inflation. Therefore, in order to use ordinary least squares, the variables will have to be reparameterised to become stationary assuming no cointegration exists between the variables. To do this, two different approaches are used to make the analysis of the regressions easier. Interest rate variables and the unemployment rate are first differenced to examine percentage point changes effect stock market returns, while the non-stationary indices and Real GDP are converted using quarter on quarter growth rates to examine how growth in these variables effects stock market growth.

Table 1: New Zealand ADF Test

Variable	Coefficient	P Value	I(0)/ I(1) at the 10% level
Consumer Confidence	-3.494	0.0101	I(0)
Real GDP	0.5871	0.9888	I(1)
CPI Inflation %	-4.0023	0.0021	I(0)
NZX Index	-2.8567	0.0539	I(1)
OCR	-1.1271	0.6989	I(1)
Trade Weighted Index	-1.7881	0.3846	I(1)
Unemployment Rate %	-2.225	0.1986	I(1)
Industrial Production Index	-1.567	0.4960	I(1)
Govt Bond Yield 10Y	-2.0170	0.2793	I(1)

Table 2: Australia ADF Test

Variable	Coefficient	P Value	I(0)/ I(1) at the 10% level
Consumer Sentiment	-2.9744	0.0405	I(0)
Real GDP	2.3033	1.0000	I(1)
CPI Inflation	-2.772	0.0659	I(0)
ASX Index	-1.278	0.6379	I(1)
OCR	-2.513	0.1153	I(1)
Trade Weighted Index	-0.689	0.8440	I(1)
Unemployment Rate %	-1.690	0.4333	I(1)
Industrial Production Index	-0.769	0.8235	I(1)
Govt Bond Yield 10Y	-1.367	0.5958	I(1)

3.2 Cointegration Testing

Both countries are tested for cointegration using the Johansen multivariate cointegration test. Cointegration tests for the long term relationship between non-stationary variables. More specifically that the error term is stationary between the non-stationary variables. The two countries I(1) variables are tested for cointegration, using a lag length of four. The results of the test are shown in the tables below.

Table 3: Cointegration Testing

	New Zealand				Australia			
Hypothesised number of Cointegrating Equations	**Trace Statistic**	**P-Value**	**Maximum Eigen-value**	**P-Value**	**Trace Statistic**	**P-value**	**Maximum Eigen-value**	**P-Value**
None	294.7390	0.0000*	95.98105	0.0000*	0.505498	0.0000*	73.23720	0.0000*
At most 1	198.7580	0.0000*	76.19181	0.0000*	0.463312	0.0000*	64.72321	0.0000*
At most 2	122.5661	0.0000*	53.44898	0.0001*	0.304715	0.0013*	37.79703	0.0161*
At most 3	69.11716	0.0002*	35.10458	0.0045*	0.174421	0.0412*	19.93377	0.3457
At most 4	34.01259	0.0154*	16.69027	0.1871	0.170696	0.0647	19.46547	0.0841
At most 5	17.32232	0.0262*	13.71289	0.0610	0.082189	0.3350	8.919410	0.2929
At most 6	3.609426	0.0574	3.609426	0.0574	0.004026	0.5172	0.419528	0.5172

Using the maximum eigenvalue, the test concludes that New Zealand has three cointegrating equations while Australia has two cointegrating equations. This shows that the time-series are moving together over time.

Table 4: Cointegrating Equations

New Zealand

Normalized cointegrating coefficients (standard error in parentheses)						
NZX	RGDP	OCR	TWI	UNEM	PRODP	BOND10
1.000000	-0.026127	-106.5633	-5.983237	-86.59186	23.86627	10.56444
	(0.00368)	(7.32588)	(0.70591)	(12.5773)	(5.91776)	(10.8402)

Australia

Normalized cointegrating coefficients (standard error in parentheses)						
ASX	AGDP	APROD	AUNEM	ABOND10	ATWI	AOCR
1.000000	0.048909	-247.0785	1402.961	-2313.007	-51.07363	1427.596
	(0.01886)	(124.447)	(402.921)	(294.113)	(18.7429)	(254.981)

The error correction model estimated from the data provides little explanatory power so has not been included in the analysis. The equations show a high degree of consistency with existing theory. The New Zealand cointegrating equation has negative coefficients on the OCR and unemployment rate. This shows that in the long-run, these factors have a negative effect on stock returns. The industrial production index has a positive coefficient which again is consistent with existing theory. Increases in production are linked with increases in stock prices.

However, the results on Australian market do not hold with current theory. Many of the coefficients have the opposite coefficient to what is expected and may suffer from multicollinearity issues as both the 10 year bond rate and OCR have been included. While the bond rate has a negative coefficient the OCR has a positive coefficient which is inconsistent with what is expected. As both the short term and long term rates are highly correlated, the model has produced inconsistent coefficients. As a result of this, in the specific models, only one measure of interest rate will be used.

3.3 Specific Models

The specific models were created by eliminating insignificant variables in the models until only significant variables remain. In the New Zealand model, all the lags of the variables are eliminated. Although in the general model many lags are significant, the model suffered from endogeniety issues making variables appear to be significant when they are not. In the Australian model, most variables appeared to be insignificant, but the variables became more significant as lags are eliminated. Multicollinearity issues are present in the model. In addition, the overall predictive powers of the Australian model are extremely low in that its value in the analysis is limited. Results on the specific models are shown in Table 5.

Table 5: Specific Models

New Zealand

Variable	Coefficient	Standard Error	P-Value
C	0.023439	0.011984	0.1050
NZGDP	1.417570	1.303351	0.1902
NZCONS	0.298814	0.118909	0.0024
NZINT	-0.028413	0.012119	0.0347
NZIPI	-2.016412	0.854667	0.0359
NZTWI	0.684214	0.194070	0.0006
NZINF	-0.010332	0.004204	0.0162
R-squared	0.320545	**Durbin-Watson**	2.357362
Adjusted R-squared	0.276709	**Prob(F-Statistic)**	0.000002

Australia

Variable	Coefficient	Standard Error	P-Value
C	0.014461	0.007830	0.0676
AUCONS	0.337750	0.121114	0.0063
AUOCR	0.011649	0.009781	0.2364
AUTWI	0.495544	0.216316	0.0240
R-squared	0.155399	**Durbin-Watson**	2.309664
Adjusted R-squared	0.122599	**Prob(F-Statistic)**	0.001503

Both the above models have high Durbin-Watson statistics and the joint hypothesis test of all the coefficient being equal to zero is passed at the 99% level in both models using the F-statistics. Both New Zealand real GDP and the Australian official cash rate have been included in the model even though they are not statistically significant at the 90% level. This is because the removal of these variables significantly reduces the predictive powers of the model. As such, interpreting the signs of the variables should be done with caution.

3.4 Diagnostic Testing

Three diagnostic tests are conducted on the models to test the validity of the models. The Lagrange Multiplier (LM) test is used to test for serial correlation and heteroscedasticity of the error term. The regression error specification (RESET) test is used to test for the correct functional form and the Chow Test is used to test for parameter consistency. The findings of these tests on both the regressions for Australia and New Zealand are found in Table 6.

Table 6: Diagnostic Testing

Test	New Zealand (F-Probability)	Australia (F-Probability)
LM Test	0.1713	0.2381
RESET Test	0.7083	0.7800
Chow Test	0.3731	0.0258

The results in Table 6 show that the New Zealand model passes all of the diagnostic tests used using the F-Statistics. The Australian passes both the LM test and RESET tests but fails the Chow Test at the 95% level. Therefore, the model has parameter inconsistency issues. This is likely caused by the stock market crash in 2007. HAC (Heteroscedasticity Robust Standard) standard errors are used in the original specification to improve the model. The Australian models parameter inconsistency issues have not been corrected because of the poor predictive power of the variables in the data set. Therefore, interpreting the model is being done with caution.

4.0 Findings and Discussions

From the diagnostic testing, the study confidently concludes that both New Zealand and Australia have fundamental economic variables that can help explain stock returns. For New Zealand, with the exception of NZGDP, all the variables in Table 6 are significant to at least the 90% level. This indicates that the study can conclude that these variables are significant and do indeed help explain stock returns. Studying the fundamental variables closer from Table 6, with the exception of New Zealand industry production index (NZIPI), all the variables have the relationship expected with stock returns. For Australia, with the exception of the Australian OCR, the study found all variables are significant to the 95% level. Thus, the study also concludes that a relationship between Australian fundamental values and stock returns exists. All three of the variables studied from Australia have a

relationship as expected in economic theory. These results are important as it allows the study to have confidence in concluding that economic fundamental variables can explain stock returns.

However, studying the coefficient of determination for both New Zealand and Australia shows that the relationship between fundamentals and stock returns is weak. For New Zealand, the Coefficient of Determination was 0.32 while Australia was even lower with a value of 0.15. Both values indicate a weak relationship and suggest that less than 32% of changes in stock returns can be explained by the fundamental variables used in this report. As a result, either other fundamental variables need to be explored or possibly non fundamental variables such as speculation might be used to explain stock returns. When comparing the results to the results of other similar studies, this study found that the coefficient of determination is almost similar. Studying the F statistic for New Zealand and Australia, both had values virtually zero. New Zealand has an F statistic of 0.00002 whereas Australia had an F statistic of 0.0015. As both values are virtually zero, it can be concluded that the fundamental variables and the stock returns have the same variances.

The results on Durbin Watson statistics for New Zealand and Australia show that both countries time series have slightly positive autocorrelation. For New Zealand, the Durbin Watson statistic was 2.35 while for Australia it was 2.30. A Durbin Watson statistic of 2 indicates zero autocorrelation while a Durbin Watson Statistic of 4 indicates perfect positive autocorrelation. As both Australia and New Zealand had values near 2, we can conclude that both countries have low level of positive autocorrelation.

In a similar study on the New Zealand stock market by Lee, Yong & Zhang (2006), the authors found that country specific macroeconomic fundamentals may be a key indicator to the behaviour of the stock market. As New Zealand is dependent on exports, macroeconomic variables of their major trading partners could be correlated with stock market returns. Lee, Yong, & Zhang (2006) argue that since the New Zealand stock market is comparatively small relative to the stock market of other developed countries, the New Zealand stock market might also be very sensitive to global macroeconomic factors or the macroeconomic factors of its major trading partners. Australia is a larger economy than New Zealand and its economy is less dependent on exports. Therefore, the explanatory power of the Australian regression should be lesser as stock returns have a lesser correlation with macroeconomic fundamentals in the economy. The New Zealand stock market appears to move with the Australian stock market but is more volatile. The New Zealand stock market reacted far more severely to the 1987 stock market crash than the Australian stock market. In Chaudhuri and Smiles (2004), the author suggest that inclusion of U.S variation in stock prices may help in improving the models.

5.0 Conclusion

This paper investigates the relationship between macroeconomic fundamentals and stock market returns in Australasia between 1995 and 2017. The macroeconomic theory behind the study comes from classical equity valuation models. In theory, macroeconomic

fundamentals should play a major part in stock market returns. This study investigates whether empirically, the models hold for Australia and New Zealand.

The linkage between macroeconomic fundamentals and stock market returns has been a popular topic in finance literature. The report draws on classical literature from Fama and contemporary studies from Hou (2011) as well as Baresa (2013) where past studies have found significant empirical linkages between fundamentals and stock returns. The methodology of this study was based on that of Laopodis, Merika, and Triantafyllou (2013). The macroeconomic variables were chosen for their theoretical link to stock returns. Unit-root testing took place on the data to test whether the time series were stationarity. Cointegration testing found that both countries' macroeconomic variables had a long-run relationship.

Two regressions are created to capture the relationships between the variables. The New Zealand model has strong results consistent with current economic theory. All the variables in the New Zealand regression apart from the industrial production index has the expected sign on their coefficients. The Australian model has less statistically significant variables in the final specification with all the variables except the OCR having the expected signs on the coefficients. None of the lags of the variables are found to be statistically significant in any of the models. This conforms to most financial theory. Efficient markets adjust to information quickly and the intrinsic value of shares on the two exchanges should be affected by current and future expected macroeconomic factors. Therefore, if lags of the variables are found to be statistically significant, it would oppose current financial theory, and the markets in Australia and New Zealand would prove to be inefficient. Overall, this study confirms that macroeconomic fundamentals do matter for stock returns in Australia and New Zealand.

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