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## Corporate Earnings, Inflation and Real Output: Empirical Evidence From Australia

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### Abstract

Until recently economists were worried about the deflation. Meanwhile, the global inflation outlook seems to have changed dramatically. Many investors now do fear a significant acceleration of inflationary pressures and are trying to protect themselves against increasing inflation rates by, for example, buying stocks. Conventional wisdom does indeed suggest that stocks are a claim on real capital and therefore may be a useful hedge against inflation. A more detailed discussion of the relationship between inflation and the stock market requires to focus on corporate earnings. This paper analyzes the relationship between corporate earnings, inflation and real output in Australia by using the VECM methodology.

**Keywords:** Inflation, Stock Markets, Corporate Earnings

**Jel-Codes:** E31, E44, G12

### Introduction

Until recently many investors seemed to fear that the global economy will fall into a deflation due to the U.S. recession and the crisis of the international financial system. These fears had major consequences for financial markets and simultaneously pushed down share prices and government bond yields. In the U.S., for example, the S&P 500 plunged below the mark of 700 points and the yield on 10 year U.S. Treasuries temporarily fell to a level of about 2%. Meanwhile, the global inflation outlook has changed dramatically and many investors now seem to believe that inflation will accelerate significantly in the medium term. Most notably, Alan Greenspan the former chairman of the Federal Reserve recently discussed the outlook for the U.S. economy in the next few years and warned that there is a danger of double digit inflation rates to be seen again (e.g., Joshi and Sircar (2009)). This scenario is mainly based on two factors closely related to economic policy. First of all, aggressive interest rate cuts have been implemented by the U.S. Federal Reserve and numerous other central banks. The activities of central bankers were not limited to cutting interest rates; additional measures were taken to respond to the money market tensions by not only reducing the price of money (short term interest rates)

but also by supplying ample liquidity (quantitative easing). At this point it is important to note that the Federal Reserve itself does not seem to be sure about the future consequences of quantitative easing (see Gavin (2008)). Central bankers from all around the world clearly do fear inflationary pressures. Most notably, the Reserve Bank of Australia decided to raise the cash rate in 2009 arguing that interest rates are extraordinary low, the global economy seems to improve and inflation in Australia is close to the target level (see Stevens (2009)). This is the first tightening move of a major central bank

Additionally, fiscal stimulus programs which further increase the level of public debt in many countries may fuel these inflationary pressures. Economic theory indeed does suggest that expansionary impulses from monetary and fiscal policy can cause inflation (e.g., Sims (1994) and Woodford (2000)). Moreover, a rising oil price and the recovering U.S. economy will also have effects on the price level in the U.S. and other countries. This changing macroeconomic environment does, of course, affect financial markets as well. In fact, some investors are trying to protect themselves from increasing inflation rates by, for example, buying stocks.

## Literature Review

Many investors seem to believe that stocks can be a useful hedge against inflation. As a matter of fact, conventional wisdom suggests that stocks are a claim on real capital. A more detailed discussion of the relationship between inflation and the stock market requires financial economists to focus on corporate earnings. Generally speaking, firms can more easily increase revenues in an macroeconomic environment that is characterized by rising inflation rates. In other words, corporate profits should grow with inflation over time. This leads to higher nominal earnings helping to stabilize real earnings. However, the empirical evidence reported in the 1970s seems to suggest that equity returns and inflation rates are negatively correlated (e.g., Bodie (1976) and Fama and Schwert (1977)). These findings have more recently been confirmed by Reilly (1997). Using sophisticated estimation techniques some econometricians have documented empirical evidence indicating that stocks may be a long term hedge against inflation (e.g., Boudoukha and Richardson (1993) and Kolari and Anari (2001)). Still, the negative short term relationship between inflation and equity returns documented in the literature remains to be puzzling for some economists.

In fact, the theory of finance does have problems to explain this negative correlation. Feldstein (1982) has noted that in the U.S. inflation has increased the tax burden of firms. Moreover, inflation distorts the price system and increases transaction costs. As a consequence, high inflation rates may retard economic growth (e.g., Barro (1996) and Faria and Carneiro (2001)). Fama (1981) has suggested that the observed negative relationship between inflation and stock returns is the result of a positive relationship between stock returns and future economic growth and an inverse relationship between future economic growth and inflation. Accepting this point of view, inflation would only be a proxy for economic growth and the negative relationship between inflation and stock returns should be interpreted with great caution. This is the so called proxy hypothesis. However, the empirical evidence

reported in the literature is not necessarily supportive of this hypothesis (e.g., Liu, Hsueh, and Clayton (1993) and Balduzzi (1995)).

Using the traditional present value model as starting point Gordon and Hochman (1979) have made suggestions which conditions lead to positive correlations between equity returns and inflation and which lead to negative correlations. Following Campbell and Shiller (1988) it has been argued that two countervailing trends are present (e.g., Schotman and Schweitzer (2000) and Basse (2009)). First of all, inflation raises corporate earnings in nominal terms and therefore (by increasing expected future dividend payments) has a positive effect on stock prices. However, there is also a negative effect because inflation increases the discount rate via the Fisher effect thus lowering stock prices. These two effects are called earnings channel and discount rate channel (e.g., Sharpe (2002)).

Conventional wisdom suggests that the earnings channel can protect investors from expected and unexpected increases to inflation rates because corporate earnings tend to rise with inflation. However, Fons and Osterberg (1986) have noted that firms typically are not able to match declines of profits with declines of expenses in a deflationary or disinflationary environment. More recently, Sharpe (2002) has argued that inflation is negative for stock prices because it lowers expected real earnings growth and increases the real required return. Phrased somewhat differently, inflation may affect stock prices in a negative way by hurting the future earnings potential of the corporate sector (via its effect on real growth) and by increasing the discount rate. Quite clearly, equities can only be a useful hedge against inflation when there is a positive reaction of corporate earnings to a rising inflationary pressures.

## Data and Methodology

Inflation is measured using the Australian GDP price deflator which is reported on a quarterly basis by the Australian Bureau of Statistics. This index is a broad

gauge of changes to the general price level in Australia. The measure of real economic activity used in this study is real GDP which is also published on a quarterly basis by the Australian Bureau of Statistics. Given the question analysed here it is quite reasonable to take a macroeconomic perspective by examining the earnings per index share of the S&P/ASX 200 index. This index is a market-capitalisation weighted and float-adjusted stock market index of Australian stocks measuring the performance of the 200 largest and most actively traded stocks listed on the Australian Securities Exchange. As a matter of fact, the S&P/ASX 200 is a common benchmark for the Australian stock market. Bloomberg provides data on earnings since the Q2 2000.

According to ADF tests (not reported) all three time series seem to be nonstationary and integrated of order 1. Examining the relationship between corporate earnings, inflation and real growth the VECM methodology suggested by Johansen (1991) is used. This technique allows econometricians to analyse the interrelationships among the three nonstationary and possibly cointegrated variables. Due to the data limitations with regard to corporate earnings the sample is Q2 2000 to Q1 2009. Thus, there may be problems with a small sample bias. As a matter of fact, Monte Carlo experiments performed by Hargreaves (1994) do indeed indicate some difficulties using the Johansen approach with sample sizes below 100. However, he has argued also that it is quite common to work with sample sizes of less than 50 observations. Moreover, Cheung and Lai (1993) studying the finite sample bias of the Johansen cointegration test have not examined sample sizes below 33 data points because of problems with limited degrees of freedom. Thus, in the case analyzed here there are just enough data points to perform cointegration analysis.

It is well documented that there are major problems with cointegration tests in the presence of structural breaks (e.g., Gregory and Hansen (1996)). Visual inspection of the time series analyzed here does not suggest the existence of massive structural changes. Testing for structural breaks by taking the

comprehensive framework suggested by Zeileis et al. (2003) into consideration has also produced no evidence for the presence of statistically significant regime shifts. To preserve space no details are reported. The rather short sample may help in this context because many possibly relevant events causing structural change (e.g., the two oil price shocks) happened before the year 2000.

## Results

Applying the Johansen procedure and assuming the existence of a linear deterministic trend the trace test indicates the existence of two cointegration relationships between the three variables examined (see table 1). This result is quite robust to different deterministic trend assumptions (see table 2). The selection of time lags to be considered in the model is guided by an analysis of the VECM residuals. Autocorrelation LM tests (not reported) suggest that there is no serial correlation of the residuals using a model with only four time lags. Therefore, while there may be some selection criteria suggesting a higher number of time lags the residuals already seem to be random variables when only four time lags are considered in the model. This approach to time lag selection has become quite popular in recent times (e.g., Hoover and Jordá (2001) and Ibrahim (2006)). Given that in the case examined here there is a rather limited number of observations this empirical research strategy - which clearly favours parsimonious modelling - seems to be preferable.

Trying to interpret the results of the VECM with four time lags and two cointegration relationships the technique of variance decomposition can be employed to analyze how corporate earnings react to real output shocks and to inflation shocks. It is well known that there are problems with the Cholesky decomposition. Most importantly, the results of a forecast error variance decomposition may be sensitive to the ordering of the variables. Therefore this study reports the findings of the variance decompositions for the two relevant orderings of variables (inflation real output corporate earnings respectively real output inflation corporate earnings) in table 3 and table 4.

**Table 1 : Testing for Cointegration**

Sample (adjusted): 2001Q3 2009Q1  
Trend assumption: Linear deterministic trend  
Lags interval (in first differences): 1 to 4

**Johansen Trace Test**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.462708	35.28139	29.79707	0.0106
At most 1 *	0.360227	16.02377	15.49471	0.0416
At most 2	0.067843	2.177868	3.841466	0.1400

Trace test indicates 2 cointegrating equations at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon, Haug and Michelis (1999) p-values

**Table 2 : Robustness to Different Trend Assumptions**

Number of Cointegrating Relations by Model (0.05 level\*)

Data Trend:	None No Intercept No Trend	None Intercept No Trend	Linear Intercept No Trend	Linear Intercept Trend
Trace Test	2	2	2	2

\*Critical values based on MacKinnon, Haug and Michelis (1999)

**Table 3 : Forecast Error Variance Decomposition of Corporate Earnings  
(Ordering: Real Output Inflation Corporate Earnings)**

Period	Corporate Earnings	Inflation	Real Output
1	88.85912	4.735300	6.405583
2	90.03748	4.485496	5.477027
3	83.96331	6.152858	9.883834
4	83.83135	7.285126	8.883521
5	78.05840	12.15830	9.783298
6	62.23288	14.30420	23.46292
7	57.77317	11.67937	30.54746
8	56.36063	11.46596	32.17341
9	49.82000	24.62194	25.55805
10	43.67569	35.44468	20.87963

**Table 4 : Forecast Error Variance Decomposition of Corporate Earnings  
(Ordering: Inflation Real Output Corporate Earnings)**

Period	Corporate Earnings	Inflation	Real Output
1	88.85912	6.458164	4.682719
2	90.03748	5.983916	3.978607
3	83.96331	5.906890	10.12980
4	83.83135	6.764325	9.404322
5	78.05840	12.50433	9.437266
6	62.23288	17.69902	20.06811\
7	57.77317	15.39019	26.83664
8	56.36063	13.36041	30.27896
9	49.82000	24.08895	26.09104
10	43.67569	35.47272	20.85159

Both orderings lead to very similar results. Therefore, the findings reported above seem to be quite robust to different orderings of the variables examined. Nearly 90% of the one step forecast variance is accounted for by own innovations of corporate earnings while shocks to inflation and real output in sum explain less than 10% of the forecast variance. With regard to long term forecasts (10 periods) innovations to inflation and real output account for about 35% respectively 21% of the forecast error variance. Thus, inflation and real output obviously do contribute to the variability of corporate earnings in Australia. According to the empirical evidence reported above the effects of inflation shocks seem to be stronger than the effects of real output shocks. This is important for financial economists analyzing the earnings channel because corporate earnings quite clearly seem to react to inflation shocks. As already noted, stocks can only be a good hedge against inflation when there is a positive response of corporate earnings to higher inflation rates. However, those who argue that stocks are an useful hedge against inflation probably would have expected an even stronger reaction.

### Conclusion

Examining Australian data the empirical evidence

reported in this study does suggest the existence of two cointegration relationships between the three variables corporate earnings, inflation and real output. Therefore, these time series seem to follow common trends and there exists a stable long run equilibrium relationship. Moreover, forecast error variance decompositions do suggest that inflation and real output contribute to the variability of corporate earnings. The findings reported in this study seem to imply that the effects of inflation shocks seem to be stronger than the effects of shocks to real output. However, in order to show that stocks are a truly effective hedge against inflation it would have been preferable to establish the existence of an even stronger reaction. Nevertheless, the empirical research strategy suggested here is informative. It would, for example, certainly be interesting to analyze data from other countries. Moreover, given that there are just enough observations to estimate the VECM it could also be rewarding to examine an alternative measure (if available) for corporate earnings in Australia.

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