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BANKING RETURNS AND MONETARY VARIABLES IN PERIODS OF ECONOMIC STABILITY: AUSTRALIAN EVIDENCE

John Simpson[1] and John Evans [2]
Curtin University of Technology,Australia&Malaysia

ABSTRACT

The purpose of this study is to examine dynamic interactions and long-term equilibrium relationships between banking stock returns and key monetary variables in a period of relative economic stability, post financial deregulation in Australia. The importance of the study lies in its demonstration of banking market efficiency under these environments supporting rational expectations in Australian banking. Vector autoregressive models are applied to analyse optimally lagged data. In a bivariate bank stock returns model which includes interest rates and exchange rates there is evidence of cointegration. Consistent with theory, Australia's bank stock returns and long-term interest rates are negatively related. Long-term interest rates are exogenous. The study is also important as it demonstrates that in these environments, interest rates and exchange rates assist in the forecasting of Australian bank returns. In accordance with theory, contractionary monetary policy implementation leads to lower banking stock returns and expansionary policy will have the opposite effect.
JEL Classification: EO, E44.

Key Words: Banking, stock market returns, interest rates, exchange rates, cointegration

Introduction

The Australian Stock Exchange (ASX) and the Australian Securities and Investment Commission (ASIC) require substantial disclosure and transparency from Australian stock broking firms. The Australian Prudential Regulatory Authority (APRA) and the Reserve Bank of Australia (RBA) are each charged with implementation of capital adequacy guidelines and monetary policy respectively. Banks in Australia remain agents of the RBA and as such they are involved involuntarily in the implementation of these policies. Banks remain the most important of Australian financial institutions in that on average 60% of a firm's financial structure is debt. In 1998 the Australian Bank's share of all financial assets stood at 41.4% as part of their principle lending function. This appears to have fallen since 1955 when the share was 55%; however, it does not mean a decline in the importance of banks. The decline "... is explained by an increase in funds under management held by the banks and an increase in the securitisation of assets off the balance sheet" (Viney, 2000, Pages 43-45).

Australian financial deregulation in the mid 1980s included the removal of interest rate ceilings, floatation of the Australian dollar and the replacement liquid government securities and statutory reserve deposit bank regulatory ratios with a less onerous and less costly prime asset ratio. It was due to global and USA economic conditions relating to the OPEC induced energy crisis that a period of inflation, high interest rates, declining exchange rates and lower bank returns ensued. By 1994 interest rates and exchange rates had reduced in volatility and a period of relative domestic economic stability[3] was maintained until late 2002. The period from 2002 to mid 2006 in Australia saw a steadily appreciating exchange rate, lower interest rates and higher bank profitability. The appreciating exchange rate was perceived to be due to a spillover of the effects of a weakening US dollar in the face of record current account deficits at a time of global uncertainty with increased Middle Eastern political risk. Thus, the period of relative stability from 1994 to 2002 is logically selected in this study to investigate rational expectations in the Australian banking industry in respect to the monetary variables

[1] First Author: School of Economics and Finance, Curtin University of Technology, Hayman Road, Bentley, Perth, Western Australia. e mail: simpsonj@cbs.curtin.edu.au

[2] Curtin University of Technology, Miri Campus, Sarawak, Malaysia.

[3] Apart from an exchange rate aberration due to the South East Asian crisis in mid 1997. Australia by comparison with developing South Eastern Asian countries remained less affected by this crisis although the Australian dollar did take a dive in mid 1998.

of interest rates and exchange rates. Over that period there were fewer external shocks to distort the data.

Secondary markets in Australian government bonds have been active over the full period of the study with the effects of the Treasury bond and note tendering system. In addition it must be concluded that following deregulation and the granting of additional banking licenses in Australia in the mid-1980s, the Australian banking industry cannot now be described as oligopolistic (at least in the wholesale sector), which was the case prior to deregulation. That is, the competitive environment for all banks in Australia has been relatively open and stable despite the existence of a small amount of takeover and merger activity and a movement by other deposit taking financial institutions, for example, building societies, to obtain banking licences.

The issues in this Australian study are as follows: Is there a long-term cointegrating relationship between Australian bank stock returns and monetary variables? Is new information about interest rates and exchange rates rapidly reflected in banking stock returns? Do interest rates and exchange rates significantly and systematically over or under predict the future banking stock returns? The answers to these questions have implications towards rational expectations and market efficiency of the Australian banking and finance sector in times of relative economic stability.

Literature Review

That macroeconomic variables are significant drivers of stock prices is now widely accepted. Studies in the USA are well documented (for example, Fama, 1970; 1990; 1991). Other studies had similar objectives (for example, Huang & Kracaw, 1984; Chen, 1991; Pearce and Roley, 1998; Wei & Wong, 1992). The most often used framework to empirically examine these factors was initially provided by Ross (1976) in the arbitrage-pricing model. Chen et al. (1986) used the arbitrage-pricing framework to show that economic variables imparted a systematic effect to stock price returns. It is contended that economic forces have influence over discount rates as well as the capacity of companies to create cash and future dividends. Macroeconomic factors can thus become risk factors in the stock markets.

The arbitrage-pricing framework attempts to discover whether or not risk premia that attach to these various risk factors are priced into stock market returns. Cointegration has become another framework for the analysis of macroeconomic variables and the stock market. Chen et al. (1986) provided evidence to suggest that there is a long-term equilibrium relationship between economic variables and the stock market and Granger (1986) sought to verify this through cointegration analysis.

It is clear that the relationship between stock prices and returns in particular countries and economic variables has received great attention over recent years. For example, Mukherjee and Naka (1995) in a study that investigated the Japanese stock market returns found (using a vector error correction model (VECM) in preference to the vector autoregressive model (VAR) model), that the Japanese stock market was cointegrated with a group of six macroeconomic variables. Their findings were robust to different combinations of macroeconomic variables in six-dimension systems. Kwan and Shin (1999) utilised a cointegration test, a Granger causality test (Granger, 1988) and a VECM to find that the Korean stock price indices were cointegrated with a set of macroeconomic variables, which included exchange rates and money supply. The set of variables provided a direct long-run equilibrium relationship with each stock price index. They also found that stock price indices were not a leading indicator for the macroeconomic variables.

Maysami and Koh (2000) when investigating the long-term equilibrium relationships between the Singapore stock index, stock returns and selected macroeconomic variables found with the assistance of a VECM that the Singapore stock market is interest and exchange rate sensitive. They also found that the Singapore stock market was significantly and positively cointegrated with the stock markets of Japan and the USA. Hondroyiannis and Papapetrou (2001) examined macroeconomic influences on the stock market for Greece. Among the macroeconomic variables investigated were interest rates and exchange rates. They too found that stock prices do not lead changes in real economic activity but that the macroeconomic activity and foreign stock market changes only partially explained Greek stock price movements. They also found that oil price changes did explain Greek stock price movements and had a negative impact on economic activity.

Greenbaum and Thakor (1995; page 127) suggest that the process of financial intermediation is of "central importance to the functioning of a modern economy". There are various reasons for this that includes the notion that the central function of banks and the regulation of banks are interrelated. Banking needs to be perceived as a viable business and to be perceived in that way it must be regulated. This regulation becomes an important part of monetary and exchange rate policy where, for example, banks are required to maintain RBA exchange settlement accounts in credit through repurchase agreements. Redemptions of investments in these areas are agreed at a penalty to the banks, which must maintain a "safety valve" proportion of their risk weighted assets in prime liquid assets that include government paper with a short-term to maturity. In addition, banks have the ability to resolve incentive problems. The large Australian banks have the ability to diversify and can reduce incentive costs and agency problems due to their efficiency in processing and re-using information. Banks derive economic benefits from their size and their direct lending function.

James (1987) found empirical evidence in the USA market of a positive and statistically significant stock price response for a company, which acquires a bank loan, compared to a negative stock price response for debt placed privately with insurance companies. According to Greenbaum and Thakor (1995) it is quite clear that given problems of private information and moral hazard, credit markets cannot be any more than semi-strong form efficient. Banks therefore have an important role to play in resolving problems of information asymmetry. Banks enhance the informational efficiency of credit markets because they possess privileged financial information that is then passed on to others. It could be argued that banks are special financial intermediaries whose operations are unique in financial markets and impact strongly on an economy. A review of the literature has not unfolded any well-known study of the strength and direction of relationships between Australian banking stock returns and these key macroeconomic variables.

Hypotheses

It is logical to investigate the Australian dollar and US dollar exchange rate, as this is the major trading currency in Australian trade and capital transactions. The USA market is a major market of Australian goods. When the AUD depreciates against the USD, Australian products become cheaper in the USA and if the demand for these goods is elastic, the volume of Australian exports should increase causing higher AUD denominated cash flows to Australian companies. More profitable companies borrow from the banks for expansion in fixed assets, trade finance and working capital and this creates greater profitability to banks which, in turn, translates to an increase in bank stock returns. The opposite should occur if there is an appreciation of the AUD. It could also be that higher bank stock returns are a signal to policy makers to ease exchange rates to, in turn, maintain momentum in an economy growing relatively strongly in the absence of inflationary pressures.

Assuming periods of relative economic stability, the following hypotheses are developed and stated in the null format:

Ho1: *There is a significant positive relationship between Australian bank stock returns and the Australian/ US dollar exchange rate in both unlagged and lagged data.*

Changes in both short- and long-term interest rates affect the discount (bank base lending rate) rate in the same direction via their effect on the nominal risk free rate of interest. Higher lending rates affect a bank's ability to lend profitably and therefore translate to lower bank returns. As both short-and long-term interest rates rise, bank stock prices fall. Similarly higher bank stock returns may be a signal to policy makers to ease interest rates at a time when there is minimal pressure for an increase in rates to maintain interest rate differentials between Australia and her major trading partners. Again substantial inflationary pressures have not been apparent over the period of the study. Banking stock returns have increased while interest rates have fallen.

Ho2: *There is a significant positive relationship between Australian bank stock returns and interest rates in both unlagged and lagged data.*

Based on the foregoing literature, if interest rates and exchange rates are significantly and consistently priced in bank stock returns they should be cointegrated and this relationship will provide evidence that these key economic variables significantly explain expected bank stock returns.

Ho3: *There are zero cointegrating relationships between banking stock returns and interest rates and exchange rates in optimally lagged data.*

Granger (1981, 1988) and Granger and Weiss (1983) provided evidence that if a pair of variable series is cointegrated the bivariate cointegrating system must possess a causal ordering in at least one direction. If the evidence is such that bank stock returns variability is linked to these key economic variables it can also be shown that the change in the bank stock returns either lag or lead movements in these economic indicators. Based on this theory and the foregoing literature the fourth hypothesis of the study is developed.

Ho4: *Causality runs from banking stock returns to interest rates and/or exchange rates OR banking stock returns are endogenous in a bivariate model that includes interest rates and exchange rates in optimally lagged data.*

Data

The primary source of data for the study is DataStream. Monthly data for each of the stock returns, exchange rates and interest rates is gathered for the period from January 1994 to February 2002. The data are analysed using the EViews 4 statistical package. The Australian banking stock returns index (BRI) represents the theoretical aggregate growth in the value of the constituents of the index in banking stocks. The index constituents are deemed to return an aggregate monthly dividend, which is included as an incremental amount to the monthly change in the price index [4]. The Australian banking stock price index [5] could also have been used in this study as the dependent variable. The reasons for the use of the banking returns index as a proxy for the financial health of the banking sector is provided in the results section. First difference data for the BRI, that is, change in BRI_t (ΔBRI), is equal to Log (BRI_t/BRI_{t-1}).

The exchange rate (EX) monthly nominal exchange rates AUD to the USD represents a mid point determined by the RBA on the basis of quotations in the Australian foreign exchange market at 4pm Eastern Standard Time on the 15th of each month. The first difference data or the change in the exchange rate (ΔEX_t) is equal to Log (EX_t/EX_{t-1}). Long-term interest rates (LB) are proxied by the monthly 10-year Australian government bond mid point between bid and offered rates obtained by the RBA from tenders of 10-year government bond sales. Short-term interest rates (CR) are proxied by the monthly interbank call-lending rate quoted by the Australian banks through the RBA. The first difference data or return on government long-term bonds (ΔLB_t) is equal to Log (GB_t/GB_{t-1}) and the return of the call money market (ΔCR_t) is equal to Log (CR_t/CR_{t-1}).

Methodology

The level series are first analysed under ordinary least squared (OLS) regressions of unlagged data to gain a feel for the relationships between the variables in the model specified. First differences series are to be similarly tested prior to the specification of a VAR model because interest also lies in the examination of optimally lagged data in order to run cointegration and causality tests.

The use of ordinary least squares (OLS) regressions assumes that all level variables are normally distributed. The Jarque-Bera test (Jarque & Bera, 1987) is used to test the normality of the distributions for each level and first difference data series. In each case the distributions, whilst histograms are bell-shaped, there are problems with skewness and kurtosis and this needs to be born in mind when considering the significance of results in the presence of serial correlation.

The regression model of bank stock returns against short- and long-term interest rates and exchange rates is given as:

$$LnBRI_t = \alpha + \beta_1 LnEX_t + \beta_2 LnCR_t + \beta_3 LnLB_t + e_t \quad \text{1)}$$

Where;
BRI = banking stock returns index

[4] The calculation is as follows: BRI_t=(BRI_{t-1})(BPI_t/BPI_{t-1})(1+BDY/100n) where BRI_t is the bank return index at time t; BRI_{t-1} is the bank return index at time t-1 (months), BPI_t is the bank price index at time t and BPI_{t-1} is the bank price index at time t-1; BDY is the dividend yield on the price index and n is the number of days in the financial year. BRIo is the index value at base date = 100.

[5] The Australian banking price index is $BPI_t = BPI_{t-1} * \frac{\sum_1^n (P_t * N_t}{\sum_1^n P_{t-1} * N_t * f}$ where $I_t, I_{t-1}, P_t, P_{t-1}$ are the ***index value at day t, the index value on the previous working day, unadjusted share price on day t, unadjusted share price on the previous working day and Nt, f, and n are the number of shares issued on day t, the adjustment factor for a capital action occurring on day t and the number of constituents in the index. BPIo is the index value at base date = 100.***

EX = monthly nominal exchange rate (AUD to USD)
CR = short-term interest rates
LB = return on long-term government bonds.

For each of the level series in bank stock returns index, long-term interest rates, short-term interest rates and exchange rates, tests are undertaken for stationarity using the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) unit root tests (Dickey & Fuller, 1981; Phillips & Perron, 1988). It does not necessarily follow that, if the level series are nonstationary, the error terms of the multivariate regression of the level series are nonstationary. Unit root tests are applied to the error terms of the regression of the level series variables. In other words and in equation format, whether or not any two vectors are cointegrated can be tested by analysing the error terms of the regressions of these level series vectors for stationarity. The errors are tested using the ADF and/or PP test. The following regression is, in turn, estimated:

$$\Delta\hat{e}_t = \alpha_0 + \gamma\hat{e}_{t-1} + \hat{v}_t \qquad \ldots 2)$$

Where;
$\Delta\hat{e}_t = \hat{e}_t - \hat{e}_{t-1}$ is the change in the value of the error term or residual at time t to time t-1.
α_0 is the intercept of this regression.
γ is the regression coefficient.
$\hat{e}_{t-1}$ is the error term at time t-1.
v_t is the error term of this equation at time t.

The ADF and the PP statistics are compared to the MacKinnon (MacKinnon, 1991) critical values at 1%, 5% and 10%. Testing for autoregressive conditional heteroskedasticity is undertaken using the White tests and applying an ARCH ML model if the errors are not homoskedastic.

If non-stationary level series are converted to stationary processes on first differencing an analysis of the unrestricted VAR model the Johansen (1988) maximum likelihood (ML) procedure (Hansen & Johansen, 1993) is applied to then test for cointegration. The optimal lag period is found using the maximum likelihood (ML) tests over lags one to four and assuming an intercept and a linear deterministic trend in the data. Granger causality is then examined in order to describe the short-term dynamics of the model and two-way causality is investigated.

Results

Regression analysis is undertaken to gain a feel for the relationships in unlagged data. On level series data, the model is found to possess strong explanatory power (see Appendix 1, Table 1). Consistent with theory, exchange rates and long-term interest rates are negatively related to banking stock returns. However, short-term interest rates have a positive relationship (significant at the 1% level). The DW statistic (Durbin & Watson, 1971) indicates serial correlation in the regression error term and that, if the bank stock returns are integrated, the regression may be spurious. Each of the level series was tested for stationarity ADF and PP tests. The results indicate that the level series in each case for bank stock returns, exchange rates, short-term interest rates and long-term interest rates are non-stationary processes. The residual in the regression is found to be stationary.

White tests confirm the existence of heteroskedasticity in the errors of the OLS. It is quite clear that a drawback in the level series data is that there is strong evidence autoregressive conditional heteroskedasticity. When the OLS regression was re-specified as an ARCH-ML model the explanatory power of the model falls (See Appendix 1, Table 2). The DW statistic remains significantly near zero and less than two to conclude that the regression results remain spurious. When regressions are run on first differences it is apparent that whilst substantial information has been lost in the first differencing process, the DW statistic indicates that serial correlation problems are no longer a problem (See Appendix 1 Table 3). Moreover long-term interest rates emerge as the significant explanatory variable in a negative relationship (significant to the 1% level). Again, as in the case of the level series, this result needs to be treated with caution due to the low explanatory power of the model.

The evidence indicates, in the absence of statistically significant results and in unlagged data, that **Ho1** is to be accepted and the alternative hypothesis of a significant negative relationship between Australian bank stock returns and exchange rates is rejected in times of relative economic stability in Australia. Further evidence for the acceptance of **Ho1** is provided later in this results section when causality tests are reported.

The evidence indicates that **Ho2** is to be rejected and the alternative hypothesis of a significant negative relationship between long-term interest rates and bank stock returns in unlagged data is accepted in a period of relative economic stability in Australia. Further evidence of the support of the rejection of **Ho2** is provided later in this results section when causality testing is reported.

After application of ADF and PP tests, it is found that the first difference series and the error terms of the regression of the first difference variables are stationary (See notes under Appendix 1 Table 3). The series are therefore integrated non stationary processes and analysis moves to the specification of a VAR and testing for cointegration and causality. A VAR stability condition test reveals that the VAR is stable. When lag order selection criteria are applied to the first difference data it is found that the maximum likelihood ratio exists at two lags. Using the lag exclusion Wald test, all lags except lag two are rejected. When Johansen cointegration tests are applied it is found that there are at least two cointegrating equations on an optimal lag length of 2 months.

The **Ho3** is thus rejected enabling the acceptance of the alternative hypothesis that there is a long-term cointegrating relationship between the variables in the model. Bank stock returns, interest rates and exchange rates possess similar stochastic trends and move together to equilibrium in the long-term. Rational expectations apply in the Australian banking market in relation to interest rate and exchange rate movements in times of relative economic stability.

Pairwise Granger causality tests indicate that long-term interest rate changes cause banking stock index changes on optimal two-month lags (F value is highest and most significant at the 1% level). There is no significant dual causality or any other causal relationship. Evidence is provided for the partial rejection of **Ho4** and the partial acceptance the alternative hypothesis that bank stock returns are endogenous in a bivariate model that includes interest rates and exchange rates in economically stable times in Australia. The only statistically significant exogenous variable is long-term interest rates which possess a negative relationship with bank stock returns. Causality results also lend support for the acceptance of **Ho1** (rejection of alternative hypothesis one) and the rejection of **Ho2** (acceptance of alternative hypothesis two).

Conclusion

The underlying objective of the paper was to investigate relationships between Australian banking stock returns and key macro-economic variables. The key monetary policy variables considered were short and long-term interest rates and exchange rates. The literature recognises that banks are key economic agents especially in their roles as central bank agents that are indirectly involved in monetary and exchange rate policy implementation. There is a substantial body of evidence that shows significant relationships between stock market returns and macro economic variables. However, the study of the effect of these variables on bank stock returns has been neglected.

As a reminder to bank stock investors, bankers and bank regulators, this study demonstrates that long-term interest rates have a significant influence on Australian bank stock returns in periods of relative economic stability where the issues are not unduly complicated by external shocks. In Australia the relationship is negative and consistent with monetary economic theory. In a bivariate time series model that includes bank stock returns, short and long term interest rates and exchange rates cointegration is evident. In periods of relative stability, rational expectations apply in the Australian banking market and long-term interest rates can be used to help forecast bank stock returns.

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APPENDIX 1

Table 1
Diagnostics of Level Series Regression (OLS)

Variable	Diagnostic (Value)
OLS of Banking Stock Returns	Adjusted R Square (.8453) *
OLS of Banking Stock Returns	F statistic (177.73)*
Intercept	t statistic (31.66)*
Exchange rate	t statistic (-7.78)*
Short-term interest rates	t statistic (1.77)*
Long-term interest rates	t statistic (-9.05)*

Note: * means significance to the 1% level. The DW statistic is significantly less than two (0.1994) indicating problems with spurious regressions because of serial correlation.

Table 2
ARCH ML Model of Level Series Banking Stock Returns

Variable	Diagnostic (value)
Banking stock returns	Adjusted R Square (0.77)*
Banking stock returns	F statistic (54.54)*
Long-term interest rates	t statistic (-17.57)*
Short-term interest rates	t statistic (+2.14)**
Exchange rates	t statistic (-11.30)*

Note: * means significance at the 1% level. ** means significance at the 5% level. DW statistic at 0.1362 (1% level of significance) indicates serial correlation.

Table 3
Regression of First Differences

Variable	Diagnostic (Value)
Adjusted R Square	0.1360*
t Statistic of long-term interest rates	-4.1181*
DW Statistic	1.9280*

Note: * All values are significant at the 1% level. The first difference banking stocks index series ADF and PP statistics at –6.7990 and –9.6809 are less than the 1%, 5% and 10% critical values at –3.5000, -2.8918, -2.5827 and –3.4993, -2.8915, -2.5826 respectively. For the first difference series in long-term interest rates, the ADF and PP test statistics at –4.3672 and –9.5383 are also less than the critical values in each case. The error term of the first difference regression of banking stock returns showed ADF and PP test statistics of –6.6427 and –9.4998, which are also less than the critical values in each case. Non stationary level series and regressions of errors have been converted to stationary processes after first differencing.