THE MONEY SUPPLY AND SHARE PRICES: AN EXAMINATION OF AUSTRALIAN EVIDENCE

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There is almost universal agreement among investment managers that changes in the quantity of money exert important influences on the movement of share prices. Three channels of influence may be delineated. First, changes in the quantity of money bring about changes in the demand for goods and services. Company earnings are responsive to changes in demand; in turn, share prices react to these profit changes. Second, an inverse relationship exists between the money supply and the general level of interest rates. Thus, an increase in the money supply brings about a fall in these rates, while a money supply decrease has a reverse effect on the same rates. One of these rates is the equity capitalization rate, the rate at which the equity market capitalizes the earnings accruing to an ordinary share to arrive at its market price. The third and most direct channel of influence involves the portfolio rebalancing activities of investors. A change in the money supply results in temporary imbalances in investors' portfolios. To redress these imbalances cash holdings are adjusted and shifts into or out of other investment media take place. Equities form an important class of these investment media.

The preceding remarks are not controversial. The controversial and more important question for the performance-minded investment manager is whether the money supply-share price relationship can be used in timing his portfolio movements into and out of the equity market. Can money supply changes be employed to predict the future course of the share market?

Although published studies for the Australian equity market are nonexistent, there have been numerous American research papers which have examined this question. In what is probably the earliest study in this area, Sprinkel compared turning points (peaks and troughs) in quarterly stock indices with turning points in quarterly money growth rates over the period 1918-1960. He found that a bear market in stock prices was predicted fifteen months after each peak in monetary growth, and that a bull market was predicted two months after each monetary growth trough was reached. While Sprinkel's analysis provided some interesting results, it suffered from two major shortcomings. First, the procedure he used, graphical analysis of turning points, was inadequate. Regression analysis, which we will employ later in this paper, allows much greater flexibility in the specification of the time lags between money supply and share price changes. Turning points do not have to be explicitly identified. The regression equation allows quantification of the relationship. Most importantly, tests of the statistical significance of the relationship are available. Second, Sprinkel glossed over the question of data availability. Obviously, investors cannot use unavailable information to make decisions. As the American monetary authorities published money supply figures with between a one to two month lag, it is inappropriate to use the money supply figure for a certain quarter to forecast the performance of share prices in the same quarter. The only money supply figures which may be used are those which pertain to previous periods. In addition, the initial monthly money supply figures published are provisional and may be altered in succeeding months. Clearly, to use the subsequently revised money supply figures would involve a forecasting procedure impossible to implement. Thus, only the initial money supply figures should be used in the analysis as these are the only figures available when share market forecasts are made.

In a lengthy analysis of the money supply-share price relationship, Rozeff incorporated these two objections. Among many equations tested, he empirically examined the following regression model

$$R_t = c_o + \sum_{i=1}^{5} a_{t-i}\, g_{t-1} + e_t \qquad (1)$$

where R_t is the price relative for quarter t of the Standard and Poor's 500 Index of stock prices, i.e., it measures one plus the rate of return on that index, and g_{t-i} is the period t-i quarterly growth rate in the money supply. A maximum lag of five quarters is contained in equation (1) to permit testing of Sprinkel's finding that a bear market can be predicted fifteen months in advance. Rozeff tested the statistical significance of equation (1) for different time periods. For the majority of the time periods examined he found no significant relationship. This suggests that the money supply cannot be used to predict the future state of the equity market.

Although Rozeff's analysis is a significant improvement over Sprinkel's, some deficiencies remain. A restriction implicit in equation (1) is that the relationship between the variables is linear. Rather than imposing this restriction at the outset, a more rigorous procedure would involve testing whether this assumption is valid and if not, finding the most appropriate functional representation. In this paper we attempt to remedy this shortcoming by employing a sophisticated form of regression analysis devised by Box and Cox. In addition, the data we analyzed were adjusted for inflation. As investment managers are more interested in the inflation-corrected performance of the share market, it makes sense to use real returns on the share index and real money supply figures. Finally, per capita money supply figures were employed. This is in view of the most direct channel of money supply influence on the share market discussed above. As this channel operates via the portfolio rebalancing activities of individual investors, it is more appropriate to remove the influence of population changes from the money supply figures used.

Thus the regression model we tested was the following

$$\frac{R_t^d - 1}{d} = c_o + \sum_{i=1}^{5} a_{t-i} \left(\frac{g_{t-i}^d - 1}{d}\right) + e_t \qquad (2)$$

where R_t is the inflation-adjusted price relative of the Sydney All-Ordinaries Index for quarter t, i.e., it is one plus the real rate of return on the index, while g_{t-i} is the per capita growth rate in the real money supply for quarter t-i. Two definitions of the money supply were used: M1, currency and current account deposits with all trading banks and M3, currency and total deposits with all trading and savings banks. All data employed were obtained from the monthly statistical bulletins of the Reserve Bank of Australia. As these bulletins become available approximately two months late, we employed the same lag structure Rozeff devised. The time period examined extends from the second quarter of 1960 to the fourth quarter of 1975.

The unusual form of the regressand and regressors of equation (2) derives from the Box-Cox refinement of regression analysis. Ignoring our redefinitions of the variables discussed above, observe that when d is set equal to one in equation (2), it simplifies to equation (1). Thus, Rozeff's model may be considered a particular version of the more general relationship we consider in this paper. Applying the Box-Cox procedure, an estimate of d may be obtained and a test of whether d differs significantly from one may be performed.

Our empirical results are contained in tables 1, 2 and 3. In table 1, no restrictions are imposed on d. In table 2, the d value on the right side of equation (2) is set to equal one. The d value on both sides of equation (2) is set equal to one in table 3. To test the hypothesis that d is equal to one, a chi-square statistical test with one degree of freedom was employed. At the 10% level of significance, the critical chi-square value is 2.710. The chi-square value obtained when M1 was used was 2.716 while when M3 was used a figure of 2.948 resulted. These lead us to reject the hypothesis of a simple linear relationship. To test the significance of the six regression models we postulated (two definitions of the money supply and different restrictions on the d value), we used an F-test. At the 10% level of significance, the critical F-statistic value with 52 and 4 degrees of freedom is approximately 3.80. Observe that none of the F-statistics in any of the tables is greater than this quantity. Thus, none of the regression relationships we examined is statistically significant.

Our empirical results lead us to conclude

that the functional relationship between the money supply and share prices is more complex than here to for assumed. However, even when we take account of this more complex representation, money supply figures cannot be used to predict the future the information contained in money supply figures into share market prices. After taking account of the statistical compilation and publication time lags, no profit opportunities are available to the investor who appreciates the economic significance of the money supply. Portfolio managers interested in improving their investment timing performance are thus advised to look elsewhere.

Table 1. d-Value Unrestricted

	Adjusted R^2	F-statistic	DW statistic	d-estimate
M1	-0.0085	0.91	1.775	2.265
M3	0.0213	1.23	1.851	2.265

Table 2. Right Side d-Value Restricted to Unity

	Adjusted R^2	F-statistic	DW statistic	d-estimate
M1	-0.0145	0.85	1.791	2.165
M3	0.0218	1.24	1.850	2.28

Table 3. d-Value on Both Sides Restricted to Unity

	Adjusted R^2	F-statistic	DW statistic	d-estimate
M1	-0.0084	0.91	1.778	1
M3	0.0172	1.19	1.803	1

Notes: The adjusted R^2 value measures how well the observations fit the postulated regression model while the DW statistic is used to find out whether additional variables should be introduced into the model specification. These statistics are not of great relevance for the purposes of this study and are documented here merely for the sake of completeness.

References:

1. G.E.P. Box and D. R. Cox. "An Analysis of Transformations", *Journal of the Royal Statistical Society, Series B*, 26, (1964), pp. 211-243.
2. M. S. Rozeff. "Money and Stock Prices", *Journal of Financial Economics*, 1, (1974), pp. 245-302.
3. B. W. Sprinkel. "Money and Stock Prices", (Homewood, Illinois: Richard D. Irwin, Inc. 1964).

BOOK REVIEW

NEW WORK ON THEORY OF CORPORATE FINANCE

The Basic Theory of Corporate Finance, by Kenneth J. Boudreaux and Hugh W. Long, Prentice-Hall, Englewood Cliffs, New Jersey, 1977. Pp. 415. $A20.25.

A new book of interest to our members is *The Basic Theory of Corporate Finance* by Kenneth J. Boudreaux and Hugh W. Long.

This work has been developed out of the teaching of the two authors of the MBA core finance course at Tulane University in the United States. They have attempted to produce a consistent and cohesive theory of corporate finance. The text is divided into two parts, with five sections, and 16 chapters.

Part 1 on the theory of financial markets and corporate valuation comprises Section I — Introduction to financial markets, and Section II — Corporate financial cash flows and valuation. Part 2 on the theory of corporate financial decision-making comprises Section III — The theory of capital structures, Section IV — The theory of capital acquisition and disbursement, and Section V — The theory of asset acquisition and divestment.

The book is best suited for undergraduate and MBA students of corporate finance. It is a profound work which will not be easily understood by readers lacking the appropriate educational background. Some knowledge of advanced mathematics is needed for comprehension. In spite of these provisions, many people interested in corporate finance should appreciate it.

This is a comprehensive, thorough-going text presenting the subject in depth. It is well-constructed with chapter summaries, bibliographical references, diagrams, graphs, and an excellent index.

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