The Effect of Unanticipated Changes in Money and Real Activity on Stock Prices

Raymond H.F. Kwok*

This paper analyzes empirically the effect of unanticipated changes in money and changes in real activity on stock prices for the Asian Newly Industrialized Economies. The money supply equation is employed to estimate both anticipated and unanticipated components of money. Unlike the experience in the industrialized countries, the unanticipated money supply has an inconsistent impact on stock prices in these four Asian markets. Moreover, the results show that, except for South Korea, future real activity dominates money growth rate in explaining real stock returns. (*JEL* Classification: E44)

I. Introduction

The impact of money on stock prices has received increased attention in recent years. Much of the work on the money-stock market relationship centered on the question of whether money is a leading indicator of stock prices. Studies by Sprinkel (1964) and Homa and Jaffee (1971) show that past increases in money lead to increases in equity prices. This is due to the fact that investors could earn above normal profits by using a trading strategy based on observed behavior of the money

*Lecturer, Division of Commerce, City Polytechnic of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong. This paper was financed by a fund from City Polytechnic of Hong Kong. An earlier version of the paper was presented in the International Conference on Asian Pacific Economy at Australia in August 1993 and the 3rd International Conference on Asian-Pacific Financial Markets at Singapore in September 1993. The author appreciated the helpful and stimulating comments from the participants. Comments by Colin Hargreaves and two anonymous referees were particularly helpful in sharpening the focus of the paper. The author alone is responsible for any mistakes in the paper.
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stock. This result contradicts the efficient markets hypothesis that current asset prices reflect all available information so that no such trading strategy can exist. On the other hand, Berkman (1978) and Lynge (1981) find that positive money announcements depressed stock prices due to the expectation of high inflation. Tobin (1965) and Mundell (1963) also argue that expected real returns on assets are negatively related to expected inflation or money growth rates.

In this paper, we examine the relationship between real stock returns and money supply in the four Asian Newly Industrialized Economies of Hong Kong, Singapore, South Korea and Taiwan. We further investigate whether the response of stock returns to money supply is consistent with the efficient markets hypothesis. The experience of the industrialized countries indicates that most of the results support this hypothesis. That is, profit maximizing investors use all available information and anticipated monetary action is fully reflected in current stock prices. Only unanticipated components have an impact on stock prices. Moreover, Fama (1981) and Kaul (1987) show that money growth rates lose their explanatory power when competing with real activity, especially with the future real activity, in explaining stock returns. While most of the studies are of the experience of industrialized countries, it is interesting to investigate the relationship between money, real activity and stock prices in the Asian economies.

The paper is organized as follows. The second section explains the theoretical framework linking money and stock prices. The data on money supply, real activity and stock returns are presented in the third section. The fourth section contains empirical results, while the main conclusions are summarized in the final section.

II. Theoretical Framework

A number of previous studies done in developed markets show that unexpectedly high money growth is associated with higher interest rates and lower stock prices. That is, if the money supply increases faster than expected, investors revise upward their expectations of future inflation which in turn will push up interest rates and depress stock prices. Moreover, Feldstein (1980) argues that increased inflation decreases real after-tax profits which will tend to depress stock prices.

An alternative explanation is that if investors believe that the central bank will react to unexpectedly high money growth by a restrictive monetary policy, this would ultimately push up short-term interest

rates. The anticipation of high short-term interest rates in the future may cause longer term yields to rise immediately with a negative impact on stock prices. In this view, unexpected high money growth rates are negatively related to stock prices.

However, if the economy suffers a period of recession, unexpected high money growth will stimulated economic growth which in turn will increase capital expenditure. High capital expenditure will ultimately push up stock prices. Another explanation can be by real balance effect. Investors will restructure their investment portfolio with high money growth by investing more in the stock market. The increased liquidity is transferred into demand for financial assets which results in higher return on stocks. In turn, high money growth will have a real balance effect which pushes up stock prices.

The next hypothesis examined in this paper is that forecasts of real activity are important determinants of common stock returns. Most of the previous studies find a strong positive relationship between stock returns and real output. In general, real economic activity is likely to affect expected cash flow more than discount rates, causing stock prices to rise. In other words, a greater than expected increase in real economic activity may increase a firm's expectations of future growth. Forecasts of high economic growth make stocks more attractive and thus cause a jump in stock prices.

However, if the economy is operating at the full employment level, a real economic activity surprise may cause investors to forecast a more restrictive policy in the future as such surprises are correlated with future inflation or money growth. This could result in a large increase in interest rates relative to cash flow, causing stock prices to fall.

The behaviour of the money supply may be considered with reference to government policy goals, namely, economic growth and price stability. The monetary policy reaction function estimated here is as follows:

$$M_t = \alpha + \beta_1 I_t + \beta_2 I_{t-1} + \beta_3 I_{t-2} + \beta_4 Y_t + \beta_5 Y_{t-1} + \beta_6 Y_{t-2} + \mu_t \qquad (1)$$
$$\beta_1, \beta_2, \beta_3 < 0; \beta_4, \beta_5, \beta_6 > 0$$

where M_t = change in money supply,

I_t = inflation rate,

Y_t = real output growth rate.

The fitted values and the residuals of equation (1) are taken as the anticipated and unanticipated components of money supply.

Since these four economies are small open economies, the independent variables included in equation (1) are designed to capture the fol-

lowing aspects of monetary policy actions. High economic growth reflects the demand for money increase. In order to maintain economic growth, government will increase the money supply. Therefore, money supply and real output growth rate are positively related. However, if the economy is close to full employment level, high economic growth will have the result of high inflation and government will use a restrictive monetary policy. In this case, the coefficients of real output will be negative. In addition, according to simple economic analysis, government will use a tighten monetary policy to cool down demand during the time of high inflation. That is, the price levels are intended to capture the countercyclical policy actions of the government. In other words, the relation between inflation and money supply is negative.

To investigate the relationship between stock prices and money supply, the change in stock prices is assumed to be a linear function:

$$RS_t = \alpha + \beta_1 EM_t^e + \beta_2 UM_t^e + \mu_t \tag{2}$$

where RS_t = change in stock prices;

EM_t^e and UM_t^e = expected and unexpected change in money supply.

To investigate the efficient markets hypothesis, a deletion test is employed. If these four markets are efficient markets, the null hypothesis of expected money supply equal to zero in equation (2) should not be rejected.

In addition, we examine the relationship between stock prices, unanticipated money supply and both current and future real output.

$$RS_t = \alpha + \beta_1 UM_t^e + \beta_2 IND_t + \beta_3 IND_{t+1} + \mu_t \ , \tag{3}$$

Fama (1981) and Kaul (1987) show that inclusion of future real activity eliminates the explanatory power of other variables like inflation and money in determining stock returns. It is interesting to investigate whether the future real activity dominates money supply in explaining stock returns in the Asian markets.

III. Data Description

We study the above hypotheses for four Asian economies using quarterly data over the period 1975-90. The variables used are inflation rates (I_t), money growth rates (M_t^e) and real output growth rates (IND_t). Data for these variables are taken from the International Financial Statistics data tape of the International Monetary Fund. All the Taiwan

TABLE 1

ESTIMATES OF MONEY SUPPLY REGRESSION

$$M_t^e = \alpha + \beta_1 I_t + \beta_2 I_{t-1} + \beta_3 I_{t-2} + \beta_4 IND_t + \beta_5 IND_{t-1} + \beta_6 IND_{t-2} + \mu_t$$

	α	β_1	β_2	β_3	β_4	β_5	β_6	R^2	*D-W*
Hong Kong	0.06	–1.17	0.08	–0.09	–0.18	–0.09	0.13	0.32	2.16
	(5.37)†	(–2.35)*	(1.60)	(–1.50)	(–2.30)	(–1.30)	(1.66)		
Singapore	0.02	0.35	–0.32	–0.26	–0.15	0.03	0.30	0.30	2.04
	(3.77)†	(0.90)	(–0.47)	(–3.78)†	(–1.95)#	(0.51)	(3.97)†		
South Korea	0.05	–0.88	0.11	0.54	0.54	–0.12	–0.53	0.21	1.86
	(3.30)†	(–2.02)*	(0.50)	(2.52)*	(2.18)*	(–0.53)	(–2.44)*		
Taiwan	0.04	–0.16	–0.09	–0.40	–0.08	0.12	0.47	0.16	1.83
	(4.07)†	(–0.37)	(–0.65)	(–2.71)†	(–0.50)	(0.74)	(2.74)†		

Note: 1. M_t^e = growth rate of money supply; I_t = inflation rate; IND_t = growth rate of industrial production. Numbers in parentheses are *t*-statistics. R^2 is the adjusted coefficient of determination. *D-W* is the Durbin-Watson test.

2. †: significant at 1% level. *: significant at 5% level. #: significant at 10% level.

data are obtained from various issues of the Industry of Free China and the Financial Statistics of Taiwan.

Inflation rates, I_t, for these four economies are calculated from the *CPI* indices. Real stock returns are the share price indices adjusted by the inflation rate. The growth rates of industrial production (IND_t) are used to measure the real activity. The measure of money used is M_2. Most of the results from the industrialized countries used based money growth rates as a measure of money. However, in the absence of appropriate data for most of the countries dealt with here, and in order to be consistent across economies, we use M_2.

Table 1 presents the results of money supply regression in these four economies. Not all the signs of coefficients are consistent to the general hypothesis that we mentioned above. These four markets show a negative relation between money supply and inflation. Among these, only Hong Kong and South Korea show a significant negative relationship between current inflation and money supply, while the other two markets show a significant negative relation between money supply and past inflation rates. The government officials in Hong Kong and South Korea will change their monetary policy immediately once the inflation rate is high. In other words, inflation rates have a significant immediate impact on the money supply in these two markets. However, the central banks in Singapore and Taiwan will change their monetary policy according to the past inflation rates. This means that inflation rates will have a long run impact influencing money supply in these two markets.

Another interesting finding is the link between money and current output. The open markets (Hong Kong and Singapore) and the closed markets (South Korea and Taiwan) behave differently. In the case of open markets, money supply has a significant negative link with the current output, while in the case of closed markets, money supply has an opposite link with current output. However, with the exception of South Korea, money growth rates seem to respond to lagged real output growth rates in a positive manner and the coefficients are significant. The money supply equation indicates that sustained economic growth is the preeminent long run goal of the monetary policy. In the case of South Korea, high output growth rate in the past seems to have pressure to the current inflation rate, which in turn, causes the central bank to tighten the current monetary policy. In other words, there exists a negative relationship between current money supply and past output growth rate.

TABLE 2
ESTIMATED EFFECT OF MONEY SUPPLY ON STOCK PRICES
$RS_t = \alpha + \beta_1 EM_t^e + \beta_2 UM_t^e + \mu_t$

	α	β_1	β_2	R^2	*D-W*	H_0: $\beta_1 = 0$
Hong Kong	0.99 (56.46)†	0.96 (2.34)*	0.13 (0.45)	0.22	1.98	$F(1,60)=5.47$*
Singapore	1.03 (47.26)†	0.61 (0.90)	1.44 (3.16)†	0.16	2.10	$F(1,60)=0.82$
South Korea	1.96 (72.75)†	–0.71 (–1.83)#	–0.38 (–1.83)#	0.27	2.09	$F(1,60)=3.35$#
Taiwan	0.99 (20.23)†	0.94 (1.06)	0.37 (0.94)	0.18	1.85	$F(1,60)=1.12$

Note: 1. EM_t^e= expected money supply; UM_t^e = unexpected money supply. Numbers in parentheses are *t*-statistics. R^2 is the adjusted coefficient of determination. *D-W* is the Durbin-Watson test. H_0 is the test of the efficient markets hypothesis.
2. †: significant at 1% level. *: significant at 5% level. #: significant at 10% level.

IV. Empirical Results

Table 2 presents the estimated results of money supply on stock prices and testing of the efficient markets hypothesis in the Asian markets. The estimated results indicate that the relationship between money supply and stock prices is different from the developed markets. Money appears in a positive manner in all cases, except the money supply in South Korea. This means that high money growth will have a real balance effect which push up stock prices. This positive relationship between real stock returns and money growth rates is contrary to Tobin and Mundell, who hypothesize a negative relationship between these two variables. However, investors in South Korea anticipate that high money growth will ultimately push up interest rates. The anticipation of high short-term interest rates in the future will have a negative impact on stock prices.

The results from Table 2 do not fully support the efficient markets hypothesis. According to the efficient markets hypothesis, the expected information should already be reflected by stock prices and therefore should not further affect stock returns. In other words, stock returns should only respond to the unexpected components of the announce-

TABLE 3

QUARTERLY ESTIMATED EFFECT REGRESSION OF REAL STOCK RETURNS ON CURRENT AND FUTURE INDUSTRIAL PRODUCTION AND UNEXPECTED MONEY SUPPLY

$$RS_t = \alpha + \beta_1 UM_t^e + \beta_2 IND_t + \beta_3 IND_{t+1} + \mu_t$$

	α	β_1	β_2	β_3	R^2	D-W
Hong Kong	1.02	0.12	–0.13	0.33	0.33	1.90
	(91.1)†	(0.42)	(–1.31)	(3.18)†		
Singapore	1.00	1.46	0.12	0.84	0.32	2.11
	(67.04)†	(3.64)†	(0.53)	(3.78)†		
South Korea	1.98	–0.41	–0.03	0.21	0.23	2.04
	(67.41)†	(–1.84)#	(–0.07)	(0.48)		
Taiwan	0.99	0.37	0.79	0.96	0.24	1.83
	(26.57)†	(1.08)	(1.96)*	(2.25)*		

Note: 1. UM_t^e=unexpected money supply; IND_t= growth rate of industrial production. Numbers in parentheses are t-statistics. R^2 is the adjusted coefficient of determination. D-W is the Durbin-Watson test.

2. †: significant at 1% level. *: significant at 5% level. #: significant at 10% level.

ments. The results show that the expected money supply in Hong Kong and South Korea still has a significant impact on stock prices. The reported F-statistics test the hypothesis that the coefficients of anticipated money supply equal zero. As the test statistics indicate, the F-statistics of these two markets reject the null hypothesis. This confirms the results of Kwok (1992a) that the expected information is not fully embodied in stock prices in these two markets.

The results of Singapore show that this market supports this hypothesis. That is, anticipated money supply has no significant effect on stock prices. Only the unanticipated money supply has a positive and significant impact on stock prices. The F-statistics also show that the null hypothesis cannot be rejected at 5% significance level. In particular, a 1% increase in unanticipated money supply causes real stock returns to increase about 1.4%.

Although the F-statistics in Taiwan indicate that the hypothesis cannot be rejected, the unanticipated money supply is insignificantly related to stock prices. This is similar to Kwok's (1992a) findings that because the Taiwan market had been highly dominated by speculative forces in the last decade, neither the expected nor unexpected components have any effect on stock returns.

In Table 3, we investigate the relationship between stock returns, unanticipated money supply, and both current and future real activity. Moreover, we examine whether the growth rates of real activity dominate money growth rates in explaining real stock returns. According to the results, the relationship between stock prices and unanticipated money supply remains unchanged as we discussed before. Not only that, the coefficient of unanticipated money supply is quite similar to Table 2. The results also indicate that real stock returns are positively related to further real output. Except for South Korea, the future real activity has a significant relationship with stock prices. This finding is consistent with the results on industrialized countries. A 1% increase in future industrial production causes stock returns in Hong Kong, Singapore and Taiwan to increase by 0.33%, 0.84%, and 0.96%, respectively. Also, since the future real output has a significant relationship with stock prices in three markets, inclusion of real activity improves the explanatory power of real stock returns regression; the R^2s increase dramatically. Thus, as postulated by the proxy effect hypothesis, real activity dominates measures of money supply when both are used as explanatory variables for real stock returns.

V. Summary and Conclusion

This paper has examined the reaction of stock prices to money supply and real output. Several conclusions emerge from this investigation. First, except for South Korea, stock prices respond positively to the money supply. Second, different from the experience of industrialized countries, stock returns in Hong Kong and South Korea respond strongly to the anticipated money supply. Third, except for Singapore, the Asian markets do not support the efficient markets hypothesis. There is a common agreement that these markets are still small and immature markets. Fourth, we find evidence of a positive relationship between real stock returns and future growth rates of real output. Finally, we find that real activity dominates measures of money growth rates when all are used to explain real stock returns.

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