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New Evidence on the Relations among Stock Returns, Inflation and Economic Activities

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Abstract
Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) are used in a four-variable VAR to analyse the inter-relationships among stock returns and three macroeconomic variables. The positive relation between China's stock market returns and inflation suggests that inflation in China is more of a monetary phenomenon. The stronger causation from stock market to real economic activities than the other way around is against traditional wisdom but provides support to Titman's (2013) catalytic model for equity market.

JEL Classification: G10, G15

Keywords: Real Stock Return, Inflation, Real Economic Activities, Granger-causality, Impulse Response Function, Forecast Error Variance Decomposition.

1. Introduction

The literature has not reached a consensus on the rationale behind the observed relation between stock returns and inflation. The question of "what causes what" between stock returns and real economic activities from recent literature has also come to our attention. This study aimed to reexamine these relations using data from China's market, a fast growing emerging economy.

1.1 The relation between real stock returns and inflation

In many cases, the relation between stock returns and inflation attracts the interest of researchers due to the fact that the empirically observed relationship is inconsistent with that suggested by classical theories. Based on Fisher's hypothesis, the real stock return should be independent of the expected inflation. In addition, the commonly held view is that stocks represent the ownership of the income generated by real assets, and hence they should be a good hedge against inflation (Fama, 1981). The theories above suggest a non-negative relationship between real stock returns and inflation. However, in both U.S. and other emerging markets, a negative relationship between real stock returns and inflation was observed more frequently than a positive relation (e.g. Chen, Roll and Ross, 1986; Kaul, 1987; Khil and Lee 2000; Rapach, 2001).

The literature has proposed various explanations for the negative relation between real stock returns and inflation. Fama (1981) and Geske and Roll (1983) both suggested that stock returns are positively correlated to real economic activities, which in turn is negatively correlated to inflation, and therefore there is a negative correlation between stock returns and inflation. Geske and Roll (1983) suggested the counter-cyclical response of money supply to the real shocks. If an unanticipated stock price drop signals negative real economic shocks, which may cause government deficit, the central bank may wish to increase money supply to pay off the debt, implying a negative relation between stock returns and changes in expected inflation.

There are also some theoretical frameworks able to address both the positive and negative relations between stock returns and inflation. For example, Danthine and Donaldson (1986) argued that the positive relation occurs if the source of inflation is purely monetary and the negative relation occurs if the source of inflation lies in real activity. Kaul (1987), on the other hand, focused on the monetary equilibrium process by arguing that a counter-cyclical monetary response will cause a negative relation while a pro-cyclical monetary response will cause a positive relation.

1.2 The relation between real stock returns and real economic activities

A positive relation between stock returns and real activities is observed frequently (Fama, 1990; Schwert, 1990). The traditional finance view explains this positive relation with the signaling effect of stock returns, that is, stock prices reflect the expectations of future real activities. Real activities, therefore, have a central role in any story about the variation of stock returns (Fama, 1990). However, Cochrane (2011) reported that changes in stock prices do not appear to forecast future dividends. This is puzzling since if stock returns simply signal information about future economic activities we should expect stock returns to predict dividend changes.

There must be alternative explanations for the observed positive correlation between stock returns and real activities. Earlier research such as Barro (1990) and Fama (1990) suggest that, apart from signaling effect, stock returns might also cause changes in real activities. For example, an increase in stock prices may cause an increase in wealth, which is likely to increase the demand for consumption and/or investment goods (wealth effect). In fact, stock returns were included as one of the leading economic indicators in macro forecasting models (Stock and Watson, 2003). The very recent macro literature also emphasizes causation running from financial market activities to economic activities (Titman, 2013). Titman (2013) illustrated how shocks to financial markets can affect investment choices, which in turn would affect the overall economy. He suggested that financial markets may be affected by exogenous shocks, such as financial market

participation, which is perhaps due to sentiment. Alternatively, Schularick and Taylor (2012) suggest that the financial market system is likely to create its very own shocks.

2. Methodology

This paper employs a four-variable VAR system to investigate the causal relations and dynamic interactions among the rate of inflation (INF), the money supply (MS), the economic activity (ECO) and the real stock returns (RSR) in China. The rate of inflation series (INF) is the percentage growth in the monthly Consumer Price Index (CPI). The money supply (MS) is the percentage growth of M1. The real economic activities are proxied by the Economic Activity Prospectus Index, which is constructed based on the economic data in four perspectives: namely industrial production, employment, investment and consumption demand, and aggregate income. ECO is calculated as the percentage growth rate in this Index. The real stock return (RSR) is the equally weighted nominal stock returns on all A shares traded in China's stock market adjusted for the expected inflation, which is obtained by taking a one-step-ahead forecast based on the four variable VAR with a constant and 7 lags (selected based on the Akaike Information Criterion) that consists of Nominal Stock Return (SR), ECO, INF, and MS. The sample period is from January 2001 to December 2013, in which the data for 2001-2005 are used for forecasting the expected inflation. The unit root tests suggest that after taking the first difference of MS, all variables are stationary. All data are obtained from the CSMAR database.

This paper uses the Granger causality test to determine whether the real stock return is useful in forecasting macroeconomic variables, and vice versa. Lee (1992) argues that a simple Granger causality test may not provide a complete description and analysis of the data. It is more informative and revealing to discuss a causal relation in the context of informative (or predictive) content and of dynamic interactions. In this paper, Innovation Accounting such as Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) are used in analyzing the inter-relationships among stock returns and macroeconomic variables. The IRF in the VAR framework can be used to trace the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. The FEVD is used to investigate how much of the forecast error variance of each of the variable can be explained by structural shocks to the other variables in the system.

3. Empirical Results

3.1 Real stock returns and inflation

The contemporaneous correlation between real stock returns and inflation is weakly positive with the correlation coefficient of 0.04 (t value of 0.43). The non-negative relation is different from the negative ones observed in many other countries. In addition, the IRF

results (Figure One) demonstrate that the real stock return initially responds positively to the shocks in inflation, and only becomes largely negative from six months onwards and then decays gradually.

In terms of the relation between real stock returns and inflation, Kaul (1987) suggested that a pro-cyclical monetary response could cause an insignificant or positive relation between the two variables. However, we found little evidence suggesting a pro-cyclical monetary response in China. For instance, the Granger causality test (Table 1) suggests no causal relation from economic activities to money supply. In addition, the FEVD results (Table 2) show that, only 9.86 per cent of the 24-months forecasting error in money supply could be explained by economic activities. Furthermore, the IRF analysis (Figure One) also suggests that the money supply does not seem to respond pro-cyclically to economic activities. Therefore, our result does not seem to support Kaul's (1987) monetary response theory.

Danthine and Donaldson (1986) argued that the relation between the stock return and inflation is likely to be non-negative if the source of inflation is monetary, and negative if the source is real economic activities. In order to test whether this hypothesis can explain the non-negative relation between stock return and inflation observed in China, we employed Variance Decomposition to investigate the source of inflation variation. The results show that the inflation in China is indeed more of a monetary phenomenon. For example, Table 2 shows that 27.94 per cent of the 24-month forecast error variance of inflation is explained by innovations in money supply while only 4.07 per cent is explained by innovations in economic activities.

Figure One Impulse response of RSR, MS, INF, and ECO to shocks in each variable

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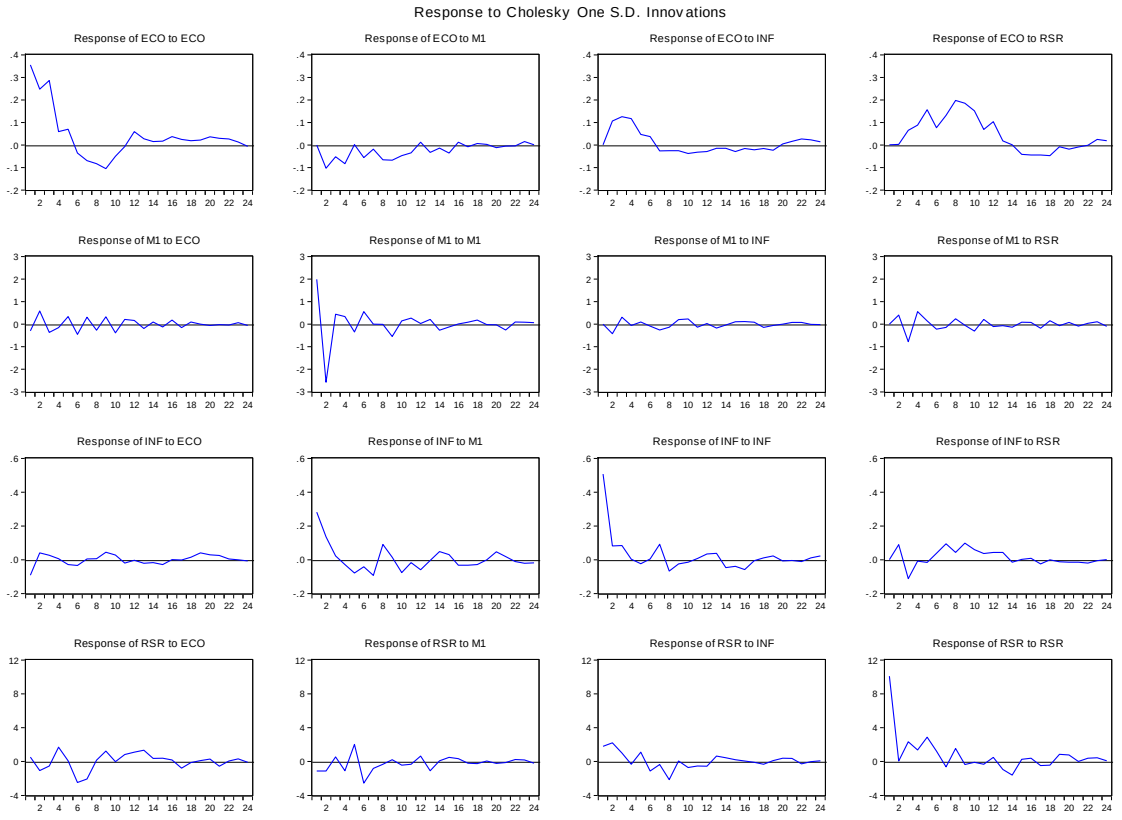

Table 1 Granger Causality Tests: RSR, MS, ECO, and INF

	ECO	MS	INF	RSR
ECO		1.02	1.11	3.73***
MS	1.61		2.43**	1.31
INF	0.65	1.44		1.43
RSR	1.56	1.11	1.11	

Note: H_0: the row variable does not cause the column variable. F-statistics are reported. ** and *** represent 5% and 1% significance level respectively.

Table 2 Variance Decomposition (24-month forecast error) of RSR, MS, ECO, and INF

Variables explained	By innovations in			
	ECO	MS	INF	RSR
	(%)	(%)	(%)	(%)
ECO	53.44	6.73	9.19	30.64
MS	9.86	76.72	3.72	9.69
INF	4.07	27.94	57.63	10.37
RSR	11.64	9.61	10.01	68.74

3.2 Real stock returns and real economic activities

The contemporaneous correlation between real stock returns (RSR) and real economic activities (ECO) is 0.20 (t value of 1.98), but the Granger causality test (Table 2) suggests that the causality is unidirectional from real stock returns to real economic activities. The FEVD results (Table 2) also suggest that 30.64 per cent of variation in real activities can be explained by real stock returns, but only 11.64 per cent of the stock return variation can be explained by real activities. The IRF analysis (Figure 1) shows that the response of real stock returns to shocks in real economic activities is unstable. On the other hand, the response of real economic activities to shocks in real stock returns is persistent for more than one year. The overall results therefore suggest that, compared with the causation from stock market to real economy, the signaling effect of stock returns plays a weaker role in explaining their positive relations, which is consistent with the wealth effect hypothesis proposed in Barro (1990) and Fama (1990) and the recent macro literature (e.g. Schularick and Taylor, 2012; Titman, 2013) that emphasizes causation from financial market to real economic activities.

The dynamic relation between real stock returns and economic activities revealed in Figure 1 shows that the response of real economic activities to shocks in real stock returns is strongly positive up to the first fourteen months, and the effect turns to be negative thereafter until the twentieth month. The relation is negligible after that. This short-term positive and long-term negative dynamic seems to provide empirical support to Titman's (2013) catalytic model for equity market: in the short-run, the incumbent public firm's stock price increases (positively due to positive participation shock) will attract investment expenditures from new entrants, causing a positive relation between stock returns and real activities. In the long run, however, the new entrants ultimately compete with, and therefore impose negative externalities on the incumbent firm. If the negative effect on the incumbent firm can outweigh the increased investments by new entrants, there could be a long-term negative relationship between public stock returns and aggregate production.

4. Conclusion

The interaction between China's stock market returns and three macroeconomic variables, namely money supply, inflation and a proxy for real economic activities, is examined over the period from January 2001 to December 2013. We found that, unlike what is observed in many other countries, real stock returns have a positive relation with inflation in China, suggesting that in China the inflation is more of a monetary phenomenon. We also discovered stronger evidence of causation running from stock market to real economic activities than the other way around, which is against traditional wisdom but in support of Titman's (2013) catalytic model for equity market.

Further research will be conducted in China to investigate how stock market price changes may affect real economic activities through investment choices and externalities that can arise from these choices.

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