Dynamic Linkages Between Monetary Policy And The Stock Market

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ABSTRACT

This paper examines the dynamic linkages between the federal funds rate and the S&P500 index for the 1970-2003 period, decade by decade, using cointegration and error-correction methodologies. The results indicate absence of cointegration during the 1970s and the 1980s but presence of a dynamic, short-run relationship between the two variables only in the 1970s. Specifically for the 1990s, there seems to have been a disconnection between actions taken by the Fed and responses by the stock market or vice versa. Overall, the results seem to suggest that there was no concrete and consistent dynamic relationship between monetary policy and the stock market and that the nature of such dynamics was different in each of the three decades, which coincided with three different Fed operating regimes.

INTRODUCTION

This article examines the issue of the dynamic interactions between monetary policy and the stock market. Monetary policy can affect the cash flows from the stock in two distinct ways. First, via changes in the firm's expected cash flows. For example, an expansionary monetary policy creates real effects by increasing a firm's profitability and thus its expected cash flows. By contrast, the effects of contractionary monetary policy will be to lower a firm's expected profitability and thus its stock price (or returns). And second, via the means of altering the discount rate at which the firm's expected cash flows are discounted. For instance, an expansionary (contractionary) monetary policy stance will reduce (raise) market interest rates, both short and long, and, by consequence the firm's appropriate discount rate which, in turn, will increase (decrease) a firm's stock price (returns).

The impact of the stock market on monetary policy can manifest itself via two general effects. The first is the wealth effect. For instance, advances in the stock market create increases in household wealth and, consequently, in consumption. The Fed, in turn, from fear of rising inflationary expectations may decide to raise interest rates in order to curtail this spending trend. The second is the credit channel. Specifically, stock market (or price) movements can also affect the cost of business financing. Advances in the stock market, by raising share prices, make borrowing easier for many sectors in the economy which, in turn, increase aggregate spending and investment. If such trends continue in the future, the Fed will be forced to respond by applying a restrictive monetary policy and this, in turn, will limit such activities and prevent the economy from overheating.

Unfortunately, early research on the relationship between the two magnitudes has provided mixed results. For instance, Homa and Jaffe (1971), and Hamburger and Kochin (1972) found support for the hypothesis that past money supply data could be used to predict stock returns, and Fama's (1970) theory of efficient markets, which states that all available information should be reflected in the current stock prices, appeared to be disputed. Further research, however, rejected these early findings and showed that past money changes had no predictive power on stock returns [e.g., Rozeff (1974) and Rogalski and Vinso (1977)]. Recent research, again provided mixed results upon examination of the nature of linkages between open market operations and asset prices. Specifically, Tarhan (1995) found no evidence that the Federal Reserve influences stock prices, while Thorbecke (1997) and Rigobon and Sack (2001) found a significant negative effect of the federal funds rate on broad equity market indexes.

In view of the above mixed empirical evidence, the purpose of this paper is to reexamine whether significant and dynamic interdependencies existed between monetary policy and the stock market since the 1970s, decade by decade. Specifically the following questions will be addressed. First, has monetary policy been influenced by movements in the stock market, above and beyond what the movements for output and inflation suggest? Second, has the stock market been influenced by changes in monetary policy? Third, has the Fed's response been directed primarily towards subduing inflation, as the Fed contends, thereby indirectly affecting the stock market? These questions will be addressed by utilizing methodologies such as cointegration, causality, and vector error-correction models. The paper considers the issue of dynamic interdependencies between monetary policy and the stock market relying on a macroeconomic framework so as to derive a monetary policy shock.

METHODOLOGY AND MAIN RESULTS

Monetary policy is measured by the federal funds rate innovations from a VAR system composed of the following variables: industrial production, inflation rate, the federal funds rate (FFR), total reserves, money supply, and nonborrowed reserves. Under cointegration, the Engle-Granger representation theorem would suggest that the dynamic relationships between the two cointegrated variables be examined within an error-correction (e-c) framework. Following the Granger representation theorem, two cointegrated variables have the following joint e-c representation:

$$\Delta FFR_{i,t} = \alpha_1 + \gamma_1\varepsilon_{t-1} + \sum_{i=1}^{n1} \lambda_i \, \Delta FFR_{i,t} + \sum_{j=1}^{n2} \kappa_j \, \Delta S\&P_{j,t} + e_t \tag{1}$$

$$\Delta S\&P_{j,t} = \alpha_2 + \gamma_2\varepsilon_{t-1} + \sum_{i=1}^{n3} \nu_i \, \Delta FFR_{i,t} + \sum_{j=1}^{n4} \pi_j \, \Delta S\&P_{j,t} + \eta_t \tag{2}$$

where FFR_t denotes the federal funds rate, Δ is the first-difference operator, γ_1, γ_2, λ_i, ν_i, κ_j, and π_j are parameters to be estimated, and e_t and η_t are stationary random processes describing the error terms.

From panel A of Table 1, several comments can be made. First, the nominal stock returns' own explanatory power, relative to the 1970s, increased in the 1980s but decreased in the 1990s, while its explanatory power for the federal funds rate increased sharply in the 1990s. Second, federal funds rate innovations accounted for a substantial portion of the error forecast variance of the nominal stock returns in the 1970s (although with decreasing intensity over time) but declined drastically in the 1990s. Third, regarding the real stock returns federal funds rate innovations explained a significant portion of their forecast variance in the first two decades but diminished in intensity in the 1990s. Finally, although the nominal stock returns surfaced as explaining a modest portion of the fed funds rate forecast variance in the 1980s and 1990s, the real stock returns did not in either decade. The estimates in panel B, where a dummy variable for testing the effects of the October 1987 market crash, point to a conclusion similar to the second decade (the coefficient of the dummy variable, DUM, is statistically insignificant).

Figures 1 and 2 exhibit the impulse response graphs for these variables with asymptotic standard errors. Inspecting Figure 1, where the nominal stock returns with the federal funds rate innovations are displayed, we can see an interesting pattern in the responses of the former to shocks from the latter for all three decades (see first column of graphs). These alternating ups and downs of the nominal stock returns appear more pronounced in the 1970s and 1990s but less so in the 1980s and take several periods to die out (this is not shown in the graphs). In Figure 2, the responses of the real stock returns to federal funds rate innovations seem to be different only in the 1970s but appear less pronounced (in the 1980s and 1990s) than the nominal stock returns. Finally, the federal funds rate's responses to nominal or real stock returns are seen to be the same albeit with lesser intensity to shocks by the real returns.

What do these graphs suggest? The responses of the stock returns, real or nominal, to federal funds shocks suggest that monetary policy has real and quantitative effects on the stock market. Furthermore, the differential responses of the stock market in different decades imply that different monetary policy regimes exerted differing impacts on the stock market.

SUMMARY AND CONCLUSIONS

This paper empirically examines the dynamic interdependencies between monetary policy and stock prices for the 1970-2003 period, in decades, using cointegration and Vector Autoregressive (VAR) or Vector Error-Correction (VEC) models. We used the strategy for assessing the impact of monetary policy on the stock market via federal funds innovations emanating from a structural VAR with several macro variables. The results indicate varying degrees of linkages between the two variables during each decade. During the 1970s and the 1980s, although there was no cointegration between the fed funds rate and the stock market, a short-run dynamic relationship between the two variables was found only in the 1970s. During the 1990s, there was both evidence of cointegration and a significant inverse relationship between the two variables. Finally, extending the analysis to examine the impact of the 1987 stock market crash, our results did not point to any influence of the crash on either the federal funds rate or the stock market.

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Table 1: VAR/VEC Model Estimates

Panel A: VAR/VEC Estimates

1970-1978

$$\Delta FFR_t = 0.3268 + 0.3234^* \Delta FFR_{t-1} + 0.3384^* \Delta FFR_{t-2} + 0.0117\ \Delta DSP_{t-1} + 0.0292^* \Delta DSP_{t-2}$$
(1.324) (4.574) (3.816) (1.221) (3.021)

$$\Delta DSP_t = 0.2044 + 0.0680\ \Delta FFR_{t-1} - 2.6203^* \Delta FFR_{t-2} - 0.0041\ \Delta DSP_{t-1} - 0.1386\ \Delta DSP_{t-2}$$
(1.112) (1.243) (-2.876) (-0.786) (-1.445)

1979-1987

$$\Delta FFR_t = 0.0028 + 0.5234^* \Delta FFR_{t-1} - 0.3646^* \Delta FFR_{t-2} + 0.0334\ \Delta DSP_{t-1} + 0.0012\ \Delta DSP_{t-2}$$
(0.324) (5.214) (-3.854) (1.441) (1.321)

$$\Delta DSP_t = -0.1054 - 0.9780\ \Delta FFR_{t-1} + 0.0523\ \Delta FFR_{t-2} + 0.0638\ \Delta DSP_{t-1} - 0.0674\ \Delta DSP_{t-2}$$
(-0.543) (-1.783) (1.226) (1.446) (-1.115)

1988-2003

$$\Delta FFR_t = 0.0388 - 0.0995^* \varepsilon_{t-1} - 0.5356^* \Delta FFR_{t-1} - 0.1964^* \Delta FFR_{t-2} - 0.0198^* \Delta DSP_{t-1} - 0.0076^* \Delta DSP_{t-2}$$
(0.122) (-4.425) (-5.524) (-2.323) (-4.222) (-2.231)

$$\Delta DSP_t = 0.1054 + 3.8436^* \varepsilon_{t-1} - 3.3758^* \Delta FFR_{t-1} - 1.5589\ \Delta FFR_{t-2} - 0.1635\ \Delta DSP_{t-1} - 0.1278\ \Delta DSP_{t-2}$$
(1.112) (6.336) (-2.223) (-1.116) (-0.656) (-1.111)

Panel B: 1987 Stock Market Crash

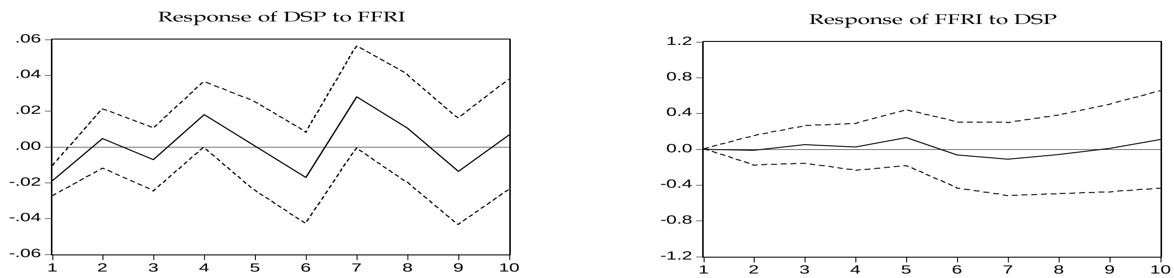
$$\Delta FFR_t = 0.0033 + 0.1790^* \Delta FFR_{t-1} + 0.0417\ \Delta FFR_{t-2} - 0.0228^* \Delta DSP_{t-1} - 0.0010\ \Delta DSP_{t-2} - 0.0107\ DUM$$
(0.082) (3.654) (1.013) (-3.892) (-0.171) (-0.175)

$$\Delta DSP_t = -0.0829 - 1.1501^* \Delta FFR_{t-1} - 1.1712^* \Delta FFR_{t-2} - 0.6081^* \Delta DSP_{t-1} - 0.3446^* \Delta DSP_{t-2} + 0.1970\ DUM$$
(-0.222) (-3.343) (-2.766) (-11.543) (-6.901) (0.376)

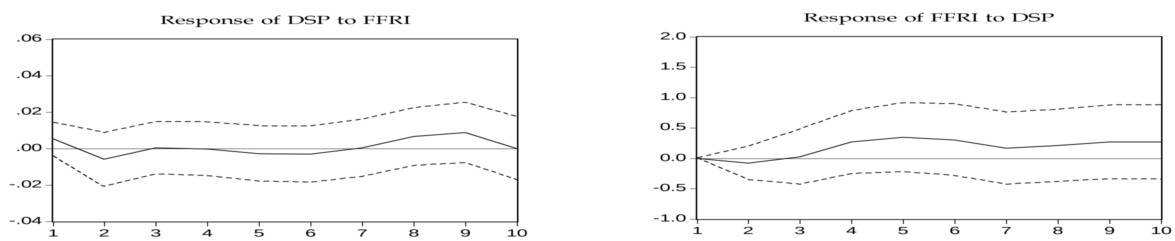
Notes: * significant at the 5%; t-stats in parentheses; DUM is the dummy variable for the market crash.

Figure 1: Impulse Response Graphs: Federal Funds Rate Innovations (FFRI) And Nominal Stock Returns (DSP), 1970-2003

Panel A: 1970-1978



Panel B: 1979-1987



Panel C: 1988-2003

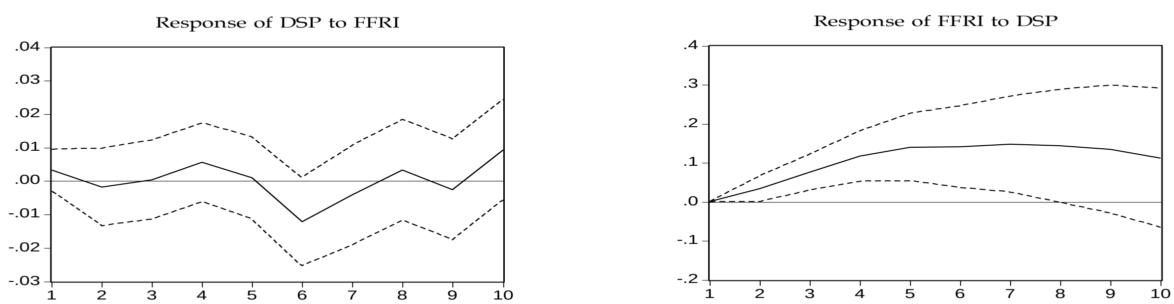
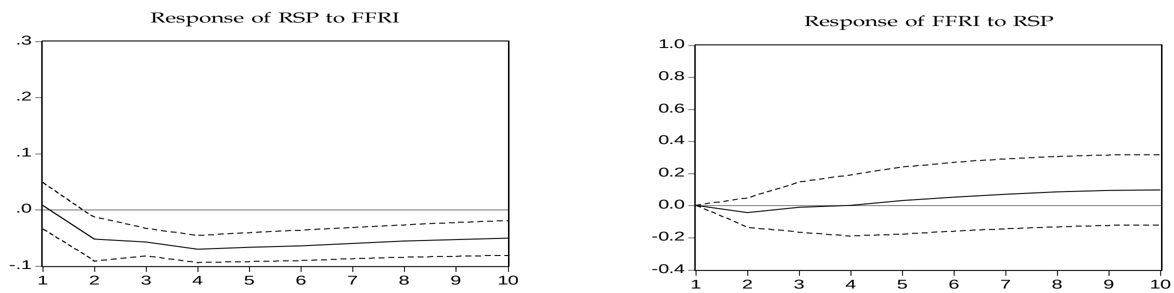
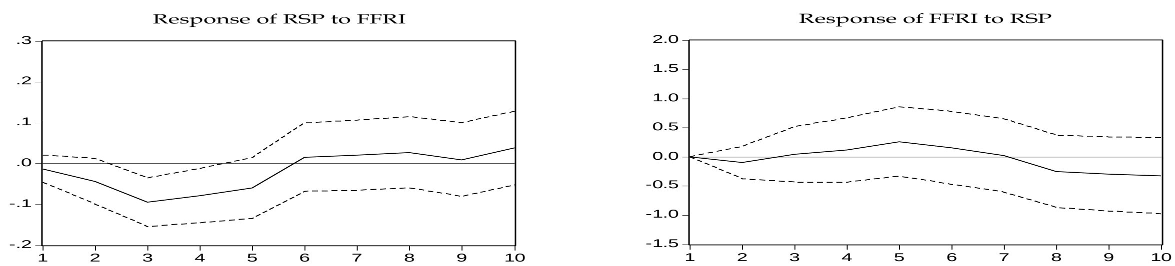


Figure 2: Impulse Response Graphs: Federal Funds Rate Innovations (FFRI) And Real Stock Returns (RSP), 1970-2003

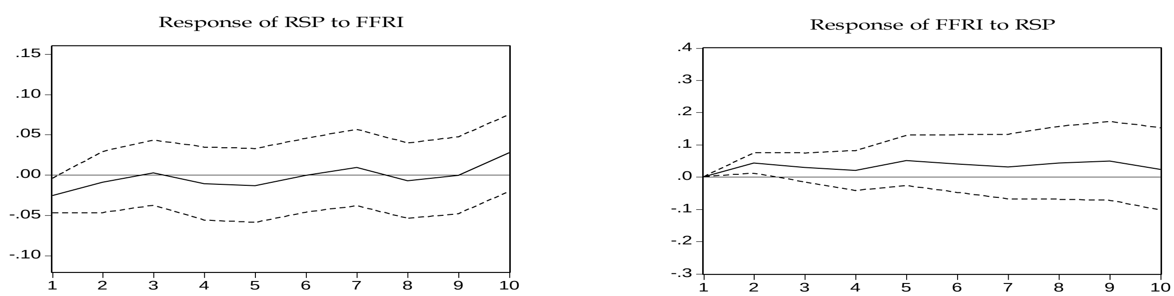
Panel A: 1970-1978



Panel B: 1979-1987



Panel C: 1988-2003



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