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On Stock Market Returns and Monetary Policy

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ABSTRACT

Financial economists have long debated whether monetary policy is neutral. This article addresses this question by examining how stock return data respond to monetary policy shocks. Monetary policy is measured by innovations in the federal funds rate and nonborrowed reserves, by narrative indicators, and by an event study of Federal Reserve policy changes. In every case the evidence indicates that expansionary policy increases ex-post stock returns. Results from estimating a multi-factor model also indicate that exposure to monetary policy increases an asset's ex-ante return.

THE ISSUE OF MONETARY neutrality has long been debated by financial economists. Rozeff (1974) presents evidence that increases in the growth rate of money raises stock returns. Black (1987), on the other hand, argues that monetary policy cannot affect interest rates, stock returns, investment, or employment. Boudoukh, Richardson, and Whitelaw (1994) state that whether monetary policy affects the real economy, and whether its effects are quantitatively important, remain open questions.

This article addresses these questions by examining the effects of monetary policy innovations on stock return data. Theory posits that stock prices equal the expected present value of future net cash flows. Thus evidence that positive monetary shocks increase stock returns indicates that expansionary monetary policy exerts real effects by increasing future cash flows or by decreasing the discount factors at which those cash flows are capitalized.

To examine the relationship between monetary policy and stock returns, a variety of empirical techniques are employed. Impulse-response functions and variance decompositions from a vector autoregression indicate that there is a large and statistically significant relationship between either negative shocks to the federal funds rate or positive shocks to nonborrowed reserves and subsequent increases in stock returns. Generalized method of moments estimation reveals that narrative evidence of a monetary expansion is also strongly correlated with increases in stock returns. An event study of changes by the Federal Reserve in its federal funds rate target provides additional evidence that a monetary expansion increases stock returns. Finally, nonlinear seemingly unrelated regression estimation of a multifactor model indicates that monetary policy, as measured both by federal funds rate innovations and

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by narrative measures, is a common factor and that assets must pay positive risk premia to compensate for their exposure to it. These results support the hypothesis that monetary policy, at least in the short run, has real and quantitatively important effects on the economy.[1]

The next section presents vector autoregression evidence on monetary policy and stock returns. Section II contains narrative evidence on the effects of monetary policy. Section III utilizes an event study approach to investigate these issues. Section IV examines the effects of monetary policy on ex-ante returns. Section V concludes and discusses the implications of the findings for further research in financial economics.

I. Vector Autoregression Evidence of Monetary Policy and Stock Returns

A. Data and Methodology

The vector autoregression (VAR) methodology has proven useful for investigating the relationship between stock returns and other variables (see, e.g., Lee (1992)). This involves regressing an n by 1 vector of endogenous variables, $\mathbf{y}_t$, on lagged values of itself:

$$\mathbf{y}_t = \Lambda_1 \mathbf{y}_{t-1} + \dots + \Lambda_p \mathbf{y}_{t-p} + \boldsymbol{\epsilon}_t, \quad \mathrm{E}(\boldsymbol{\epsilon}_t \boldsymbol{\epsilon}_t') = \boldsymbol{\Omega}. \tag{1}$$

Assuming that $\mathbf{y}_t$ is covariance stationary, equation (1) can be inverted and represented as an infinite vector moving average process:

$$\mathbf{y}_t = \boldsymbol{\epsilon}_t + \boldsymbol{\Pi}_1 \boldsymbol{\epsilon}_{t-1} + \boldsymbol{\Pi}_2 \boldsymbol{\epsilon}_{t-2} + \boldsymbol{\Pi}_3 \boldsymbol{\epsilon}_{t-3} + \dots. \tag{2}$$

Since the variance-covariance matrix of ϵ_t (Ω) is symmetric and positive definite, the Cholesky factorization implies that there exists a lower triangular matrix $\mathbf{P}$ such that $\Omega = \mathbf{PP}'$. Using $\mathbf{P}$, equation (2) can be rewritten as

$$\begin{aligned} \mathbf{y}_t &= \mathbf{PP}^{-1}\boldsymbol{\epsilon}_t + \boldsymbol{\Pi}_1\mathbf{PP}^{-1}\boldsymbol{\epsilon}_{t-1} + \boldsymbol{\Pi}_2\mathbf{PP}^{-1}\boldsymbol{\epsilon}_{t-2} + \dots \\ &= \boldsymbol{\Gamma}_0 \boldsymbol{v}_t + \boldsymbol{\Gamma}_1 \boldsymbol{v}_{t-1} + \boldsymbol{\Gamma}_2 \boldsymbol{v}_{t-2} + \dots \end{aligned} \tag{3}$$

where $\boldsymbol{\Gamma}_i = \boldsymbol{\Pi}_i\mathbf{P}$, $\boldsymbol{v}_t = \mathbf{P}^{-1}\boldsymbol{\epsilon}_t$, and $\mathrm{E}[\boldsymbol{v}_t\boldsymbol{v}_t'] = \mathbf{I}$. Equation (3) represents the endogenous variables ($\mathbf{y}_t$) as functions of the orthogonalized innovations ($\boldsymbol{v}_{t-i}$).

[1] Siegel's (1985) work provides another interpretation for the results. He presents a flexible price equilibrium model in which money is endogenous and changes in money signal changes in economic activity. Thus unexpected money growth in his model affects real asset returns because it communicates information about real activity. As Hardouvelis (1987) discusses, evidence that discretionary policy changes by the Fed affect real asset returns would be inconsistent with Siegel's real activity hypothesis. Thus, if funds rate innovations, nonborrowed reserve innovations, and the other variables used in this paper measure only monetary policy shocks, then the results presented here would be inconsistent with the real activity hypothesis. If, on the other hand, the monetary policy measures also reflect endogenous responses to the economy, the results in this article could be consistent with Siegel's hypothesis.

One can also determine the percentage of each variable's forecast error variance that is attributable to innovations in each of the endogenous variables.[2]

Bernanke and Blinder (1992), employing this VAR approach, use the federal funds rate to measure monetary policy. Evidence from variance decompositions and Granger causality tests indicate that the funds rate forecasts unemployment, industrial production, and other real variables well over the 1959: 7–1989:12 period. This is consistent with the hypothesis that monetary policy exerts an important effect on real variables. However, other researchers (e.g., Sims (1992)) present evidence that casts doubt on the hypothesis that federal funds rate shocks are useful for identifying monetary policy changes. Specifically, these authors find that when the funds rate is placed first in a Cholesky ordering, positive innovations in the funds rate are correlated with subsequent increases in inflation. This increase in inflation in response to a "contractionary" policy shock has been labeled the "price puzzle." As Christiano, Eichenbaum, and Evans (1994) discuss, this response could occur because the Fed is using some indicator of inflation that the econometrician is not including in the VAR. If the Fed tightens policy in response to this indicator and if the tightening only affects inflation with a lag, then contractionary policy will appear to be correlated with higher future inflation. Christiano *et al.* find that including an index of sensitive commodity prices as an additional indicator of inflation eliminates the price puzzle and causes positive innovations in the funds rate to be associated with subsequent decreases in the price level.

This identification strategy of Christiano *et al.* is used here to model monetary policy shocks. A monthly VAR with the growth rate of industrial production, the inflation rate, the log of a commodity price index, the federal funds rate, the log of nonborrowed reserves, the log of total reserves, stock returns, a constant, and six lags is estimated. Orthogonalized innovations in the funds rate are used to measure monetary policy. Following Christiano *et al.*, the order of orthogonalization is the same as the order in which the variables are listed above. In addition, since the Federal Reserve targeted nonborrowed reserves (NBR) over the October 1979–August 1982 period, orthogonalized

[2] The variance-covariance matrix of the k-period-ahead forecast error is:

$$\mathrm{Var}[\mathbf{y}_{t+k} - \mathrm{E}(\mathbf{y}_{t+k}|\mathbf{y}_t, \mathbf{y}_{t-1}, \mathbf{y}_{t-2}, \ldots)] = \mathbf{\Gamma}_0'\mathbf{\Gamma}_0 + \mathbf{\Gamma}_1\mathbf{\Gamma}_1' + \ldots + \mathbf{\Gamma}_{k-1}\mathbf{\Gamma}_{k-1}.$$

The contribution of the jth orthogonalized innovation to the k-period-ahead FEV is:

$$\mathbf{\Gamma}_{0,j}\mathbf{\Gamma}_{0,j}' + \mathbf{\Gamma}_{1,j}\mathbf{\Gamma}_{1,j}' + \ldots + \mathbf{\Gamma}_{k-1,j}\mathbf{\Gamma}_{k-1,j}',$$

where $\Gamma_{0,j}$ is the jth column of the matrix $\mathbf{\Gamma}_0$. The contribution of an innovation in the jth variable to the k-period-ahead FEV in the ith variable is then given by:

$$\sum_{s=0}^{k-1} \mathbf{\Gamma}_{s,ij}^2 \Bigg/ \sum_{j=1}^{n} \sum_{s=0}^{k-1} \mathbf{\Gamma}_{s,ij}^2,$$

where $\mathbf{\Gamma}_{s,ij}$ is the ijth element of the matrix $\mathbf{\Gamma}_s$.

innovations in NBR are used to measure monetary policy over this period.[3] When NBR is used to measure monetary policy, it is placed ahead of the federal funds rate in the recursive ordering.

The stock return data are for the 22 industries that Boudoukh, Richardson, and Whitelaw (1994) use and for 10 size portfolios. These data come from the Center for Research in Security Prices (CRSP) database. The industry data include firms traded for any full calendar year over the 1953–1990 period. Firms are sorted into industries based on two-digit Standard Industrial Classification (SIC) codes and industry portfolio returns are equally-weighted averages of the returns on individual firms. The size portfolios are value-weighted and are sorted into deciles based on market capitalization at the end of each quarter.

The size portfolios are useful for investigating why monetary policy matters, if in fact it does. If monetary policy has real effects, one reason for this could be that it affects firms' balance sheets. Gertler and Gilchrist (1994) argue that a monetary tightening, by increasing interest rates, can worsen cash flow net of interest and thus firms' balance sheet positions. This decline in net worth can reduce a firm's ability to borrow and thus to spend and invest. Gertler and Gilchrist further argue that these credit constraints should affect small firms, which are less well-collateralized, more than large firms. Evidence that monetary policy affects stock returns of small firms more than those of large firms thus supports the hypothesis that monetary policy matters because it affects firms' access to credit.

To investigate whether monetary policy affects size and industry portfolios, both impulse responses and innovation accounting methods are used. Since forward-looking investors should quickly capitalize the implications of monetary policy shocks for future cash flows and discount factors, the initial period response of stock returns to a monetary policy shock is examined. Standard errors for these coefficients are calculated by Monte Carlo methods using 300 draws from the posterior distribution of the orthogonalized impulse responses (see Doan (1992)). Since financial economists have found that stock returns are somewhat forecastable (see Campbell and Ammer (1993) and the references contained therein), the percent of the 24-month forecast error variance of stock returns explained by monetary policy shocks is also examined. Standard errors are again calculated using the Monte Carlo methods discussed by Doan with 300 draws from the posterior distribution.

Apart from stock returns, data for the other variables are obtained from the Haver Analytics data tape (the mnemonics for these variables are listed in Table I). Since data on commodity prices are available from Haver Analytics beginning in January 1967 and since the industry stock return data of Boudoukh *et al.* (1994) extend to December 1990, the estimation using federal funds rate innovations to measure monetary policy is performed over the 1967:1–1990:12 period. October 1987, the month of the October 19 stock market crash and the subsequent easing of monetary policy on October 20 and

[3] Since this sample period contains only 34 observations, this VAR system is estimated with two lags of each of the variables.

Table I

Impulse Response of Industry and Size Stock Returns to One-Standard Deviation Shock to the Federal Funds Rate (FF)

The coefficients in the Table represent the 7,4th element of the matrix Γ_0 in the orthogonalized moving average process:

$$\mathbf{y}_t = \boldsymbol{\Gamma}_0 \boldsymbol{v}_t + \boldsymbol{\Gamma}_1 \boldsymbol{v}_{t-1} + \boldsymbol{\Gamma}_2 \boldsymbol{v}_{t-2} + \ldots$$

where $\mathbf{y}_t$ is a (7×1) vector whose elements are industrial production growth (IPN), the inflation rate (IFN), the log of an index of sensitive commodity prices (CP), the federal funds rate (FF), the log of nonborrowed reserves (NBR), the log of total reserves (TR), and stock returns for portfolio k (SR_k). The order of the variables in the vector $\mathbf{y}_t$ is the same as the order in which they are listed above. Thus the 7,4th element of the matrix Γ_0 measures the response of SR_k in the initial period to a one-standard deviation shock to FF. The original vector autoregression is estimated with a constant and six lags. The sample period extends from January 1967 to December 1990. Data on IPN, IFN, CP, FF, NBR, and TR are obtained from the Haver Analytics data tape. The mnemonics for these variables are, respectively, IPN, PCU, PZALL, FFED, FARAN, and FARAT. Data on SR_k represent either industry or size portfolios. The industry portfolios are for two-digit Standard Industrial Classification (SIC) industries and represent equally-weighted averages of individual firms' returns. The size portfolios are sorted into deciles based on market capitalization at the end of each quarter and represent value-weighted averages. The stock return data are obtained from the Center for Research in Security Prices (CRSP) database. All numbers are measured in percentage units.

Portfolio	Response to One-Standard Deviation Shock to FF	(Std. Error)
Apparel	−0.509	(0.376)
Chemicals	−0.642	(0.313)
Clay, glass, and stone	−0.945	(0.318)
Electrical machinery	−0.735	(0.424)
Food and beverage	−0.773	(0.280)
Furniture	−0.950	(0.339)
Instruments	−0.741	(0.374)
Leather	−0.662	(0.104)
Lumber	−1.42	(0.527)
Metal products	−0.774	(0.323)
Mining	−1.34	(0.374)
Misc. manufacturing	−0.776	(0.395)
Nonelectrical machinery	−0.894	(0.363)
Paper	−0.884	(0.333)
Petroleum products	−0.760	(0.331)
Primary metals	−0.879	(0.338)
Printing and publishing	−0.664	(0.331)
Rubber and plastics	−0.791	(0.321)
Textiles	−0.635	(0.362)
Tobacco	−0.583	(0.259)
Transportation equipment	−0.803	(0.386)
Utilities	−0.662	(0.186)
First decile (smallest)	−0.941	(0.389)
Second decile	−0.799	(0.369)
Third decile	−0.911	(0.341)
Fourth decile	−0.900	(0.307)
Fifth decile	−0.904	(0.302)
Sixth decile	−0.739	(0.294)
Seventh decile	−0.866	(0.284)
Eighth decile	−0.727	(0.275)
Ninth decile	−0.544	(0.269)
Tenth decile (largest)	−0.570	(0.215)

21, is deleted from the estimation in this and the following sections. Unlike the rest of the sample period, this is a month when changes in stock returns caused changes in monetary policy. Including this observation would thus bias estimates of the effects of monetary shocks on stock returns.

B. Results

Tables I–IV report the results of the VAR estimation. Tables I and II indicate that in the initial period a one-standard deviation positive innovation in the funds rate depressed stock returns by an average of -0.80 percent per month and a one-standard deviation positive innovation in nonborrowed reserves increased stock returns by an average of 1.79 percent per month. These compound to annual effects of -10 percent and 24 percent, respectively. The standard errors indicate that, in most cases, these point estimates are statistically different from zero. Thus expansionary (contractionary) monetary policy, as measured by innovations in both the funds rate and nonborrowed reserves, has a large and statistically significant positive (negative) effect on stock returns.

Tables III and IV present the percent of the 24-month forecast error variance (FEV) of stock returns that is explained by innovations in monetary policy. Table III indicates that, on average, 3.94 percent of the FEV of portfolio returns is explained by funds rate innovations, and Table IV indicates that, on average, 15.85 percent of the FEV of stock returns is explained by nonborrowed reserves innovations. The standard errors show that, in most cases, these FEVs are statistically different from zero. Thus monetary policy innovations explain a substantial fraction of portfolio stock returns.

All of the results in Tables I–IV measure the effects of monetary policy shocks on nominal stock returns. In considering the question of monetary neutrality, we are interested in whether monetary policy affects real stock returns. These regressions are thus reestimated using real returns measured in several ways. Real returns are measured as the difference between nominal returns and 1) actual inflation, 2) expected inflation calculated using a Kalman filter method and one-step-ahead forecasts from the VARs described above, 3) expected inflation measured using the method of Fama and Gibbons (1984), 4) expected inflation as forecast by Data Resources, Inc., and 5) one-month Treasury bill returns.[4] In every case the results are very similar to those obtained using nominal returns. Thus rather than complicate the analysis by considering the best way to measure expected inflation we focus on results using nominal returns.[5]

[4] The Data Resources, Inc. data are only available starting in October 1973.

[5] For the next several months following the initial month, the cumulative responses of real and nominal stock returns to contractionary monetary shocks remain negative and gradually move toward zero. The results are very similar for real and nominal returns. This similarity probably reflects the fact that monetary policy shocks in VAR systems of this type do not have large effects on inflation over the first several months.

Table II

Impulse Response of Industry and Size Stock Returns to One-Standard Deviation Shock to the Log of Nonborrowed Reserves (NBR)

The coefficients in the Table represents the 7,4th element of the matrix Γ_0 in the orthogonalized moving average process:

$$\mathbf{y}_t = \boldsymbol{\Gamma}_0 \boldsymbol{v}_t + \boldsymbol{\Gamma}_1 \boldsymbol{v}_{t-1} + \boldsymbol{\Gamma}_2 \boldsymbol{v}_{t-2} + \ldots$$

where $\mathbf{y}_t$ is a (7×1) vector whose elements are industrial production growth (IPN), the inflation rate (IFN), the log of an index of sensitive commodity prices (CP), the log of nonborrowed reserves (NBR), the federal funds rate (FF), the log of total reserves (TR), and stock returns for portfolio k (SR_k). The order of the variables in the vector $\mathbf{y}_t$ is the same as the order in which they are listed above. Thus the 7,4th element of the matrix Γ_0 measures the response of SR_k in the initial period to a one-standard deviation shock to NBR. The original vector autoregression is estimated with a constant and two lags. The sample period extends from October 1979 to August 1982. Data on IPN, IFN, CP, NBR, FF, and TR are obtained from the Haver Analytics data tape. The mnemonics for these variables are, respectively, IPN, PCU, PZALL, FARAN, FFED, and FARAT. Data on SR_k represent either industry or size portfolios. The industry portfolios are for two-digit Standard Industrial Classification (SIC) industries and represent equally-weighted averages of individual firms' returns. The size portfolios are sorted into deciles based on market capitalization at the end of each quarter and represent value-weighted averages. The stock return data are obtained from the Center for Research in Security Prices (CRSP) database. All numbers are measured in percentage units.

Portfolio	Response to One-Standard Deviation Shock to NBR	(Std. Error)
Apparel	1.07	(1.01)
Chemicals	1.69	(0.72)
Clay, glass, and stone	2.56	(0.88)
Electrical machinery	1.51	(0.99)
Food and beverage	1.19	(0.69)
Furniture	1.90	(0.98)
Instruments	2.27	(0.96)
Leather	1.01	(0.72)
Lumber	2.23	(0.11)
Metal products	1.53	(0.10)
Mining	2.85	(0.13)
Misc. manufacturing	1.26	(0.92)
Nonelectrical machinery	2.21	(0.87)
Paper	1.86	(0.87)
Petroleum products	3.14	(1.31)
Primary metals	2.08	(1.07)
Printing and publishing	1.94	(0.75)
Rubber and plastics	1.37	(0.89)
Textiles	1.25	(0.82)
Tobacco	1.14	(0.68)
Transportation equipment	1.34	(1.12)
Utilities	1.81	(0.50)
First decile (smallest)	2.23	(0.89)
Second decile	1.85	(0.89)
Third decile	1.40	(0.93)
Fourth decile	1.94	(0.88)
Fifth decile	2.35	(0.74)
Sixth decile	2.42	(0.84)
Seventh decile	2.32	(0.82)
Eighth decile	2.38	(0.77)
Ninth decile	1.74	(0.70)
Tenth decile (largest)	1.30	(0.58)

Table III

Percent of 24-Month Forecast Error Variance (FEV) of Industry and Size Stock Returns Accounted for by Innovations in the Federal Funds Rate (FF)

The contribution of FF shocks to the FEV of industry and size stock returns is estimated using a VAR system $\mathbf{y}_t$ with industrial production growth (IPN), the inflation rate (IFN), the log of an index of sensitive commodity prices (CP), FF, the log of nonborrowed reserves (NBR), the log of total reserves (TR), stock returns for portfolio k (SR_k), a constant, and six lags. $\mathbf{y}_t$ depends on orthogonalized innovations in all the variables ($\boldsymbol{v}_{t-i}$):

$$\mathbf{y}_t = \boldsymbol{\Gamma}_0\boldsymbol{v}_t + \boldsymbol{\Gamma}_1\boldsymbol{v}_{t-1} + \boldsymbol{\Gamma}_2\boldsymbol{v}_{t-2} + \dots$$

The percentage contribution of an innovation in variable j to the 24-month FEV of variable i is then given by:

$$100 \times \sum_{s=0}^{23} \boldsymbol{\Gamma}_{s,ij}^2 \Bigg/ \sum_{j=1}^{4}\sum_{s=0}^{23} \boldsymbol{\Gamma}_{s,ij}^2.$$

The contribution of an innovation in FF to the 24-month FEV of SR_k is reported below. The order of orthogonalization in calculating this is IPN, IFN, CP, FF, NBR, TR, and SR_k. The sample period extends from January 1967 to December 1990. Data on IPN, IFN, CP, FF, NBR, and TR are obtained from the Haver Analytics data tape. The mnemonics for these variables are, respectively, IPN, PCU, PZALL, FFED, FARAN, and FARAT. Data on SR_k represent either industry or size portfolios. The industry portfolios are for two-digit SIC industries and represent equally-weighted averages of individual firms' returns. The size portfolios are sorted into deciles based on market capitalization at the end of each quarter and represent value-weighted averages. The stock return data are obtained from the Center for Research in Security Prices database.

Portfolio	Percent of 24-month FEV Explained by FF innovation	(Std. Error)
Apparel	2.37	(0.94)
Chemicals	2.82	(1.15)
Clay, glass, and stone	4.60	(1.60)
Electrical machinery	4.30	(1.03)
Food and beverage	3.51	(1.76)
Furniture	3.97	(1.37)
Instruments	3.78	(1.06)
Leather	2.97	(1.20)
Lumber	3.61	(1.54)
Metal products	4.03	(1.32)
Mining	6.25	(2.19)
Misc. manufacturing	3.11	(1.20)
Nonelectrical machinery	4.86	(1.31)
Paper	3.26	(1.17)
Petroleum products	3.18	(1.23)
Primary metals	4.92	(1.50)
Printing and publishing	3.37	(1.21)
Rubber and plastics	4.00	(1.24)
Textiles	2.48	(1.04)
Tobacco	3.01	(1.24)
Transportation equipment	3.70	(1.21)
Utilities	5.13	(2.03)
First decile (smallest)	4.08	(1.17)
Second decile	4.15	(1.40)
Third decile	4.29	(1.52)
Fourth decile	4.45	(1.56)
Fifth decile	4.38	(1.53)
Sixth decile	3.71	(1.46)
Seventh decile	4.50	(1.74)
Eighth decile	4.00	(1.61)
Ninth decile	3.72	(1.32)
Tenth decile (largest)	4.21	(1.53)

Table IV

Percent of 24-Month Forecast Error Variance (FEV) of Industry and Size Stock Returns Accounted for by Innovations in Nonborrowed Reserves (NBR)

The contribution of NBR shocks to the FEV of industry and size stock returns is estimated using a VAR system $\mathbf{y}_t$ with industrial production growth (IPN), the inflation rate (IFN), the log of an index of sensitive commodity prices (CP), the federal funds rate (FF), the log of nonborrowed reserves (NBR), the log of total reserves (TR), stock returns for portfolio k (SR_k), a constant, and two lags. $\mathbf{y}_t$ depends on orthogonalized innovations in all the variables ($\boldsymbol{v}_{t-i}$):

$$\mathbf{y}_t = \boldsymbol{\Gamma}_0\boldsymbol{v}_t + \boldsymbol{\Gamma}_1\boldsymbol{v}_{t-1} + \boldsymbol{\Gamma}_2\boldsymbol{v}_{t-2} + \ldots$$

The percentage contribution of an innovation in variable j to the 24-month FEV of variable i is then given by:

$$100 \times \sum_{s=0}^{23} \boldsymbol{\Gamma}^2_{s,ij} \Big/ \sum_{j=1}^{4}\sum_{s=0}^{23} \boldsymbol{\Gamma}^2_{s,ij}.$$

The contribution of an innovation in NBR to the 24-month FEV of SR_k is reported below. The order of orthogonalization in calculating this is IPN, IFN, CP, NBR, FF, TR, and SR_k. The sample period extends from October 1979 to August 1982. Data on IPN, IFN, CP, FF, NBR, and TR are obtained from the Haver Analytics data tape. The mnemonics for these variables are, respectively, IPN, PCU, PZALL, FFED, FARAN, and FARAT. Data on SR_k represent either industry or size portfolios. The industry portfolios are for two-digit Standard Industrial Classification (SIC) industries and represent equally-weighted averages of individual firms' returns. The size portfolios are sorted into deciles based on market capitalization at the end of each quarter and represent value-weighted averages. The stock return data are obtained from the Center for Research in Security Prices (CRSP) database.

Portfolio	Percent of 24-month FEV Explained by NBR innovation	(Std. Error)
Apparel	9.24	(5.68)
Chemicals	16.37	(6.40)
Clay, glass, and stone	19.44	(8.51)
Electrical machinery	13.83	(5.00)
Food and beverage	12.09	(4.69)
Furniture	13.76	(6.50)
Instruments	17.53	(6.06)
Leather	8.42	(5.92)
Lumber	13.82	(5.99)
Metal products	13.70	(5.44)
Mining	18.30	(6.40)
Misc. manufacturing	12.93	(4.72)
Nonelectrical machinery	19.63	(6.07)
Paper	14.49	(6.37)
Petroleum products	19.28	(8.45)
Primary metals	14.13	(6.50)
Printing and publishing	16.69	(7.03)
Rubber and plastics	11.61	(5.83)
Textiles	11.38	(5.18)
Tobacco	7.51	(1.24)
Transportation equipment	13.03	(5.15)
Utilities	21.69	(9.24)
First decile (smallest)	17.13	(8.03)
Second decile	15.40	(6.43)
Third decile	18.34	(7.41)
Fourth decile	17.88	(6.34)
Fifth decile	20.23	(7.73)
Sixth decile	20.60	(8.84)
Seventh decile	19.96	(7.34)
Eighth decile	20.86	(8.29)
Ninth decile	18.45	(6.34)
Tenth decile (largest)	19.63	(5.28)

The results reported above are robust to minor changes in the specification. When total reserves are dropped, employment growth or unemployment are used instead of industrial production growth, the nonstationary variables are first-differenced, the number of lags is changed, or October 1987 is included in the sample, the results hold up. Although the numbers change slightly in these cases, the finding that expansionary (contractionary) monetary policy has a large and statistically significant positive (negative) effect on stock returns remains.

The findings with size portfolios in Tables I and II are noteworthy. They indicate that monetary policy shocks exert an important and statistically significant effect on the returns of small firms. For large firms, on the other hand, monetary innovations have the smallest effect. These large firms are most likely to be well collateralized and thus immune from binding credit constraints. Thus the attenuated effect of monetary shocks on large firms compared to small firms is consistent with the hypothesis that monetary policy works by affecting firms' access to credit.

The larger effect of monetary policy on stock returns during the 1979–1982 period (Tables II and IV) than over the 1967–1990 period (Tables I and III) probably reflects the fact that monetary policy was changing much more over this period. In seeking to fight inflation, the Federal Reserve allowed the federal funds rate to exceed 19 percent, compared to an average of 7 percent over the rest of the sample period. The volatility of monetary policy, as measured by the variance of the funds rate or money supply growth, was also significantly higher over this period. If monetary policy matters, the large policy changes occurring over this period would have a greater effect on expected cash flows and discount factors and consequently on stock returns than the smaller policy changes occurring over the longer sample period.

II. Narrative Evidence of Monetary Policy and Stock Returns

A. Data and Methodology

Another approach to identifying monetary shocks is pioneered by Friedman and Schwartz (1963). They use Federal Reserve statements and other historical documents over the 1867–1960 period to identify exogenous changes in monetary policy and the responses of real variables. Romer and Romer (1989) extend Friedman and Schwartz's work to include six episodes of monetary tightening after 1960 and find that these periods are followed by contractions in industrial production and increases in unemployment. Presumably if these policy changes did cause real output (and thus firms' cash flows) to decline, stock returns would have declined when the policy shocks occurred. However, the small sample size would cause estimates of the effect of monetary policy on stock returns to be imprecise.

Boschen and Mills (1995) have recently employed this narrative approach to assemble a much larger sample of monetary policy shocks. They construct an index of monetary policy over the 1953:1–1991:12 period. By examining Federal Open Market Committee records and similar documents, they construct an index that classifies monetary policy into five categories: strongly anti-inflationary (−2), anti-inflationary (−1), neutral (0), pro-growth (1), and strongly pro-growth (2). They find that their index is predictably correlated with money market indicators of monetary policy such as innovations in the federal funds rate and nonborrowed reserves.

Boschen and Mills's index is used here as an alternative way to test whether monetary policy affects stock returns. To do this, the industry stock return data are regressed on the variables used by Chen, Roll, and Ross (1986) and on the Boschen and Mills index. Chen, Roll, and Ross use the Treasury bond/Treasury bill spread (the horizon premium), the corporate bond/Treasury bond spread (the default premium), the monthly growth rate in industrial production, unexpected inflation, and the change in expected inflation. To calculate unexpected inflation, they first determine the expected real rate on a one-month Treasury bill using the method of Fama and Gibbons (1984). They subtract this from the nominal Treasury bill rate (known at the beginning of the month) to calculate expected inflation. Unexpected inflation is set equal to the difference between actual inflation and expected inflation. The change in expected inflation is set equal to the first difference of the expected inflation series. Chen, Roll, and Ross argue that each of the series that they use, being either the difference between asset returns or very noisy, could be treated as innovations. The Boschen and Mills index numbers are also treated as innovations.

The 22 industry stock return equations are estimated as a system, and White's (1984) method is used to obtain heteroskedasticity-consistent standard errors. Expected inflation is estimated jointly with the asset return equations. The sample period employed is the same one (1967:1–1990:12) used to estimate the vector autoregressions.

Data on the horizon premium, the default premium, inflation, and the return on Treasury bills are obtained from Ibbotson Associates (1994). Data on industrial production are obtained from the Haver Analytics data tape (its mnemonic is IPN).

B. Results

Table V reports the results of the estimation using the Boschen and Mills index. It indicates that a one-unit increase in the index (e.g., a change in monetary policy from neutral to pro-growth) increases industry stock returns by an average of 0.83 percent per month. This compounds to an annual effect of 10.4 percent. The standard deviation of the Boschen and Mills index over the 1967:1–1990:12 period is 0.96. Thus a one-standard deviation increase in the index increases industry stock returns by an average of 10 percent. This is close to the 10.2 percent effect that a one-standard deviation change in the funds rate has on average on industry returns over the same sample period. The standard errors in Table V indicate that, in most cases, the point estimates are statistically different from zero. These results hold up when real returns (calculated as discussed in the previous section) are used in place of nominal returns. Thus expansionary monetary policy, whether measured by innovations in the

Table V

The Relation Between Industry Stock Returns and Narrative Evidence of Monetary Policy

The table reports each industry's monetary policy beta. Industry stock return data are for two-digit SIC industries and represent equally-weighted averages of individual firms' returns obtained from the Center for Research in Security Prices (CRSP) database. Monetary policy is measured by the Boschen and Mills (1995) index of the stance of monetary policy. The other right-hand side variables are the horizon premium, the default premium, the growth rate of industrial production, unexpected inflation, and the change in expected inflation. Expected inflation is obtained by subtracting the expected real rate on a one-month Treasury bill (calculated using the method of Fama and Gibbons (1984)) from the nominal Treasury bill rate known at the beginning of the month. Unexpected inflation equals the difference between actual inflation and expected inflation. The change in expected inflation is the first difference of the expected inflation series. Data on the horizon premium, the default premium, inflation, and Treasury bill returns are obtained from Ibbotson Associates (1994). Data on the growth rate of industrial production are obtained from the Haver Analytics data tape (mnemonic = IPN). The sample period extends from January 1967 to December 1990. All estimation is performed jointly and the standard errors are adjusted for heteroskedasticity.

Industry	Monetary Policy Beta	(Std. Error)
Apparel	0.0140	(0.0049)
Chemicals	0.0061	(0.0034)
Clay, glass, and stone	0.0085	(0.0037)
Electrical machinery	0.0108	(0.0048)
Food and beverage	0.0070	(0.0030)
Furniture	0.0111	(0.0043)
Instruments	0.0084	(0.0044)
Leather	0.0150	(0.0041)
Lumber	0.0109	(0.0065)
Metal products	0.0090	(0.0041)
Mining	−0.0015	(0.0047)
Misc. manufacturing	0.0083	(0.0045)
Nonelectrical machinery	0.0091	(0.0041)
Paper	0.0064	(0.0036)
Petroleum products	0.0005	(0.0039)
Primary metals	0.0054	(0.0039)
Printing and publishing	0.0077	(0.0039)
Rubber and plastics	0.0127	(0.0040)
Textiles	0.0142	(0.0042)
Tobacco	0.0025	(0.0028)
Transportation equipment	0.0122	(0.0043)
Utilities	0.0031	(0.0020)

federal funds rate and nonborrowed reserves or by narrative indicators, exerts a large and statistically significant positive effect on monthly stock returns.

III. Event Study Evidence

A. Data and Methodology

Another way to investigate the relationship between monetary policy and stock returns is to use daily data. Cook and Hahn (1989) argue that the

Federal Reserve controlled the federal funds rate so closely during the 1974–1979 period that market participants were able to discern a change in the funds rate target on the day that it occurred. They then collect a sample of 76 changes in the funds rate over this period from *Wall Street Journal* articles on the business days following the policy changes.[6]

As Jones (1994) discusses, the Fed abandoned federal funds rate targeting in 1979. From 1979–1982 it targeted nonborrowed reserves. From 1982–1987, it focussed on a borrowing guideline. However, with the appointment of Alan Greenspan on 11 August 1987, the funds rate again became, "the best signal to use in determining when he [Greenspan] is changing policy."[7]

An attempt is made to extend Cook and Hahn's data set by collecting a sample of federal funds rate changes during the Greenspan years that signalled policy changes. A key word search of major newspapers over the 11 August 1987 to 31 December 1994 period is performed. Every reference to the federal funds rate is examined to see whether it refers to a policy-induced change. Changes in the funds rate due to technical factors such as corporations withdrawing funds from the banking system to meet tax payments are excluded. Actual policy changes are easy to identify. For instance, financial market observers agree that there were 23 funds rate cuts between June 1989 and July 1992 (see Jones (1994) and Grant (1992)) and six increases in 1994 (see Bradsher (1994) and Risen (1994)).

The responses of the Dow Jones Industrial Average (DJIA) and Dow Jones Composite Average (DJCA) to federal funds rate changes are noted. The stock market responses are calculated as the percentage changes in the indexes over the 24 hours bracketing the news of the funds rate changes. Data on the DJIA and DJCA indexes are obtained from the *Wall Street Journal Index*.

The following ordinary least squares regression is then estimated:

$$\Delta \mathrm{P}_t = \beta_0 + \beta_1(\Delta \mathrm{FF}_t) \tag{4}$$

where $\Delta \mathrm{P}_t$ is the percentage change in the DJIA or the DJCA and $\Delta \mathrm{FF}_t$ is the amount (in percentage points) by which the Federal Reserve changed the funds rate. β_1 should be less than zero if news of expansionary (contractionary) monetary policy is an event that increases (decreases) future cash flows or decreases (increases) the discount factors at which those cash flows are capitalized.

B. Results

The results of regressing the DJIA index on news of federal funds rate changes are (with *t*-statistics in parentheses):

[6] Cook and Hahn (1989) show that increases (decreases) in the funds rate over the 1974–1979 period are correlated with increases (decreases) in short and long term interest rates. Thorbecke and Alami (1994) show that these increases (decreases) over the 1974–1979 period are correlated with decreases (increases) in stock returns.

[7] Jones (1994) p. 95.

$$\Delta \text{DJIA}_t = \underset{(1.34)}{0.226} - \underset{(-2.35)}{1.44 \Delta \text{FF}_t}$$

R-squared = 0.05, Std. Error of Regression = 1.82, $N = 116$

The results of regressing the DJCA index on news of funds rate changes are:

$$\Delta \text{DJCA}_t = \underset{(0.79)}{0.092} - \underset{(-2.47)}{1.04 \Delta \text{FF}_t}$$

R-squared = 0.05, Std. Error of Regression = 1.25, $N = 116$

Thus there is a statistically significant negative relation between policy-induced changes in the funds rate and changes in the DJIA and the DJCA. This finding is consistent with the hypothesis that news of expansionary (contractionary) monetary policy is an event that increases (decreases) future cash flows or decreases (increases) the discount factors at which those cash flows are capitalized.

The smaller coefficient on the DJCA index compared to the DJIA index probably reflects the fact that the former includes utilities and transportation stocks in addition to the 30 industrial stocks. The results in Tables I, III, and V indicate that the response of utility stocks to monetary policy shocks is small and Thorbecke (1995) finds that transportation (as opposed to transportation equipment) is not affected much by monetary policy. Thus, including these stocks in the index reduces the magnitude of the coefficient relating monetary policy to stock returns.

IV. Monetary Policy and Ex-Ante Returns

A. Data and Methodology

The evidence presented above indicates using three different methods that monetary policy has a large and statistically significant effect on ex-post stock returns. These results suggest that monetary policy might be a systematic factor that affects ex-ante returns. In a multifactor model such as the Arbitrage Pricing Theory (Ross (1976)), an asset must pay a premium to compensate for its exposure to common factors, but not for its exposure to idiosyncratic risks. In Ross' framework, the return R_{it} on asset i at time t can be written:

$$R_{it} = \lambda_{0t} + \sum_j \beta_{ijt}\lambda_{jt} + \sum_j \beta_{ijt} f_{jt} + \epsilon_{it} \tag{5}$$

where λ_{0t} is the risk-free rate, β_{ijt} measures the exposure of asset i to factor j, λ_{jt} is the risk premium associated with factor j, f_{jt} is the unexpected change in factor j, and ϵ_{it} is a mean-zero error term. The ex-ante expected excess return in this framework is then given by a beta-weighted vector of risk premia ($\Sigma_j\ \beta_{ijt}\lambda_{jt}$). To investigate whether monetary policy affects ex-ante returns it is thus necessary to obtain estimates of assets' monetary policy betas and of the risk premium (if any) associated with monetary policy.

To do this, the approach of McElroy and Burmeister (1988) is employed. They use a seemingly unrelated nonlinear regression technique to simultaneously estimate the risk premia and the exposures associated with observable macroeconomic factors. This method allows them to impose the nonlinear cross-equation restrictions that the intercept terms depend on the risk premia. Although their two-stage approach has been criticized, it does deliver consistent estimates of the risk premia and the exposures. It is thus useful for measuring the magnitude of the effect (if any) that monetary policy has on ex-ante returns.

The stock return data, as before, are for the 22 industries that Boudoukh *et al.* (1994) investigate. In addition, data on small company stocks (obtained from Ibbotson Associates (1994)) and on eight other industries are included.[8] These last nine portfolios are used in an attempt to increase the cross-sectional variation in expected returns.

The data on macroeconomic factors combine variables to measure monetary policy with the factors employed by Chen, Roll, and Ross (1986). Monetary policy is measured first by innovations in the funds rate from the VAR model described above and second by the Boschen and Mills index. The factors employed by Chen, Roll, and Ross (1986) are described above.[9]

The sample period begins in 1967:7 (because the original VAR used 6 lags) and ends in 1990:12. Each of the regression equations thus has 275 degrees of freedom.

B. Results

Table VI reports the results obtained from estimating the multi-factor model. When monetary policy is measured using the funds rate, the risk premium equals -0.57 percent per month and the mean absolute value of the 22 monetary policy betas is -1.06 percent per month. When monetary policy is measured using the Boschen and Mills index the risk premium equals 1.10 percent per month and the mean absolute value of the 22 monetary policy betas is 0.68 percent per month. These results imply that, on average, the expected return on a stock decreases by 0.60 percent per month when monetary policy is measured by the funds rate, and by 0.75 percent per month when monetary policy is measured by the Boschen and Mills index. These compound to annual effects of 7.5 percent and 9.4 percent, respectively. For the five industries with the largest exposures to monetary policy, these annual effects average 10.4 percent when the funds rate is used and 13.4 percent when the Boschen and Mills index is used. These results indicate that monetary policy

[8] I thank Jacob Boudoukh for kindly providing the data for all thirty industries.

[9] Thorbecke and Coppock (1995) also estimate a multi-factor model including a measure of monetary policy. The estimation here differs because the sample period is much longer, because both VAR and narrative indicators are used to measure monetary policy, and because Boudoukh, Richardson, and Whitelaw's (1994) data set is used.

Table VI

Nonlinear Seemingly Unrelated Regression (NLSUR) Estimates of the Risk Premiums Associated with Macroeconomic Factors

The risk premia are NLSUR estimates of the λ_{jt} in the equation:

$$R_{it} = \lambda_{0t} + \sum_j \beta_{ijt} f_{jt} + \sum_j \beta_{ijt}\lambda_{jt} + \epsilon_{it}$$

where R_{it} represents the return at time t on an industry portfolio, λ_{0t} is the return on one-month Treasury bills, β_{ijt} is the exposure of asset i to the macroeconomic factor j, f_{jt} is the innovation in the macroeconomic factor j, λ_{jt} is the risk premium associated with macroeconomic factor j, and ϵ_{it} captures the effect of idiosyncratic factors on R_{it}. Industry stock return data are for two-digit Standard Industrial Classification (SIC) industries and represent equally-weighted averages of individual firms' returns obtained from the Center for Research in Security Prices database. The macroeconomic factors are monetary policy, the horizon premium, the default premium, the growth rate of industrial production, unexpected inflation, and the change in expected inflation. Monetary policy is measured either by the Boschen and Mills (1995) index or by federal funds rate innovations from a VAR system composed of industrial production growth (IPN), the inflation rate (PCU), the log of an index of sensitive commodity prices (PZALL), the federal funds rate (FFED), nonborrowed reserves (FARAN), and the log of total reserves (FARAT). Expected inflation is obtained by subtracting the expected real rate on a one-month Treasury bill (calculated using the method of Fama and Gibbons (1984)) from the nominal Treasury bill rate known at the beginning of the month. Unexpected inflation equals the difference between actual inflation and expected inflation. The change in expected inflation is the first difference of the expected inflation series. Data on the horizon premium, the default premium, inflation, and Treasury bill returns are obtained from Ibbotson Associates (1994). Data on variables in the VAR system are obtained from the Haver Analytics data tape. The Haver mnemonics are in parentheses next to these variables. The sample period extends from July 1967 to December 1990.

Macroeconomic Factor	Risk Premium	Std. Error	Risk Premium	Std. Error
Boschen & Mills index	1.10	0.39		
Federal funds rate			−0.57	0.25
The horizon premium	0.95	0.48	1.18	0.60
The default premium	−1.06	0.39	−1.09	0.48
Industrial production	−0.0063	0.0023	−0.0081	0.0030
Unexpected inflation	0.00006	0.00074	0.0014	0.0011
Change in expected inflation	−0.0015	0.00055	−0.0020	0.0008

is a common factor and that assets must pay large positive premiums to compensate for their exposures to it.

The average estimated monetary risk premiums (7.5 percent and 9.4 percent) are large. The excess return on the value-weighted New York Stock Exchange index over this period averaged about 7 percent. Thus these estimates suggest that investors would be willing to accept the risk-free rate of return (or less) on an asset with zero exposure to monetary policy. The point estimates of the risk premia might be overstated because all of the assets employed have exposures of the same sign to monetary policy and because the standard errors are large. An attempt is made to mitigate these problems by including asset returns that fared well under tight monetary policy. However, it is not possible to obtain consistent time series for such assets over the entire sample period. If these assets had been included, they would probably have reduced the magnitude of the estimated monetary risk premia and the standard errors.

In any case, the results presented in this section and the previous sections indicate that monetary policy has real effects, and that these effects are quantitatively important. Whether monetary policy is measured by funds rate innovations, by the Boschen and Mills index, by nonborrowed reserves innovations, or by an event study of funds rate changes, the results indicate that expansionary (contractionary) monetary policy causes stock returns for almost every portfolio examined to increase (decrease).[10] A one-standard deviation negative shock to the funds rate increases returns by an average annual rate of 10 percent; a one-standard deviation increase in the Boschen and Mills index increases annual returns by an average annual rate of 10 percent; a one-standard deviation positive shock to nonborrowed reserves increases returns by an average annual rate of 24 percent, and a 100 basis point policy-induced decline in the funds rate increases the Dow Jones Industrial Average the same day by an average of 1.44 percent. Thus monetary policy not only has real effects on ex-post returns, but also has effects that are quantitatively important. This evidence suggests that monetary policy might also affect ex-ante returns. The results of estimating a multi-factor model indicate that monetary policy is a common factor and that exposure to it increases an asset's ex-ante return on average by 7.5 percent (when monetary policy is measured using the funds rate) or 9.4 percent (when policy is measured using the Boschen and Mills index). Even if these monetary risk premia are overstated, the large effects of monetary policy on ex-post returns make it plausible that the effects on ex-ante returns, if measured more precisely, would remain large.

V. Conclusion and Implications for Research

Financial economists have long debated whether money is neutral. This article addresses this question by examining how stock return data respond to monetary policy shocks. Theory posits that stock prices equal the expected present value of future net cash flows. Thus evidence that positive monetary shocks increase stock returns indicates that expansionary monetary policy exerts real effects by increasing future cash flows or by decreasing the discount factors at which those cash flows are capitalized. Using several measures of monetary policy and a variety of empirical techniques, this article presents evidence that monetary policy exerts large effects on ex-ante and ex-post stock returns. These findings are consistent with the hypothesis that monetary policy, at least in the short run, has real and quantitatively important effects

[10] The fact that four different measures of monetary policy all yield similar results implies that our findings are not merely capturing an interest rate effect but rather are providing evidence concerning how monetary shocks affect stock returns.

on real variables.[11] Results from size portfolios indicate that monetary shocks have larger effects on small firms than large firms. This evidence supports the hypothesis that monetary policy matters partly because it affects firms' access to credit.

The evidence presented here suggests several directions of future research for financial economists. First, while the findings above indicate that monetary policy is a common factor they do not reveal why it affects stock returns. To answer this question, the approach of Campbell and Mei (1993) would be useful. They have shown that an asset's beta with a common factor can be decomposed into portions representing the covariance of news about 1) expected future cash flows, 2) expected future interest rates, and 3) expected excess returns with the risk factor. Thus Campbell and Mei's method can shed light on the channels through which monetary policy affects stock returns.

A second direction for future research builds on the work of Fama and French (1995). They argue that firm size proxies for sensitivity to an unknown risk factor. They also find that small stocks have lower earnings on book equity than big stocks because, while both were harmed by the recession of 1981–1982, big but not small stocks benefitted from the subsequent expansion. The finding presented here that monetary policy is a risk factor that has a large effect on small firms coupled with the theoretical framework of Gertler and Gilchrist (1994) and the empirical evidence reported in Thorbecke and Coppock (1995) provide a possible explanation for Fama and French's results. As discussed above, Gertler and Gilchrist argue that a monetary tightening, by worsening balance sheet positions, can constrain the access of small firms to credit. Gertler and Gilchrist further argue that these credit constraints bind a larger number of small firms in a downturn, implying that changes in monetary policy should have a larger effect on small firms in bad times than in good times. Building on this insight, Thorbecke and Coppock find that tight monetary policy during the 1981–1982 recession harmed both small and large firms, while easier monetary policy during the subsequent expansion benefited large but not small firms. The evidence of an asymmetric response of small stocks to monetary shocks in recessions and expansions together with the finding that monetary policy is a common factor that has a large effect on small firms suggests that it might be one of the state variables producing the size-related variation in returns discussed by Fama and French.

A third direction for future research relates to the work of Marshall (1992). He shows in an equilibrium monetary asset pricing model that an increase in expected inflation decreases the expected return to money and to any asset that substitutes for money. In his model, a monetary shock that induces positive serial correlation in inflation will increase agents' demand for equities and reduce their demand for money. Thus an increase in money growth can be positively correlated with real equity returns. Using data simulated from the model, Marshall finds that a one-standard-deviation money growth impulse

[11] Of course, monetary policy also affects inflation. Thus these findings do not necessarily imply that looser monetary policy is better.

increases equity returns by 0.12 percent in the initial period. In this article, the effect of a one-standard-deviation shock to monetary policy (measured in several different ways) on equity returns is an order of magnitude larger. It would be interesting to investigate whether responses of the magnitude found in this article could be obtained using plausible parameter values in Marshall's model. If not, this would suggest that it might be fruitful to incorporate market frictions (e.g., the adverse selection and moral hazard problems discussed by Bernanke and Gertler (1995)) to explain the positive correlation between expansionary monetary policy and real variables.

A final direction for future research concerns an explanation for the *unexpected* inflation/stock return correlation. Boudoukh, Richardson, and Whitelaw (1994), in an ingenious article, present evidence explaining the *expected* inflation/stock return correlation.[12] One explanation for the *unexpected* inflation/stock return correlation has been presented by Tobin (1978, 1988). Tobin argues that financial markets believe that *news* of inflation will generate a monetary tightening by the Federal Reserve that will reduce the present value of future earnings and thus current stock returns. Since many authors (e.g., Bernanke and Blinder (1992) and Fuhrer and Moore (1995)) have demonstrated that news of inflation causes the Federal Reserve to tighten monetary policy, the evidence here indicating that tighter monetary policy depresses stock returns is consistent with Tobin's hypothesis. Future research should investigate the extent to which Tobin's hypothesis can explain the puzzling finding that stocks, which represent claims against real assets, do not provide good hedges against unexpected changes in inflation.

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[12] It seems probable that a result that has puzzled scholars for as long as the negative inflation/stock return correlation should have more than one cause. In addition to Boudoukh, Richardson, and Whitelaw's explanation, another interesting hypothesis has been advanced by Stulz (1986). He argues that an increase in expected inflation, by decreasing real wealth, could decrease real interest rates and the expected real rate on the market portfolio.

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