Stock Returns and Inflation with Supply and Demand Disturbances

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We account for the relation between stock returns and inflation with two independent disturbances: supply shocks and demand shocks. Supply shocks reflect real output shocks and cause a negative relation between stock returns and inflation, while demand shocks are mainly due to monetary shocks and generate a positive relation between stock returns and inflation. We show, both theoretically and empirically, that the stock return–inflation relation varies over time and across countries, depending on the relative importance of the two types of shocks. Our empirical evidence is based on pre- and postwar periods in the United States, as well as the postwar period in the United Kingdom, Japan, and Germany.

This article reexamines the relation between stock returns and inflation. Following Fisher (1930), who noted that nominal interest rates are reliable predictors of inflation, economists thought that this relation could be easily extended to common stocks. Consistent with the view that stocks represent ownership of physical capital assets, their real values should be independent of the rate of inflation.

Contrary to this commonly held view, many researchers find a negative relation between common stock returns and inflation [e.g., Lintner (1975), Bodie (1976), Jaffe and Mandelker (1976), Nelson (1976), and Fama and Schwert (1977)]. Fama (1981, 1983) explains the negative relation by arguing that money demand is procyclical, while money supply is exogenously determined. Geske and Roll (1983) focus on a countercyclical monetary response that reinforces the negative real activity–inflation relation. Kaul

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(1987, 1990) and others support Fama's conclusion with evidence that the stock return–inflation relation depends on the money supply function [see also Kaul and Seyhun (1990) and Boudoukh, Richardson and Whitelaw (1994)].

There also have been several theoretical attempts to explain the observed relations between stock returns and inflation. Danthine and Donaldson (1986) provide a rational expectations equilibrium model that features a negative relation between stock returns and inflation arising from nonmonetary sources (e.g., a real output shock). In this model, stocks are a good hedge against purely monetary inflation. Other theoretical analyses such as Stulz (1986) and Marshall (1992) also imply that stock returns may be negatively correlated with inflation, especially when the source of inflation is related to nonmonetary factors [see also Carmichael (1985), Lee (1989) and Bakshi and Chen (1996)]. Unlike the proxy hypothesis of Fama, theoretical analyses based on equilibrium models show that the relation between stock returns and inflation could be either negative or positive. Few empirical studies have directly examined these theoretical models, although recent empirical extensions of the proxy hypothesis incorporate different monetary regimes and supply shocks [e.g., Kaul (1987, 1990) and Kaul and Seyhun (1990)].

The purpose of this article is to explore whether the observed relation between stock returns and inflation can be explained as a combination of two shocks: one due to supply disturbances and the other due to demand disturbances. We argue that supply disturbances are primarily due to real output shocks and cause a negative stock return–inflation relationship. Demand disturbances, on the other hand, are mainly due to monetary shocks and give rise to a positive stock return–inflation relationship. Consequently, the relative importance of the two types of shocks should determine the eventual relation between stock returns and inflation. Using the methodology introduced by Blanchard and Quah (1989), we show that the relation between the unexpected component of inflation and stock returns varies both over time and across countries, depending on whether demand or supply shocks are the predominant source of inflation. The evidence is provided from the experiences of four different countries, the United States, the United Kingdom, Germany, and Japan.

The article is organized as follows. Section 1 provides an analysis of the relationship between stock returns and unexpected inflation based on a bivariate model of stock returns and inflation. As an illustration, a simple structural model is presented to help interpret the empirical findings. Section 2 discusses empirical findings for the postwar and prewar periods of the United States, the United Kingdom, Japan, and Germany. Section 3 concludes.

1. A Model

1.1 Identification Based on a Bivariate Time-Series Representation

We consider a 2×1 vector z_t consisting of the first differences in the log of real stock prices, Δsp_t (i.e., real stock returns), and the rate of inflation, π_t: $z_t = [\Delta sp_t, \pi_t]'$. By the Wold theorem, z_t has the following bivariate moving average representation (BMAR):

$$z_t = [\Delta sp_t, \pi_t]' = B(L)\varepsilon_t, \quad \text{or} \tag{1}$$

$$\begin{bmatrix} \Delta sp_t \\ \pi_t \end{bmatrix} = \begin{bmatrix} B_{11}(L) & B_{12}(L) \\ B_{21}(L) & B_{22}(L) \end{bmatrix} \begin{bmatrix} \varepsilon_t^s \\ \varepsilon_t^d \end{bmatrix}, \tag{2}$$

where sp_t = the log of real stock price; π_t = inflation rate; ε_t is a 2×1 vector consisting of ε_t^s and ε_t^d; ε_t^s = supply shock; ε_t^d = demand shock; L is the lag operator (i.e., $L^n x_t = x_{t-n}$), $B_{ij}(L)$ for $i, j = 1, 2$ is a polynomial in the lag operator L (i.e., $B_{ij}(L) = \sum_k b_{ij}(k)L^k$ with $\sum_k \equiv \sum_{k=0}^{\infty}$), Δ is the first-difference operator; and the innovations are orthonormalized such that $\text{var}(\varepsilon_t) = I$.

The representation implies that we interpret real stock returns and inflation to be driven by supply and demand disturbances. The time paths of the dynamic effects of the two types of disturbances on real stock returns and inflation are implied by the coefficients of the polynomials $B_{ij}(L)$. Following Blanchard and Quah (1989), we identify supply disturbances ε_t^s as having a permanent effect on real stock prices but demand disturbances ε_t^d as having only a temporary effect on real stock prices [see also Hess and Lee (1990) and Lee (1995)]. Since $b_{12}(k)$ is the effect of ε_t^d on Δsp after k periods, the identifying restriction is represented by the restriction that the coefficients in $B_{12}(L)$ add up to zero:

$$B_{12}(L)|_{L=1} = B_{12}(1) = \Sigma_k b_{12}(k) = 0. \tag{3}$$

The BMAR model (i.e., estimates of $B(L)$) in Equation (2) is derived by inverting a bivariate vector autoregression (BVAR). By estimating the following BVAR of $z_t = [\Delta sp_t, \pi_t]'$:

$$z_t = A(L)z_{t-1} + u_t, \tag{4}$$

where $A(L) = [A_{ij}(L)] = [\Sigma_k a_{ij}(k)L^{k-1}]$ for $i, j = 1, 2$, $u_t = [u_{1t}, u_{2t}]' = z_t - E(z_t \mid z_{t-s}, s > 1)$ with $\text{var}(u_t) = \Omega$, we obtain estimates of $A(L)$ and Ω. By inverting this BVAR of z_t, we obtain a BMAR of z_t:

$$z_t = [I - A(L)L]^{-1}u_t, \tag{5}$$

where I is the identity matrix of rank 2.

Estimates of $B(L)$ can be obtained by noticing that

$$B_0 E_t = u_t \tag{6}$$

and that

$$z_t = B(L)\varepsilon_t = [I - A(L)L]^{-1} u_t. \tag{7}$$

Using Equation (6), Equation (7) implies that

$$B(L) = [I - A(L)L]^{-1} B_0. \tag{8}$$

To calculate $B(L)$, we only need an estimate of B_0. This can be obtained by taking the variance of each side of Equation (6):

$$B_0 B_0' = \Omega. \tag{9}$$

Here, we obtain three restrictions for the four elements of B_0: b_{11}^0, b_{12}^0, b_{21}^0, b_{22}^0. Our bivariate model of z_t in Section 1.1 provides the identifying restriction:

$$B_{12}(L)|_{L=1} = B_{12}(1) = \Sigma_k b_{12}(k) = 0.$$

1.2 An Illustrative Model

We use the following model, which is a variant of that in Blanchard and Quah (1989), to demonstrate how the identification restriction is consistent with a class of structural macroeconomic models and to illustrate the differential effects of the two types of shocks on real stock returns and inflation [see also Nelson (1979)]. Let

$$y_t^d = m_t - p_t - r_t, \tag{10}$$
$$y_t^s = \theta_t + N_t, \tag{11}$$
$$p_t = m_t - \theta_t - r_{t-1}, \tag{12}$$
$$r_t = -am_t, \quad 0 < a < 1, \tag{13}$$

where y^d = log of aggregate demand; y^s = log of aggregate supply; m = log of the money supply; p = log of the price level; r = interest rate; θ = log of productivity; and N = log of employment.

Equation (10) states that aggregate demand is a positive function of real balances and a negative function of interest rate. Equation (11) describes the aggregate supply as a function of productivity and employment. Equation (12) shows that the price level is affected positively by money supply and is negatively affected by productivity and interest rate in the previous period. Because the interest rate is negatively related to money supply, as shown in Equation (13), Equation (12) indicates that the current period price is a positive function of the money supply in both the current and previous periods. We capture sluggish adjustments in prices and aggregate demand by the effect of monetary policy on interest rate changes.

In order to close the model, we assume

$$m_t = m_{t-1} + \varepsilon_t^d, \quad \text{and} \tag{14}$$
$$\theta_t = \theta_{t-1} + \varepsilon_t^s, \tag{15}$$

where ε_t^d and ε_t^s are serially uncorrelated and mutually orthogonal demand and supply disturbances. For simplicity, we assume that the demand shock is mainly due to monetary shocks, and the supply shock is due to productivity shocks.

From the model, the growth in output (Δy) and inflation (π) are given by

$$\Delta y_t = y_t - y_{t-1} = \varepsilon_t^s + a(1-L)\varepsilon_t^d, \quad \text{and} \tag{16}$$
$$\pi_t = p_t - p_{t-1} = -\varepsilon_t^s + (1+aL)\varepsilon_t^d. \tag{17}$$

By using log-linear approximations to the usual present value model of stock prices [e.g., Campbell and Shiller (1988, 1989)] and employing output y_t as a proxy for aggregate dividends, we obtain the spread s_t between sp_t and y_t as

$$s_t = sp_t - y_t = E_t \Sigma_k \rho^k \Delta y_{t+k}, \tag{18}$$
$$= \varepsilon_t^s + a(1-\rho)\varepsilon_t^d - a\varepsilon_{t-1}^d, \tag{19}$$

where $0 < \rho < 1.0$ is a discount factor. Equation (19) is derived from the prediction formula of Hansen and Sargent (1980) [see also Lee (1995, 1996)]. By solving Equation (18) for Δsp, we obtain

$$\begin{aligned} z_t &= \begin{bmatrix} \Delta sp_t \\ \pi_t \end{bmatrix} = \begin{bmatrix} B_{11}(L) & B_{12}(L) \\ B_{21}(L) & B_{22}(L) \end{bmatrix} \begin{bmatrix} \varepsilon_t^s \\ \varepsilon_t^d \end{bmatrix} \\ &= \begin{bmatrix} 2-L, & a(1-L)(2-\rho-L) \\ -1, & (1+aL) \end{bmatrix} \begin{bmatrix} \varepsilon_t^s \\ \varepsilon_t^d \end{bmatrix}. \end{aligned} \tag{20}$$

Comparison of Equation (20) with Equation (2) shows that this model is characterized by the restriction $B_{12}(1) = 0$. The model contains several implications for the stock return–inflation relation. Supply shocks (e.g., technology shocks or oil shocks) have a positive (contemporaneous) effect on stock returns ($b_{11}(k)|_{k=0} = \partial \Delta sp_t / \partial \varepsilon_t^s = 2$) but a negative (contemporaneous) effect on inflation ($b_{21}(k)|_{k=0} = \partial \pi_t / \partial \varepsilon_t^s = -1$). As Fama (1981) argued, supply shocks cause a negative relation between stock returns and inflation. In contrast, demand shocks (e.g., monetary shocks) have a positive effect on stock returns ($b_{12}(k)|_{k=0} = \partial \Delta sp_t / \partial \varepsilon_t^d = a(2-\rho)$) and inflation ($b_{22}(k)|_{k=0} = \partial \pi_t / \partial \varepsilon_t^d = 1$). The result is a positive relation between stock returns and inflation. Unlike the effects of each type of shock (i.e., unexpected components), the effects of expected components depend on the process of exogenous variables m_t and θ_t.

The model has some long-term implications. The long-term effects of supply shocks on stock returns ($\Sigma_k b_{11}(k) = B_{11}(1) = \Sigma_k \partial \Delta sp_t / \partial \varepsilon^s_{t-k}$) and inflation ($\Sigma_k b_{21}(k) = B_{21}(1) = \Sigma_k \partial \pi_t / \partial \varepsilon^s_{t-k}$) are $+1$ and -1, respectively. Supply shocks yield a negative long-term relation between stock returns and inflation. The long-term effects of demand shocks on stock returns ($\Sigma_k b_{12}(k) = B_{12}(1) = \Sigma_k \partial \Delta sp_t / \partial \varepsilon^d_{t-k}$) and inflation ($\Sigma_k b_{22}(k) = B_{22}(1) = \Sigma_k \partial \pi_t / \partial \varepsilon^d_{t-k}$) are 0 and $1 + a$, respectively. Demand shocks generate a neutral long-term relation between stock returns and inflation. Our framework allows for a positive or a negative relation between inflation and stock returns. The exact relation depends upon the relative long-term importance of each shock.

2. Empirical Results and Implications

2.1 The Data

Our estimates use postwar U.S. data (1947:I–1994:IV), prewar U.S. data (1926:I–1944:IV), and postwar data of the United Kingdom, Japan, and Germany (1961:I–1994:IV). We construct U.S. quarterly returns by compounding monthly value-weighted returns with dividends obtained from the CRSP data file. The price level is the seasonally unadjusted consumer price index (CPI) and is taken from the Citibase data file and from Ibbotson (1995). For aggregate monetary and output measures, we use the monetary base and industrial production from the Citibase data file and the Survey of Current Business. For the United Kingdom, Japan, and Germany, all the data (share prices, CPI, industrial production, and money supply) are obtained from the publication, *International Financial Statistics*.

We employ a BVAR of real stock returns and inflation with two lags [see Lee (1992) for another VAR application, also James, Koreisha, and Partch (1985)]. The lag length is based on both the Akaike (1974) and Schwarz (1978) criteria. Our preliminary findings show that logged stock price and CPI series are not cointegrated. This result justifies a bivariate model of their first-differences (i.e., stock returns and inflation).

2.2 Dynamic Effects of Each Component in the Postwar United States

Once we identify supply and demand disturbances by imposing the restriction $B_{12}(1) = 0$ on the BMAR, we can examine dynamic effects of each type of shock on stock returns and inflation over various horizons. Figure 1 is a plot of the orthonormalized moving average coefficients. It depicts the response of stock returns (Δsp; panel A), inflation (π; panel B), and stock prices (sp; panel C) to a one-standard deviation in either supply or demand shocks.

Supply shocks initially have a strong positive effect on stock returns; however, the effect dissipates after one quarter. Supply shocks have a mild negative effect on inflation for several quarters. The result is a negative contemporaneous relationship between stock returns and inflation caused

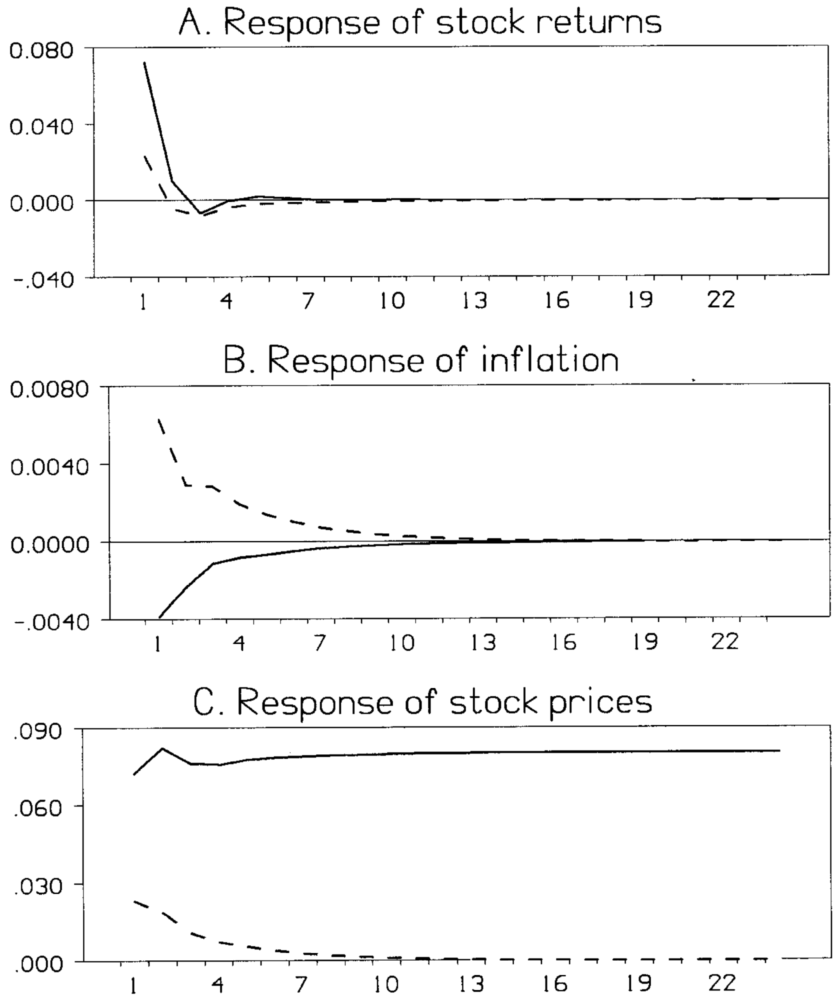

Figure 1
Response of U.S. postwar period stock returns, inflation, and stock prices to supply (——) and demand (- - - -) disturbances
In panel A, both (positive) supply and (positive) demand disturbances have a positive initial effect on stock returns. In panel B, positive supply disturbances lower inflation, while positive demand disturbances increase inflation. In panelC, both (positive) supply and (positive) demand disturbances increase stock prices.

by supply shocks. Demand shocks initially have a positive effect on stock returns followed by a negative effect, but their effect becomes negligible after the second quarter. Their positive effect on inflation, however, is quite strong initially and declines slowly over time. Therefore, demand shocks generate a positive contemporaneous relationship. It is also noted that the stock market seems to adjust rather fast to both demand and supply shocks to the economy. Inflation appears to adjust slowly to the two types of shocks. As expected, supply shocks have a permanent effect on stock prices, but demand shocks have only a temporary effect (panel C).

2.3 Two Components of Stock Returns and Inflation in the Postwar United States

By imposing the identifying restriction and setting each shock separately equal to zero, we can decompose the historical values of real stock return and inflation series into two parts: one arising from the accumulated effects of current and past supply disturbances (the supply component), and the other from the accumulated effects of current and past demand disturbances (the demand component) [see Lee (1992)]. Figure 2 presents the historical values of stock return and inflation series over the postwar period 1947:IV–1994:IV. It compares stock returns and inflation due to the supply component (panel A) and those due to the demand component (panel B). Overall the figure shows that the supply components of stock returns and inflation are negatively correlated. The demand components of returns and inflation are positively correlated. The negative correlation is strongest from the mid-1950s to the late 1970s.

To present various relationships in a more explicit manner, Table 1 shows the cross correlations of the components of stock returns and inflation. Stock returns (sr) and inflation (π) for the postwar period are significantly negatively correlated with a contemporaneous correlation of -0.28 (panel A). The supply components (sr^s and π^s) are even more strongly negatively correlated (-0.80). In contrast to the supply components, the demand components (sr^d and π^d) are strongly positively correlated (0.49). The correlations between different components of stock returns and inflation are insignificant (panel A). In summary, we find that the two distinct components of stock returns and inflation have very different correlations between them. These findings are consistent with the equilibrium analyses of Danthine and Donaldson (1986).

The cross correlations between each component of stock returns and inflation and the growth in the monetary base (mbg) and industrial production (ipg) provide a more thorough documentation of the effects. Panel B shows that stock returns do not appear to be correlated with changes in the monetary base (-0.01). They are, however, strongly correlated with subsequent industrial production growth. Stock returns anticipate output growth. This result is consistent with Fama's proxy hypothesis. Inflation is strongly affected by and correlated with growth in the monetary base (0.34). As shown by Fama (1981), inflation and output are negatively correlated (-0.08), and in particular inflation anticipates lower outputs. But output and the monetary base are uncorrelated (0.02).

The correlations between components and exogenous variables in panel C show that, among other things, the supply component of inflation (π^s) is

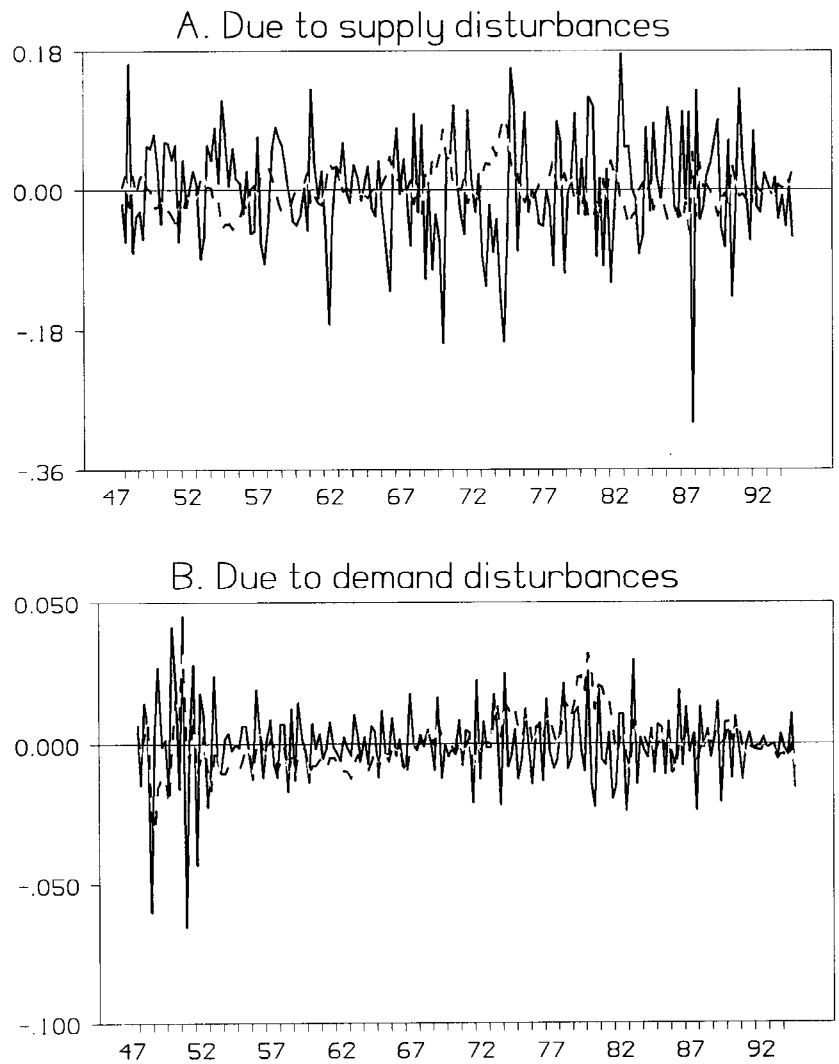

Figure 2
U.S. postwar period stock returns (——) and inflation (- - - -) due to two types of disturbances
The supply components of stock returns and inflation are negatively correlated (panel A), whereas the demand components of stock returns and inflation are positively correlated (panel B).

strongly negatively correlated with changes in real output (ipg) (−0.21), but its correlation with changes in the monetary base (mbg) (−0.02) is insignificant. In contrast, the demand component of inflation (π^d) is strongly positively correlated with changes in the monetary base (0.41), but uncorrelated with changes in output (0.03).

Table 1
Cross correlations for U.S. postwar period (1947:IV–1994:IV)

$x_t y_{t-k}$	$k=-4$	-3	-2	-1	0	1	2	3	4
Panel A									
$sr\pi$	−.08	−.11	−.07	−.21***	−.28***	−.14**	−.07	−.16**	−.04
$sr^s\pi^s$	−.12*	−.18***	−.17**	−.45***	−.80***	−.03	.10	−.02	.07
$sr^d\pi^d$	.19***	.07	.00	.10	.49***	−.31***	−.33***	−.02	.02
$sr^s\pi^d$	−.11	−.06	.04	.00	−.03	−.05	−.04	−.20***	−.10
$sr^d\pi^s$	.07	.04	−.17**	−.08	−.02	−.01	.04	.07	.03
Panel B									
sr mbg	−.04	−.07	−.07	−.02	−.01	−.08	−.04	−.08	−.14*
sr ipg	.12	.20***	.38***	.30***	−.01	−.12*	−.11	−.17**	−.18**
π mbg	.32***	.32***	.30***	.32***	.34***	.35***	.33***	.35***	.38***
π ipg	−.23***	−.28***	−.31***	−.22***	−.08	.01	.04	.08	.08
mbg ipg	.01	.00	.01	.03	.02	−.09	.00	.00	−.08
Panel C									
sr^s mbg	−.07	−.07	−.06	−.03	−.04	−.08	−.03	−.08	−.15*
sr^s ipg	.11	.20***	.37***	.26***	−.03	−.13*	−.11	−.17**	−.17**
π^s mbg	.04	.05	.04	.00	−.02	.04	.04	.08	.16*
π^s ipg	−.12	−.24*	−.41***	−.43***	−.21***	−.04	.04	.14*	.20***
sr^d mbg	.07	.00	−.03	.04	.07	−.03	−.04	−.02	−.02
sr^d ipg	.06	.04	.08	.16**	.07	−.01	−.02	−.03	−.05
π^d mbg	.35***	.34***	.33***	.37***	.41***	.38***	.36***	.35***	.34***
π^d ipg	−.20***	−.29***	−.12	.00	.03	.03	.03	.01	−.03
Panel D									
sr debtg	−.01	.02	−.03	.07	.18**	.06	.00	.02	.01
sr^s debtg	.00	.04	−.01	.09	.17**	.07	.00	.02	.04
sr^d debtg	−.04	−.04	−.06	−.06	.05	.00	−.01	−.01	−.08
π debtg	.34***	.27***	.22***	.13*	.12	.12	.16**	.16**	.10
mbg debtg	.40***	.41***	.42***	.40***	.43***	.44***	.42***	.34***	.39***
ipg debtg	−.25***	−.27***	−.22***	−.07	−.01	.06	.09	.05	.04
π^s debtg	.09	.01	.00	−.11	−.22***	−.17**	−.11*	−.09	−.09
π^d debtg	.34***	.30***	.26***	.22***	.27***	.24***	.25***	.24***	.17**

This table gives cross correlations between x_t and y_{t-k}.
*, **, *** denotes significance at 10%, 5%, and 1%, respectively.
sr = stock return; π = inflation rate; sr^s, π^s = stock return and inflation rate due to supply shocks; sr^d, π^d = stock return and inflation rate due to demand shocks; mbg, ipg, and debtg = growth rates in monetary base, industrial production, and government debt.

These findings indicate that the negative relation between supply components of stock returns and inflation is primarily due to real output shocks, whereas the positive relation between demand components of stock returns and inflation is mainly due to monetary shocks. It is noted that these findings are consistent with our modeling of supply and demand disturbances in Equations (14) and (15) and the implications of the previously cited equilibrium models.

2.4 The Prewar Period of the United States

Unlike the postwar period, there is evidence that the relation between real stock returns and inflation is positive in the prewar period [e.g., Kaul (1987)]. To examine whether supply and demand shocks have different effects on the relation, we implement a similar procedure for the prewar period of

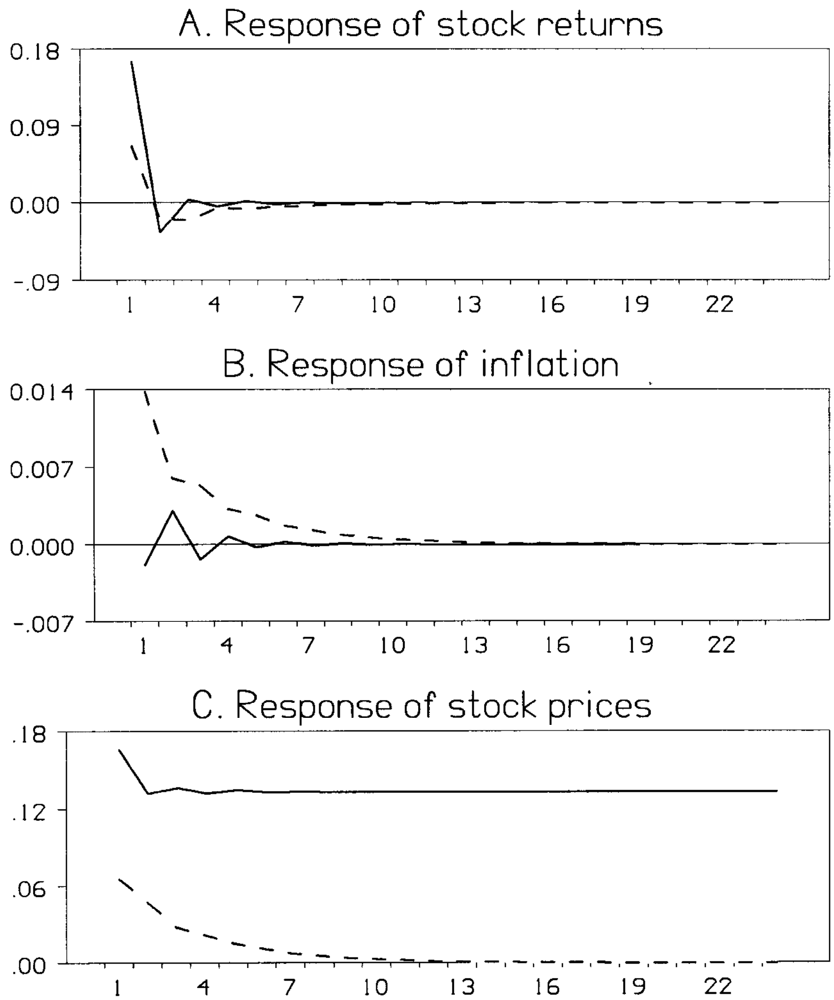

Figure 3
Response of U.S. prewar period stock returns, inflation, and stock prices to supply (——) and demand (- - - -) disturbances
In panel A, both (positive) supply and (positive) demand disturbances have a positive initial effect on stock returns. In panel B, positive supply disturbances initially lower inflation, while positive demand disturbances increase inflation. In panel C, both (positive) supply and (positive) demand disturbances increase stock prices.

1926–1944. As in the postwar period, Figure 3 shows that supply shocks yield a negative stock return-inflation relation (panel A); demand shocks have a positive relation. Again, supply shocks have a permanent effect on

Table 2
Cross correlations for U.S. prewar period (1926:IV–1944:IV)

$x_t y_{t-k}$	$k=-4$	-3	-2	-1	0	1	2	3	4
Panel A									
$sr\pi$	.17	.21*	−.01	.24**	.08	−.12	−.12	−.03	.01
$sr^s\pi^s$	.25**	.11	−.39***	.86***	−.61***	.05	.20*	−.31***	.10
$sr^d\pi^d$	.24**	.03	−.05	.14	.54***	−.37***	−.33***	.06	.01
$sr^s\pi^d$	.03	.21*	.10	.01	−.01	.02	−.04	.03	−.01
$sr^d\pi^s$	.09	−.09	.06	−.01	.01	.02	.08	−.18	.03
Panel B									
sr mbg	−.06	.00	.05	.03	−.10	.21*	−.06	−.07	.04
sr ipg	−.10	.35***	−.12	−.02	.61***	−.11	−.08	.06	−.07
π mbg	.04	.18	.15	.11	.20*	−.02	.23**	.14	.16
π ipg	−.06	.15	.03	−.07	.20*	.44***	.16	.19*	.20*
mbg ipg	.08	.05	.00	.24**	.06	.03	.07	.18	.07
Panel C									
sr^s mbg	.04	−.05	.03	.07	−.14	.29**	−.11	−.11	.05
sr^s ipg	−.11	.27**	−.06	.03	.52***	−.20*	−.02	.09	−.08
π^s mbg	.06	.02	−.05	.00	.10	−.25**	.29**	−.11	−.03
π^s ipg	−.17	−.15	.20*	−.12	−.19	.46***	−.22*	.05	.08
sr^d mbg	−.23**	.12	.04	−.08	.07	−.13	.10	.07	−.01
sr^d ipg	.00	.27**	−.17	−.11	.33***	.19	−.14	−.07	.01
π^d mbg	.01	.17	.15	.10	.17	.03	.16	.17	.18
π^d ipg	−.02	.19	−.01	−.05	.25**	.34***	.21*	.19	.19

This table gives cross correlations between x_t and y_{t-k}.
*, **, *** denotes significance at 10%, 5%, and 1%, respectively.
sr = stock return; π = inflation rate; sr^s, π^s = stock return and inflation rate due to supply shocks; sr^d, π^d = stock return and inflation rate due to demand shocks; mbg, ipg, and debtg = growth rates in monetary base, industrial production, and government debt.

stock prices, while demand shocks are transitory (panel C). Table 2 shows that the correlation between stock returns and inflation is insignificantly positive for the prewar period (0.08). However, supply shocks have a significant negative (contemporaneous) correlation of −0.61, and demand shocks have a significant positive (contemporaneous) correlation of 0.54. Panel C indicates that the supply component of stock returns is strongly related to industrial production growth, and that the demand component of inflation is weakly but positively related to monetary growth.

2.5 Two Regimes

To understand different correlations between the post- and prewar periods, we examine the relative importance of the two types of shocks. Table 3 presents the percentage of forecast error variance in real stock returns and inflation that is explained by either supply or demand shocks. By construction, the percentage of forecast error variance explained by the other type of shocks can be computed by subtracting the numbers from 100. The standard deviations presented in parentheses are obtained by using a Monte Carlo integration procedure due to Kloek and Van Dijk (1978) and are based on 10,000 simulations.

Table 3
Variance decomposition: percentage of forecast error variance explained by supply (ε^s) and demand (ε^d) shocks

	U.S. postwar period (1947–1994)				U.S. prewar period (1926–1944)			
explained by	sr_t ε^s		π_t ε^d		sr_t ε^s		π_t ε^d	
Horizon								
1 Qt	90.6%	(1.0)	72.8%	(6.1)	86.2%	(2.5)	98.4%	(8.4)
2	90.5	(1.5)	70.4	(6.0)	85.8	(2.4)	94.7	(7.6)
3	89.6	(1.7)	72.4	(6.1)	84.8	(4.7)	94.7	(7.7)
4	89.4	(1.8)	73.1	(6.1)	84.8	(4.8)	94.7	(7.6)
8	89.3	(1.9)	73.5	(6.1)	84.6	(5.3)	94.9	(7.6)
12	89.3	(1.9)	73.6	(6.1)	84.6	(5.3)	94.9	(7.6)
24	89.3	(1.9)	73.6	(6.1)	84.6	(5.3)	94.9	(7.6)

The percentage of the forecast error variance explained by the other shock is the difference between 100% and the corresponding entry above. Numbers in parentheses are simulated standard deviations.

Supply shocks explain the majority of stock return variation in both periods. Demand shocks explain the majority of inflation variation. Demand shocks, however, are substantially more important in explaining prewar inflation and mildly more important in explaining prewar stock returns. The prewar positive correlation between stock returns and inflation is consistent with the importance of prewar demand shocks.

2.6 Other Countries

Previous studies find that in industrialized countries stock returns and inflation are negatively related in the postwar period [Bodie (1976), Jaffe and Mandelker (1976), Nelson (1976), Fama and Schwert (1977), Gultekin (1983), Solnik (1983), and Kaul (1987, 1990)]. To test the robustness of our hypothesis, we reexamine the experience of three industrialized countries — the United Kingdom, Japan, and Germany. This analysis is conducted for the period 1961–1994. To save space, the tables and figures that summarize the empirical results are not reported in the article but are available upon request. As in previous studies, all three countries show negative correlations between stock returns and inflation. More importantly, without exception, our results parallel those for the United States: significantly negative correlations for supply shocks and significantly positive correlations for demand shocks.

For the United Kingdom, the supply component of stock returns and inflation is more strongly related to the growth in industrial production, whereas the demand component of inflation is more strongly related to monetary growth. For Japan, the demand component of inflation is due to monetary growth. The supply component of stock returns is weakly related to subsequent industrial production growth, while its demand component is weakly negatively related to subsequent industrial production growth. For Germany, the supply component of stock returns and inflation is strongly related to industrial production growth, but inflation is not positively related to monetary growth.

The variance decomposition shows that supply shocks were a dominant factor in stock return variation in the three countries. The explanatory power of supply shocks in explaining inflation was not as large as that of the U.S. postwar period, but generally larger than that in the U.S. prewar period.

3. Concluding Remarks

Our results confirm the predictions of equilibrium models that show that the relationship between stock returns and unexpected inflation can be either positive or negative, depending on the source of inflation in the economy. By combining earlier results in a coherent manner and by applying a time-series decomposition technique devised by Blanchard and Quah (1989), we disentangle two types of disturbances: supply shocks and demand shocks. The negative stock return–inflation relationship is due to supply (real output) shocks, while the positive relationship is due to demand (monetary) shocks.

Our framework suggests that the stock return–inflation relation is regime dependent; it can be either negative or positive depending on the relative importance of supply versus demand shocks. We provide evidence that in the postwar period of the United States and other countries (e.g., the United Kingdom, Japan, and Germany), supply shocks were relatively more important than they were in the U.S. prewar period. And consistent with the predictions of our model, postwar stock return–inflation relations are negative in all four countries, but their relation is positive in the prewar period in the United States.

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