The Distributional Effects of Disinflationary Monetary Policy

by

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ABSTRACT

Macroeconomists traditionally focus on the aggregate consequences of disinflationary monetary policy, not its distributional effects. This paper considers these distributional effects. The evidence indicates that contractionary monetary policy harms interest rate-sensitive industries by depressing output and employment and increasing the cost of capital. These industries are further hurt as declines in output and increases in the cost of capital reduce capital formation. The evidence also indicates that tight monetary policy in 1981-82 decimated the earnings of small firms. These earnings have remained at low levels since then. Finally, the evidence indicates that wealth holders are helped by contractionary monetary policy as interest rates increase and inflation declines. Before tightening monetary policy to pursue these benefits, however, policy makers should weigh carefully the damage that they will inflict on interest-sensitive sectors and small firms.

1. INTRODUCTION

Macroeconomists traditionally use the aggregate demand/aggregate supply apparatus to analyze the effects of disinflationary monetary policy. A monetary contraction is modeled as reducing aggregate demand. Assuming an upward-sloping aggregate supply curve, the contraction reduces aggregate output and prices. Wages and price are then assumed to decline, returning the economy to full employment with lower inflation. For instance, this framework is often employed to explain the monetary policy experience of 1979-82. In October 1979 Federal Reserve Chairman Paul Volcker implemented tighter monetary policy to fight inflation. The economy suffered two recessions over the next three years, with the 1981-82 recession bringing the unemployment rate to a post-War high of over 10 percent. Inflation finally began declining in 1982, allowing the Fed to loosen monetary policy. The economy then started a 92-month recovery in November 1982. Inflation since 1983 has averaged 3.7 percent, compared to an average over the 1979-81 period of 9.4 percent.

What this traditional analysis of disinflation ignores is how the burdens of such a policy are shared. What sectors are harmed the most? In what ways are they harmed? How long does it take them to recover? Do any sectors benefit from disinflationary policy?

This paper addresses these questions by surveying several studies by the author and others and by bringing new evidence to bear on the question. The results indicate that firms in interest rate-sensitive industries and small firms bear a disproportionate burden from contractionary monetary policy. Output and employment following a monetary contraction begins declining in interest rate-sensitive sectors on average eight months after the policy changes, reaches its lowest level after 18 months, and continues to be affected for 33 months. The cost of capital in these sectors can increase by 10 percentage points or more because of their exposure to monetary policy. These decreases in output and increases in the cost of capital retard capital formation in the affected industries, multiplying their losses. Small firms suffer even more from disinflationary policy. Earnings of small firms were decimated in 1981-82 by the Volcker deflation. Since then these earnings have remained at historically low levels. The evidence also indicates that wealth holders gain over time from contractionary policy as interest rates increase and inflation declines. These and other benefits of disinflation come, though, at significant costs to interest rate-sensitive sectors and to small firms.

Section 2 provides a theoretical background for this paper. Section 3 summarizes the empirical findings. Section 4 contains a discussion. Section 5 concludes.

2. THEORETICAL BACKGROUND

Textbook models (e.g., Dornbusch and Fischer, 1994) teach that contractionary monetary policy raises interest rates and thus restricts demand in interest rate-sensitive sectors. According to Jones (1994) and Caves, Frankel, and Jones (1994), examples of industries that are sensitive to interest rates include aircraft, automobiles, capital goods, construction, and furniture. As output slows in these industries, other cyclically-sensitive industries such as those producing durable goods should also contract. Industries producing necessities such as food, apparel, or utilities should show the least decline, since people continue to require these items even during slowdowns.

While traditional models imply that interest rate-sensitive industries and cyclical industries should bear the brunt of disinflationary policy, recent work has emphasized that credit-constrained firms will also suffer from tight money. As Bernanke (1993) and Gertler and Gilchrist (1994) have discussed, firms with better balance sheet positions are more able to finance their activities either directly using their own funds or indirectly using their net worth as collateral to obtain credit. Firms that have weak balance sheet positions or that are otherwise constrained in their access to capital markets are more dependent on banks to finance inventory investment and capital formation.

For these credit-constrained firms, a monetary contraction can severely curtail their ability to operate. As Gertler and Gilchrist (1994) have discussed, a monetary tightening, by increasing interest rates, can worsen cash flow net of interest and thus firms' balance sheet positions. As Bernanke and Blinder (1988) have shown, a monetary contraction engineered through an open market sale by the Federal Reserve can decrease bank loans (assuming that bonds and bank loans are imperfect substitutes).

The reduction in collateralizable net worth and in bank loans caused by a monetary contraction restricts working capital and thus economic activity among firms with limited access to capital markets.

Gertler and Gilchrist have argued that smaller firms are more likely to be constrained in their access to credit. They are more likely to obtain funds from banks than from equity, bonds, or commercial paper. They are less likely to be well-collateralized. Further, Gertler and Gilchrist argued that, because credit constraints bind a larger number of small firms in a downturn, changes in monetary policy should have a larger effect on small firms in bad times than in good times. A monetary contraction when the economy is in a recession can have a much more serious effect on small firms than a monetary expansion would when the economy is growing. Thus, if credit constraints help propagate monetary policy, small firms should suffer more from disinflationary monetary policy, especially during recessions.

While tight monetary policy can reduce capital formation by credit-constrained firms, there are also other channels through which it can affect investment. By decreasing output and sales in interest rate-sensitive or cyclically-sensitive industries, it can decrease capital formation in these industries. Chirinko (1993, p. 1883), in a recent survey of research about investment, concluded that "investment is most sensitive to quantity variables (output or sales) with price variables having only a modest effect." Further, by increasing uncertainty in interest rate-sensitive sectors, monetary policy can also deter investment. Pindyck and Solimano (1993) have argued that an increase in uncertainty about future cash flows is a major deterrent to investment.

Pindyck and Solimano model uncertainty as being due to various macroeconomic variables. In the language of finance, there are certain systematic sources of risk that affect cash flows, interest rates, and asset prices. Assets must pay increments to their returns (risk premia) to compensate for their exposures to these risk variables. One general way to model this relationship between risk and return has been developed by Ross (1976). He posited that the return on asset i (r_i) is given by:

$$r_i = r_f + \Sigma_j \beta_{ij} \lambda_j + \Sigma_j \beta_{ij} f_j + \epsilon_i \quad (1)$$

where r_f is the risk-free rate, β_{ij} is the exposure of asset i to macroeconomic variable j, λ_j is the risk premium associated with macroeconomic variable j, f_j is the unexpected change in variable j, and ϵ_i is a mean-zero error term. If monetary policy is a systematic source of risk, then it can increase uncertainty about future cash flows and deter investment. Those industries with greater exposures to monetary policy (those with larger β coefficients) should be more affected by the riskiness of monetary policy changes.

While disinflationary monetary policy will initially harm (or fail to benefit) most sectors, as interest rates rise and prices decline certain groups should gain. The clearest winners are wealth holders. Since the holding of interest-bearing assets are concentrated among the wealthiest, higher interest rates that shift the functional distribution of income toward interest payments will shift the personal distribution of income toward the wealthiest. Further, in order to hold an asset, savers require not only an expected real return but also compensation for expected inflation. Assume, for instance, that to hold a given bond wealth holders require a 2% expected real return and a 7% inflation premium. The return on the bond would thus be 9% If inflation declines to 3%, then the real return on the bond actually would be 6%. Thus savers receive a 4% higher real return than they expected, provided involuntarily by borrowers. In practice wealthier households are creditors while businesses, the government, and poorer households are debtors. Thus one would expect an unanticipated disinflation to help wealthier households at the expense of the other sectors.

3. EMPIRICAL EVIDENCE

A. *The Effects of Disinflationary Policy Across Industries*

Two recent papers (Thorbecke 1995a and 1995b) have investigated the effects of monetary policy across industries. The industries employed were the 22 for which industrial production data are available from the Federal Reserve. These include durable and nondurable manufacturing, mining, and utilities. The responses of industrial production over the next 48 months and stock returns in the initial month to a monetary contraction were noted. Data on the change in industrial production following tight monetary policy are useful because they provide direct evidence on the extent to which various industries are affected. Data on the response of stock returns to contractionary policy are also useful for several reasons. First, theoretically stock prices equal the expected present value of firms' future net cash flows, implying that changes in industry stock prices caused by monetary policy should foretell future changes in real activity in that industry. As Black (1987) has argued, increases in stock prices in a sector more often than not presage increases in sales, earnings, and capital outlays in that sector. Second, stock returns are useful for determining whether monetary policy is a systematic source of uncertainty with a risk premium (a λ in the notation of equation (1)) associated with it. Third, stock return data are probably measured with less error than data on industrial production. Thus it is useful to examine the response of stock returns as well as the response of industrial production to monetary policy shocks.

The impulse-response methodology of Sims (1980) was used to note the response of stock returns and industrial production to monetary policy. This approach involves calculating unexpected changes in monetary policy (the impulse) in period t and noting the predicted effect on stock returns and industrial production in periods t, t+1, t+2, etc. (the responses). To measure unexpected changes in monetary policy a method similar to that employed by Christiano, Eichenbaum, and Evans (1994) was used. They measured monetary policy by unexpected changes in the federal funds rate. The funds rate is the rate on overnight loans between banks and has often been used as the Fed's instrument in implementing monetary policy. Christiano *et al.* noted that including an index of sensitive commodity prices along with variables such as GDP and the GDP deflator in a prediction equation for the funds rate produced a credible measure of monetary policy in that it was correlated in the expected way with variables such as bank reserves, real GDP, employment, and prices. Following their approach Thorbecke (1995a, 1995b) calculated unexpected changes in the federal funds rate by regressing the funds rate on a constant, six lags of itself, and six lags of aggregate industrial production growth, the inflation rate, the log of a commodity price index, the log of nonborrowed reserves, the log of total reserves, and either the log of real industry output or stock returns in the industry. The portion of the funds rate that could not be predicted using these variables (the residual) was treated as the unexpected change in the funds rate. The predicted responses of industrial production and stock returns to these funds rate shocks were noted. Standard errors were calculated by Monte Carlo methods using 300 draws from the posterior distribution of the orthogonalized impulse response coefficients (see Doan (1992)).

The sample period for this estimation was January 1967 to December 1990. The sample period began in January 1967 because this is the first month for which data on commodity prices are available from the Haver Analytics data tape. It ends in December 1990 because this is the last month for which data on industry stock returns and production (kindly provided by Jacob Boudoukh) are available.[1]

The results indicate that contractionary policy (i.e., an unexpected increases in the funds rate) caused large and statistically significant decreases in stock prices and industrial production. Stock prices decreased immediately. Industrial production began decreasing after about eight months, reached its lowest level at about 18 months, and continued to be affected for 33 months or more. Table 1 presents the response of stock returns in the initial month by industry. The coefficients indicate that a one-standard deviation unexpected increase in the funds rate depressed industry stock returns by an average of -0.81 percent per month. This compounds to an average annual effect of -10.2 percent. The standard errors indicate that 17 of these coefficients are statistically different from zero at at least the 5 percent level and 20 are at at least the 10 percent level. Table 2 presents the responses of industrial production after 18 months by industry. For the 11 industries most affected by monetary policy, a one-standard-deviation shock to the federal funds rate will decrease output after 18 months by an average of 0.9 percent. This value implies that the 300 basis point increase in the funds rate implemented by the Fed in 1994 and early 1995 will decrease output in these industries after 18 months by 4.3 percent. The standard errors indicate that for these 11 industries 9 are statistically different from zero at at least the 5 percent level and 10 are at at least the 10 percent level.

A very simple method of combining the information in both

Tables in order to determine which industries are more affected is to assign industries in each Table a rank of one if they have the largest coefficient (in absolute value), two if they have the next largest coefficient, and so on. By summing an industry's ranking in both Tables it is possible to obtain a measure of which industries are most affected that combines the information in both Tables. Table 3 presents this measure.

The evidence in Table 3 is consistent with textbook models that imply monetary policy should have the greatest effect on interest-rate sensitive and other cyclically-sensitive industries. The three most affected industries (lumber; clay, glass, and stone; and primary metals) and the sixth most affected industry (rubber) produce inputs to the construction or auto industries. The fourth most affected industry (transportation equipment) includes automobiles and aircraft. The fifth most affected industry (furniture), as Jones (1994) argued, is interest-sensitive. Capital goods industries (nonelectrical machinery, metal products, electrical machinery, and instruments) take up places six, seven, eight, and ten. The bottom of the list is made up of industries producing nondurables or necessities such as food, textiles, utilities, tobacco, apparel, and leather. Thus, consistent with traditional models, the evidence indicates that a monetary contraction harms interest rate-sensitive industries and has little or no effect on industries producing necessities.

B. *Contractionary Monetary Policy and Employment*

It is also desirable to investigate the effects of monetary policy through employment changes. Data on employment from the Haver Analytics data tape were only disaggregated into durable and nondurable industries, not the 22 subcategories examined above. However, employment data were available for several sectors for which industrial production data were unavailable. Coppock and Thorbecke (1995) used impulse-response functions to measure the predicted effect of federal funds rate increases on employment in these sectors. The data and methodology employed were identical to those described in the previous section, except that sectoral employment data were substituted for data on stock returns and industrial production. The sample period extended from January 1967 to December 1993. Table 4 presents the responses of employment after 18 months by industry. For the 4 sectors most affected by monetary policy, a one-standard-deviation shock to the federal funds rate will decrease employment after 18 months by an average of 0.5 percent. This value implies that the 300 basis point increase in the funds rate implemented by the Fed in 1994 and early 1995 will decrease employment in these sectors after 18 months by 2.4 percent. The standard errors indicate that 6 of the 10 sectors exhibit an employment response that is statistically different from zero at at least the 5 percent level and 8 of the 10 exhibit a response that is statistically different at at least the 10 percent level.

The evidence in Table 4 indicates that a monetary contraction has a much larger effect on employment in durable goods industries than in nondurable goods industries. This finding mirrors those presented in Table 3, where the 9 most affected industries all produce durable goods and 8 of the 10 least affected industries all produced nondurables.

Blanchard (1995) has discussed other ways that a negative aggregate shock such as a monetary contraction can exert distributional effects through employment changes. He argued that unskilled workers have much larger labor supply elasticities than skilled workers. Decreases in wages of skilled workers will not decrease their labor supply much, while decreases in wages of unskilled workers will sharply decrease theirs. He further argued that there are "ladder" effects, by which the lower employees on the ladder (unskilled workers) are the first to be let go during a contraction. For these reasons, he argued that a negative aggregate shock will decrease employment much more for unskilled workers than for skilled workers. Thus those at the lower tail of the income distribution should be disproportionately harmed by a monetary contraction.

Blinder and Esaki (1978) investigated the effects of negative macroeconomic shocks on the distribution of income. Writing shortly before the Volcker deflation, they found that each one percentage point rise in unemployment takes about 0.28% of national income away from the lowest 40% of the income distribution and gives it to the richest 20%. These values imply that the Volcker deflation, which increased unemployment by over 4 percentage points, redistributed more than 1.12% of national income away from the bottom 40% to the top 20%.

C. *Monetary Policy, the Cost of Capital, and Capital Formation*

The fact that monetary policy affects stock returns, industrial production, and employment makes it plausible that it is a systematic source of risk for which assets must pay a premium. Thorbecke (1995a) found that there was a statistically significant negative risk premium associated with monetary policy (measured, as before, using unexpected changes in the funds rate). He also found that all 22 industries had negative exposures to funds rate shocks. Most of these exposures, as Table 1 documents, are statistically different from zero. These findings imply that the product $\beta_{ij}\lambda_j$ in equation (1) capturing the effect of monetary policy risk on the cost of capital r_i is positive. Thus stocks have to pay a higher return because of the risks they face due to contractionary monetary policy. Table 5 reports, using percentage points per year, the increment to the cost of capital caused by firms' exposures to monetary policy.

The numbers are very large. They imply that across the 22 industries the cost of capital increases on average by 7.7 percentage points because of uncertainty about monetary policy. Among the five industries most exposed to monetary policy, the cost of capital increases on average by 10.5 percentage points. These results indicate that assets must pay large positive premiums to compensate for their exposures to monetary policy.

This evidence coupled with the evidence in the previous sections imply that disinflationary monetary policy will deter capital formation. Chirinko (1993) concluded that reductions in output, as are caused by contractionary monetary policy, act as major deterrents to investment. Further, although he found that changes in the cost of capital (c_K) had more modest effects, increases of 10 percentage points or more because of a firm's exposure to monetary policy are bound to reduce investment. Project managers are trained to compare the returns on a new investment with c_K and will be less willing to invest if some factor increases c_K by 10 percentage points. Further, the evidence that monetary policy has a large effect on industry output and that it has a risk premium associated with it implies that it is one of the macroeconomic sources of uncertainty discussed by Pindyck and Solimano (1993). Pindyck and Solimano have argued that macroeconomic variables that increase uncertainty about future cash flows act as major deterrents to investment. Thus disinflationary policy will hamper investment in exposed sectors by decreasing output, by raising the cost of capital, and by increasing uncertainty. As Fischer (1991) has argued, a factor such as monetary policy that deters investment in a sector will also decrease that sector's long run growth.

D. *Disinflationary Policy and Small Firms*

Fama and French (1995) found that the until 1981, profitability showed little relationship to firm size. They also found that profits of small firms declined much more than profits of large firms during the 1981-82 recession. Finally, examining data from 1983 to 1991, they found that while earnings of large firms quickly recovered, earnings of small firms never really did. Rather, they remained at historically low levels. Fama and French argued that there is some unknown macroeconomic risk factor that produces this size-related variation in economic performance among firms.

There is much evidence indicating that the systematic macroeconomic variable producing the differences in economic performance is monetary policy. First, the 1981-82 recession is widely believed to have been caused by tight monetary policy initiated by Fed Chairman Paul Volcker to fight inflation. The expansion of the middle to late 1980s is similarly believed to have been sparked by the easing of monetary policy in late 1982. Second, Gertler and Gilchrist (1994) found using impulse-response functions that contractionary monetary policy reduces sales of small firms much more than sales of large firms. They also found that small firms exhibit an asymmetric response to monetary policy (but large firms do not). Small firms are harmed much more by contractionary monetary policy during recessions than they are helped by expansionary monetary policy during expansions. Thus, small firms would have been hurt more than large firms by contractionary monetary policy in 1981-82 but helped less by expansionary policy thereafter. Third, estimating the monetary policy exposures from equation (1) (the β's), Thorbecke and Coppock

(1995a) found that small firms were harmed by contractionary monetary policy during the Volcker deflation but not helped from the subsequent monetary expansion beginning in late 1982 (while large firms were helped by the expansion). Their estimates are presented in Table 6.[2] Fourth, as discussed above, Thorbecke (1995a) found that monetary policy is a systematic risk factor having a statistically significant risk premium associated with it. Thus the evidence points to monetary policy as the systematic factor that contributed to the 1981-82 slowdown of small firms but that failed to cause a recovery among small firms thereafter.[3]

This evidence implies that the environment of disinflationary growth prevailing after 1982 was obtained at the expense of small firms. These firms were decimated by the 1981-82 recession and never recovered. Evidence that small firms bear a disproportionate burden from disinflations, as Bernanke (1993) has argued, should be of interest to policy makers.

E. *Disinflationary Policy and Wealth Holders*

In Section II it was argued that declines in inflation should benefit wealth holders. Formal evidence of this has been presented by Boudoukh, Richardson, and Whitelaw (1994). Extending a result that has been demonstrated by many researchers, they showed that both expected and unexpected increases in inflation reduce stock returns. Inflation also lowers bond returns (see Hardouvelis, 1988). Thus higher inflation harms wealth holders and lower inflation benefits them. Contractionary monetary policy, which reduces inflation, should benefit wealth holders. Indeed, contractionary policy is frequently implemented in response to demands by Wall Street to fight inflation (see, for example, Levy and Levy, 1994).

One problem with the conclusion that contractionary monetary policy helps wealth holders concerns the evidence presented in Table 1. This evidence indicates that contractionary policy depresses stock returns in all the industries examined.

This evidence that contractionary policy depresses returns can be reconciled with the claim that disinflationary policy benefits wealth holders by noting the difference between the short and long run responses of stock returns to monetary policy. Initially a monetary tightening will reduce forecasts of economic activity and thus stock returns (see Tables 1 and 2). Over time, however, this tightening will reduce inflation (see Christiano *et al.*, 1994). This decline in inflation will increase stock returns in the future (see Boudoukh *et al.*, 1994).

Figure 1 presents evidence of the differential short and long run effects of monetary policy on stock returns, bond returns, and real estate prices.[4] It builds on the finding of financial economists that asset returns are somewhat forecastable (see Campbell and Mei, 1993). Unexpected changes in monetary policy not only affect asset returns immediately, but also affect agents' forecasts of future returns. This can happen, for instance, if news of a monetary contraction now reduces forecasts of inflation in the future. Figure 1 shows how news of a monetary tightening (an unexpected increase in the funds rate) affects agents forecasts of future returns on the Standard and Poors' Composite Index, the Salomon Brothers High Grade Corporate Bond Index, and the return to homebuilding stocks. The methodology and data used in constructing this Figure are somewhat technical and thus discussed in the Appendix. The Figure indicates that although contractionary monetary policy depresses asset returns initially and in the immediate future, it also increases forecasted returns further in the future. Thus while disinflationary monetary policy initially harms wealth holders, it benefits them over time as decreases in inflation produce capital gains.[5] The evidence that stocks and bonds benefit over time from disinflationary monetary policy explains why Wall Street lobbies for such policies. Thorbecke and Coppock (1995b) have used industry stock return data to present more detailed evidence of the differential short and long run effects of monetary policy on stock returns.

Moore (1989) and Niggle (1989) have investigated the distributional effects of disinflationary policy by household type-poor, middle income, and rich. The distribution of asset holdings is very different across these groups. Whereas poor households tend to be net debtors, the top 10 percent of wealth holders tend to be net lenders. Following the Volcker deflation this top 10 percent held 94.4 percent of all bonds and trusts and 50.8 percent of all other interest-bearing assets. As Moore and Niggle discuss, high interest rates due to the Volcker deflation caused the share of interest in personal income to increase almost 5 percent between

1979 and the end of 1982. Since the ownership of interest bearing assets is so heavily concentrated among the wealthiest, this shift in the functional distribution of income produced a shift in the personal distribution of income towards greater inequality. Niggle estimated that the higher interest rates due to contractionary monetary policy increased the share of total income going to the wealthiest 10 percent of households by 3.5 percent.[6]

4. DISCUSSION

It is interesting to consider why the various cyclically-sensitive industries are affected by monetary policy. Some are affected because borrowed funds are a large share of total costs. Gertler and Gilchrist (1994) note that small firms (firms with less than 500 employees) make up 75 percent of sales in retail and wholesale trade and 90 percent of sales in construction. As they discuss, the predominance of small firms in these industries implies that their borrowing costs will be higher. These higher costs help explain why construction, retail trade, and wholesale trade are the first, third, and fourth most affected industries in Table 4. In addition, data on the coverage ratio (the ratio of interest payments to the sum of interest payments and profits) indicate that clay, glass, and stone; transportation equipment; rubber and plastics; nonelectrical machinery; and metal products all have high borrowing costs. These high costs help explain why these industries are the second, fourth, sixth, seventh, and eighth most affected industries in Table 3.

Other industries are affected because their income elasticities of demand are large. In Table 3 the 9 most affected industries are durable goods industries and (apart from utilities) 8 of the 9 least affected industries are nondurable goods industries. Part of the reason that nondurable industries such as food and apparel are not affected whereas durable industries such as machinery and transportation equipment are is that the former are necessities for which the direct income elasticity of demand is low while the latter are not and have higher income elasticities.

There are also indirect channels through which a monetary contraction can affect expenditure patterns. As Adelman and Taylor (1990) discuss, an economic slowdown, by decreasing income, will cause household spending patterns to change. These indirect effects will cause industries producing durable goods demanded by households (e.g., furniture and appliances) to be harmed by a monetary contraction.

The housing industry is strongly affected on both the demand and supply sides by monetary policy (see Dornbusch and Fischer, 1994). Monetary policy that causes the mortgage interest rate to double will also cause the monthly payment on a conventional mortgage to double, curtailing demand. However, since contractors often use mortgages to finance construction costs, increases in mortgage rates also restrict their ability to build new houses.

The Social Accounting Matrix (SAM) for the U.S. presented by Reinert and Roland-Holst (1992) provides additional insight into why durable goods industries are affected by monetary policy.

Their SAM indicates that 30 percent of spending by construction goes to durable goods industries. Thus as tight monetary policy slows construction, its demand for durable goods such as lumber, primary metals, and clay, glass, and stone plummets. Their SAM also indicates that 30 percent of expenditures by durable goods industries is received by durable goods industries. Thus as the demand for automobiles and for inputs into construction decreases, expenditure on other durable goods industries such as primary metals and machinery plummets.

5. CONCLUSION

This paper has considered the distributional effects of disinflationary monetary policy. It has done this by surveying the results of several studies and by bringing new evidence to bear on the question. The evidence indicates that contractionary monetary policy depresses output and employment in interest rate-sensitive and cyclically-sensitive industries. These effects not only directly harm industries exposed to monetary policy but also restrict capital formation in these sectors, curtailing their long run growth. Further, tight monetary policy in 1981-82 decimated the earnings of small firms. Since that time these earnings have remained at historically low levels. Contractionary policy, by reducing inflation, does yield benefits over time to wealth holders. Further, since the ownership of interest-bearing assets is concentrated among the wealthiest, the shift in the functional distribution of income towards interest payments during the Volcker deflation shifted the personal distribution of income towards greater inequality. Policy makers should be aware, however, that in conferring these benefits they inflict enormous damage on interest rate-sensitive industries and small firms. If small firms are concentrated in the most dynamic sectors of the economy, as Fazzari (1993) has argued, the damage inflicted on them by disinflationary policy is alarming. Even if small firms are not "engines of growth," the disproportionate burden that they and interest rate-sensitive industries bear from contractionary policy is troubling. The Federal Reserve should take these distributional effects into consideration before choosing to tighten monetary policy.

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FOOTNOTES

*I thank Irma Adelman for invaluable comments. Any errors are my own.

1. October 1987, the month in which stock prices dropped 20 percent in one day, was excluded from the estimation.

2. Thorbecke and Coppock (1995a) also measured monetary policy during the Volcker deflation period using unexpected changes in nonborrowed reserves (NBR). The Federal Reserve targeted NBR over the October 1979 - August 1982 period. Using unexpected changes in NBR they also found that contractionary monetary policy had a large negative effect on small firms' returns during the 1979-1982 period.

3. The evidence that small firms were harmed by the Volcker deflation but not helped by the subsequent expansion could reflect no new effect beyond that discussed in Section 3A. This could be true if small firms are more prevalent in cyclically-sensitive industries. To test for this returns on the 11 industries in Table 1 most exposed to monetary policy were regressed over the 1982-1987 period on funds rate shocks and the other variables employed by Thorbecke and Coppock (1995a). For all except the 10th most exposed industry, the monetary expansion over this period caused a large, statistically significant increase in stock returns. Thus the asymmetric effect of monetary policy in good and bad times applies to small firms specifically rather than to cyclically-sensitive firms generally.

4. The methodology used in constructing Figure 1 was designed to employ assets whose prices vary continuously in speculative markets. Thus real estate prices themselves are inappropriate. As a proxy, the returns on homebuilding stocks, which vary sensitively with real estate prices, were used.

5. The financial press often offers a similar explanation when discussing why funds rate increases depress stock prices. Hurtado (1994), discussing the 98 point drop in the Dow Jones Industrial Average that occurred on 4 February 1994 following news of a Fed contraction, stated that if the Fed move improved the inflationary outlook, the stock market could bounce back. Laderman (1994) argued that 7 of the last 8 times that the Fed pushed interest rates up from their cyclical lows, the stock market ended up increasing over time.

6. As Moore (1989) and Niggle (1989) discuss, there is some ambiguity to the finding that higher interest rates benefits the wealthy because it also produces capital losses on existing stocks and bonds. However, as Figure 1 shows, these capital losses are offset over time as tighter policy causes inflation to decline. The intense lobbying by Wall Street for disinflationary policy also indicates that the effect of these capital losses are second order compared to the gains from tighter monetary policy.

Table 1: Impulse Response of Industry Stock Returns in Initial Month to One-Standard Deviation Shock to the Federal Funds Rate

Industry	Response to One-Standard Deviation Shock to FF	(Std. Error)
Lumber	-0.0142**	(0.00527)
Mining	-0.0134**	(0.00374)
Furniture	-0.00950**	(0.00339)
Clay, Glass, and Stone	-0.00945**	(0.00318)
Nonelectrical Machinery	-0.00894**	(0.00363)
Paper	-0.00884**	(0.00333)
Primary Metals	-0.00879**	(0.00338)
Transportation Equipment	-0.00803**	(0.00386)
Rubber and Plastics	-0.00791**	(0.00321)
Misc. Manufacturing	-0.00776*	(0.00395)
Metal Products	-0.00774**	(0.00323)
Food and Beverage	-0.00773**	(0.00280)
Petroleum Products	-0.0076**	(0.00331)
Instruments	-0.00741**	(0.00374)
Electrical Machinery	-0.00735*	(0.00424)
Printing and Publishing	-0.00664**	(0.00331)
Utilities	-0.00662**	(0.00186)
Leather	-0.00662**	(0.00104)
Chemicals	-0.00642**	(0.00313)
Textiles	-0.00635*	(0.00362)
Tobacco	-0.00583**	(0.00259)
Apparel	-0.00509	(0.00376)

Source: Thorbecke (1995a)
*Significant at the 10% level.
**Significant at the 5% level.

Table 2: Impulse Response of Industry Industrial Production after 18 Months to One-Standard Deviation Shock to the Federal Funds Rate

Industry	Response to One-Standard Deviation Shock to FF	(Std. Error)
Primary Metals	-0.00838**	(0.00234)
Clay, Glass, and Stone	-0.00797**	(0.00367)
Transportation Equipment	-0.00750**	(0.00273)
Rubber and Plastics	-0.00671*	(0.00351)
Lumber	-0.00644**	(0.00247)
Electrical Machinery	-0.00584**	(0.00197)
Chemicals	-0.00563**	(0.00221)
Metal Products	-0.00523	(0.00360)
Instruments	-0.00490**	(0.00244)
Furniture	-0.00474**	(0.00192)
Petroleum	-0.00454**	(0.00277)
Textiles	-0.00383	(0.00245)
Nonelectrical Machinery	-0.00273	(0.00267)
Misc. Manufacturing	-0.00251	(0.00372)
Paper	-0.00205	(0.00231)
Utilities	-0.00167	(0.00174)
Printing and Publishing	-0.00164	(0.00176)
Apparel	-0.00156	(0.00106)
Food and Beverage	-0.000481	(0.00249)
Tobacco	0.000199	(0.00175)
Mining	0.000239	(0.00178)
Leather	0.00423	(0.00347)

Source: Thorbecke (1995b)
*Significant at the 10% level.
**Significant at the 5% level.

Table 3: Combined Ranking of Industries in Tables 1 and 2

Industry	Combined Ranking
Lumber	6
Clay, Glass, and Stone	6
Primary Metals	8
Transportation Equipment	11
Furniture	13
Rubber and Plastics	13
Nonelectrical Machinery	18
Metal Products	19
Electrical Machinery	21
Paper	21
Instruments	23
Mining	23
Petroleum	24
Misc. Manufacturing	24
Chemicals	26
Food and Beverages	31
Textiles	32
Utilities	33
Printing and Publishing	33
Tobacco	40
Apparel	40
Leather	40

Note: The combined ranking is the sum of the each industry's rank in Table 1 and Table 2. In each Table an industry is assigned a rank of one if it has the largest coefficient (in absolute value), two if it has the second largest coefficient, and so on. The combined ranking thus synthesizes the information in both Tables to provide a rough measure of which industries are most affected by monetary policy.

Table 4: Impulse Response of Sectoral Employment after 18 Months to One-Standard Deviation Shock to the Federal Funds Rate

Sector	Response to One-Standard Deviation Shock to FF	(Std. Error)
Construction	-0.00735**	(0.00253)
Durable Goods	-0.00527**	(0.00187)
Retail Trade	-0.00286**	(0.00087)
Wholesale Trade	-0.00284**	(0.00088)
Finance, Insurance, Real Estate	-0.00217**	(0.00069)
Services	-0.00167**	(0.00056)
Nondurable Goods	-0.00116*	(0.00077)
Government	-0.00106*	(0.00058)
Transportation	-0.00084	(0.00091)
Mining	0.000845	(0.00338)

Source: Coppock and Thorbecke (1995)
*Significant at the 10% level.
**Significant at the 5% level.

Table 5. Increase in Cost of Capital Due to Exposure to Monetary Policy

Industry	Increase in Cost of Capital (Percentage Points)
Mining	11.8
Lumber	11.4
Clay	10.7
Paper	9.5
Rubber & Plastics	9.1
Primary Metals	8.6
Furniture	8.0
Textiles	8.0
Transportation Equipment	7.8
Nonelectrical Machinery	7.7
Electrical Machinery	7.5
Metal Products	7.5
Petroleum	7.3
Food & Beverage	7.2
Miscellaneous Manufacturing	6.9
Leather	6.9
Instruments	6.8
Printing & Publishing	6.3
Tobacco	6.2
Chemicals	5.6
Utilities	4.9
Apparel	4.3

Source: Thorbecke (1995a) and calculations by the author.

Table 6. The Exposures of Portfolio Stock Returns to Unexpected Changes in the Federal Funds Rate

Volcker Deflation Period (1979:10 - 1982:10)		
Portfolio	Exposure	t-statistic
First Decile (smallest)	-1.33**	-2.20
Second Decile	-0.77	-1.12
Third Decile	-0.87	-1.36
Fourth Decile	-1.09*	-1.72
Fifth Decile	-1.11*	-1.82
Sixth Decile	-0.99	-1.64
Seventh Decile	-0.99	-1.66
Eighth Decile	-0.84	-1.55
Ninth Decile	-0.75	-1.31
Tenth Decile (largest)	-0.70	-1.27

Post Deflationary Expansion (1982:8 - 1987:9)		
Portfolio	Exposure	t-statistic
First Decile (smallest)	-2.27	-1.49
Second Decile	-2.60**	-1.99
Third Decile	-3.11**	-2.35
Fourth Decile	-3.29**	-2.57
Fifth Decile	-3.37**	-2.66
Sixth Decile	-2.94**	-2.41
Seventh Decile	-3.15**	-2.62
Eighth Decile	-2.63**	-2.21
Ninth Decile	-2.55**	-2.25
Tenth Decile (largest)	-2.13*	-1.94

Note: The first sample period extended to October 1982 rather than August because the Jacobian cross-products matrix was not of full rank when the sample ended in August, causing some of the estimates to be biased. For those estimates that were not biased (including those for the ten decile stock returns) the results were similar whether the sample ended in August or October.

Source: Thorbecke and Coppock (1995a)

*Significant at the 10% level.

**Significant at the 5% level.

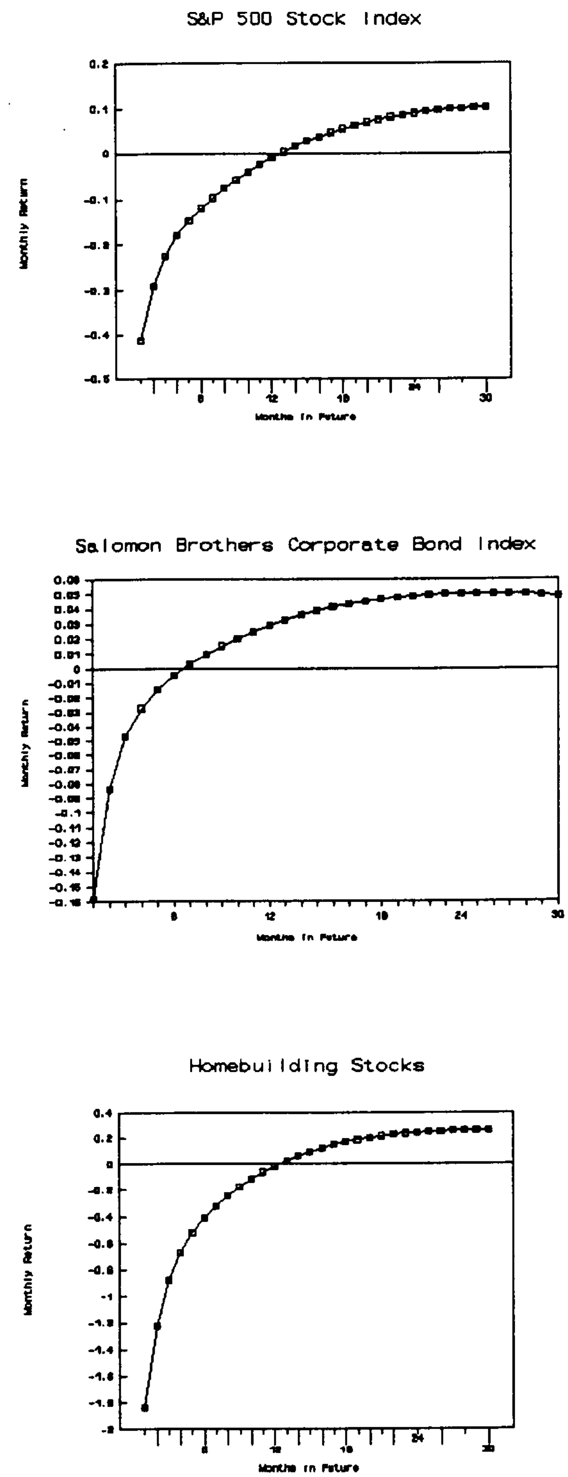

Figure 1. Covariance Between Unexpected Changes in the Federal Funds Rate and Changes in the Contemporaneous Forecasts of Future Returns (Scaled by the Variance of the Unexpected Change in the Funds Rate).

APPENDIX

Financial economists have recently found that future asset returns are partly forecastable based on past values of variables. For instance, Campbell and Mei (1993) forecasted asset returns ($r_{i,t}$) based on a set of k macroeconomic variables ($x_{j,t-1}$) known in the previous period:

$$r_{i,t} = a_{i,1}x_{1,t-1} + a_{i,2}x_{2,t-1} + \ldots + a_{i,k}x_{k,t-1} + e_{i,t} \quad \text{(A1)}$$

Campbell and Mei assumed that these macroeconomic variables can also be forecasted based on lagged values of themselves:

$$\begin{aligned} x_{1,t} &= p_{1,1}x_{1,t-1} + p_{1,2}x_{2,t-1} + \ldots + p_{1,k}x_{k,t-1} + u_{1,t} \\ x_{2,t} &= p_{2,1}x_{1,t-1} + p_{2,2}x_{2,t-1} + \ldots + p_{2,k}x_{k,t-1} + u_{2,t} \\ &\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ x_{k,t} &= p_{k,1}x_{1,t-1} + p_{k,2}x_{2,t-1} + \ldots + p_{k,k}x_{k,t-1} + u_{k,t} \end{aligned} \quad \text{(A2)}$$

Equations (A1) and (A2) can be rewritten in matrix notation by letting:

$\mathbf{a'}_i = \{a_{i,1}, a_{i,2}, \ldots, x_{i,k}\}$, $\mathbf{x'}_t = \{x_{1,t}, x_{2,t}, \ldots, x_{k,t}\}$,

$\mathbf{u'}_t = \{u_{1,t}, u_{2,t}, \ldots, u_{k,t}\}$ and

$$\mathbf{P} = \begin{bmatrix} p_{1,1} & p_{1,2} & \ldots & p_{1,k} \\ p_{2,1} & p_{2,2} & \ldots & p_{2,k} \\ \ldots & \ldots & \ldots & \ldots \\ p_{k,1} & p_{k,2} & \ldots & p_{k,k} \end{bmatrix}$$

Equation (A1) and (A2) can then be written:

$$r_{i,t} = \mathbf{a'}_i\mathbf{x}_{t-1} + e_{i,t} \quad \text{(A3)}$$

and

$$\mathbf{x}_t = \mathbf{P}\mathbf{x}_{t-1} + \mathbf{u}_t \quad \text{(A4)}$$

In equation (A3) $e_{i,t}$ represents the portion of the return on asset i in period t that was not predictable using information available in period t-1. In equation (A4) $\mathbf{u}_t$ represents new information about the macroeconomic variables $\mathbf{x}'_t$ that was not predictable in period t-1. If the first macroeconomic variable measures monetary policy using the federal funds rate, then $u_{1,t}$ represents the unexpected change in the funds rate. One might want to examine whether an unexpected change in the funds rate is related to an unexpected change in the asset return. One way to do this, advocated by Campbell and Mei (1993), is to examine the coefficient $cov(e_{i,t},u_{1,t})/var(u_{1,t})$, where cov represents the unconditional covariance and var represents the unconditional variance. This coefficient is similar to what one would obtain from regressing the unexpected change in the asset return in the initial month on the unexpected change in the funds rate.

The equations presented above also contain information about future months. New information about the macroeconomic variables ($\mathbf{u}_t$) affect forecasts of the macroeconomic variables in the future. For instance, news of contractionary monetary policy will affect forecasts of output and prices in future periods. Equation (A4) implies that news of $\mathbf{u}_t$ will change the forecast of $\mathbf{x}_{t+1}$ in period t by $\mathbf{P}\mathbf{u}_t$, the forecast of $\mathbf{x}_{t+2}$ in period t by $\mathbf{P}^2\mathbf{u}_t$, the forecast of $\mathbf{x}_{t+3}$ in period t by $\mathbf{P}^3\mathbf{u}_t$, and so on. But by equation (A3), these changes in the period t forecasts of the macroeconomic variables $\mathbf{x}_{t+j}$ for j = 1,2,3, ... will affect period t forecasts of future asset returns $r_{i,t+j+1}$. As an example, forecasts of lower inflation in period t+j due to contractionary monetary policy in period t will affect period t forecasts of asset returns in period t+j+1. The forecast of $r_{i,t+1}$ in period t will change by $\mathbf{a}'_i\mathbf{u}_t$, the forecast of $r_{i,t+2}$ in period t will change by $\mathbf{a}'_i\mathbf{P}\mathbf{u}_t$, the forecast of $r_{i,t+3}$ in period t will change by $\mathbf{a}'_i\mathbf{P}^2\mathbf{u}_t$, and so on. It is then possible to examine the relationship between unexpected changes in the funds rate in period t ($u_{1,t}$) and changes in the forecasts of asset returns in future months. This can be done again by looking at the covariance of unexpected changes in the funds rate in period t with changes in the period t forecast of asset returns in period t+j divided by the variance of the unexpected change in the funds rate in period t. This would give a series of coefficients of the form:

$\{cov(u_{1,t},\mathbf{a}'_i\mathbf{u}_t)/var(u_{1,t}),\ cov(u_{1,t},\mathbf{a}'_i\mathbf{P}\mathbf{u}_t)/var(u_{1,t}),$

$cov(u_{1,t},\mathbf{a}'_i\mathbf{P}^2\mathbf{u}_t)/var(u_{1,t}),\ cov(u_{1,t},\mathbf{a}'_i\mathbf{P}^3\mathbf{u}_t)/var(u_{1,t}),\ \ldots\}$

These coefficients measure the correlation between an unexpected change in the funds rate in period t and changes in the forecasts of future asset returns made in period t. It is these coefficients that are plotted in Figure 1.

The asset return data used in calculating these coefficients are the returns on the Standard and Poors' Composite Stock Index and the Salomon Brothers High Grade Corporate Bond Index, both obtained from Ibbotson Associates (1994), and the return on homebuilding stocks, obtained from the Standard and Poors' Statistical Service. The macroeconomic variables used are the federal funds rate, the dividend yield on the Standard and Poors' Index, the growth rate of industrial production, the log of an index of sensitive commodity prices, and the real interest rate. Data on the first four variables were obtained from the Haver Analytics data tape. The mnemonics for these variables are, respectively, FFED, SDY5COM, IPN, and PZALL. Data on the real interest rate were obtained from Ibbotson Associates (1994). The sample period for the Standard & Poors' Stock Index and the Salomon Brothers' Bond index extended from January 1967 to December 1993. The sample period for homebuilding stocks extended from January 1974 to December 1993.