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The Costs of Anticipated Inflation

"Our strategy continues to be centered on moving toward, and ultimately reaching, stable prices, that is, price levels sufficiently stable so that expectations of change do not become major factors in key economic decisions."
Alan Greenspan, in testimony to the House Committee on Banking, Finance, and Urban Affairs on January 24, 1989.

Inflation can distort economic decision making. In this regard, it is important to distinguish between the effects of anticipated and unanticipated inflation. Some of the more serious costs arise from inflation that is not fully anticipated. As discussed in the *Letter* of March 2, 1990, these include arbitrary transfers of wealth between creditors and debtors and difficulty in distinguishing between absolute price changes and movements in relative prices. Inflation uncertainty also hampers long-term planning by business and labor, and increases uncertainty about the real returns to saving and investment, thereby reducing economic growth.

In contrast, many argue that when inflation is fully anticipated, there is little or no cost to the economy since nominal interest rates will adjust to maintain real returns. However, with a tax system that is not indexed to inflation and loan instruments that generally do not allow households to borrow against anticipated increases in future income, even anticipated inflation can have distortionary effects. This *Letter* discusses the major effects of anticipated inflation, and presents some quantitative estimates of these effects on the allocation of resources in the U.S. economy. These estimates show that even fully anticipated inflation is significantly non-neutral in its impact.

Anticipated inflation and taxes

Irving Fisher provided the classic analysis of the effects of anticipated inflation in his *Theory of Interest* over a half century ago. Fisher argued that borrowers and lenders base their decisions on real interest rates, and that nominal interest rates adjust to compensate for anticipated inflation. Moreover, in a world in which interest income is taxable and the costs of borrowing are tax deductible, the Fisherian model suggests that borrowers and lenders base their decisions on *after-tax* real interest rates.

Thus, for example, when the marginal income tax rate is 50 percent and the equilibrium real after-tax rate of interest is three percent, the nominal interest rate will settle at six percent, assuming anticipated inflation is zero. But if anticipated inflation rises to five percent, the nominal interest rate will rise to 16 percent to give the same real after-tax return of three percent.

The key insight of the Fisherian model is that anticipated inflation should have no impact on the real economy as long as nominal rates adjust fully to preserve real rates of return. In practice, however, certain aspects of the U.S. tax code interact with inflation in such a way that real rates are affected. First, although the tax code allows businesses to provide for the replacement of worn-out capital stock through a depreciation allowance, it specifies allowable depreciation in terms of the historical cost of the capital, not its current replacement cost. Thus, when prices rise due to inflation, the effective tax rate on business profits also rises because the base for depreciation is not increased accordingly. As a result, business investment tends to fall relative to other kinds of spending in an inflationary environment.

The U.S. tax code also may discourage inventory investment during inflationary periods. Seventy percent of U.S. firms value inventories on a first-in, first-out basis (FIFO). When these firms sell goods out of inventory in an inflationary period, they incur a taxable capital gain since the goods are sold at inflated prices but are valued for tax purposes at old, lower prices.

LIFO accounting, in which valuation is on a last-in, first-out basis, largely avoids this tax because the cost of goods sold is measured in terms of more recent prices. However, it is more complex

than FIFO, and it has the disadvantage of reducing reported pre-tax profits, something publicly-held firms may be reluctant to do. To the extent that firms use the FIFO method, then, anticipated inflation raises the after-tax cost of holding inventories, which, in turn, may reduce inventory investment.

Liquidity constraints

In addition to the way anticipated inflation interacts with the tax code to alter real investment decisions, rising nominal interest rates associated with anticipated inflation tend to exacerbate liquidity constraints on households. Even in a noninflationary environment, households may be liquidity constrained in the sense that they are unable to borrow against rising real incomes to alter their current spending and investment patterns.

Anticipated inflation exacerbates this constraint because it raises nominal interest rates immediately, while increases in household nominal incomes occur only gradually. Because lenders are averse to high ratios of current debt service to current income, households are not able to borrow against the anticipated increases in future income, making it more difficult for them to qualify for loans. As a result, borrowing by households for expenditures on housing and consumer durables tends to be more sensitive to nominal after-tax interest rates than to real after-tax rates. And although capital gains on housing assets are given favorable tax treatment, which tends to increase the demand for housing when inflation and nominal interest rates rise, the effect of liquidity constraints tends to dominate, so that expenditures on residential investment vary inversely with nominal interest rates.

In contrast, this type of liquidity constraint is less important for businesses. The typical business has both old and new capital stock. When expected inflation rises, the cashflow (net of debt service) on the existing capital rises as well, and offsets the low initial net cashflow on new capital investment. As a result, business borrowing tends to respond more to real interest rates than to nominal interest rates.

Estimating the costs

To estimate the costs of anticipated inflation, I have simulated its effects on the U.S. economy using a medium-scale structural econometric model. In the simulation, money growth was permanently raised by five percentage points, thus generating a permanent increase in the inflation rate of five percentage points. Nominal interest rates were allowed to rise by the amount required to keep the aggregate demand for goods and services equal to long-run potential output.

The Fisher effect suggests that nominal interest rates should rise by more than the five-percentage point increase in the anticipated rate of inflation to compensate for both the increase in inflation and the increased tax liability associated with the higher nominal interest payments. However, as discussed above, the use of historical cost depreciation in an inflationary environment increases the effective tax rate on business profits and, therefore, raises the real cost of capital for business. This tends to reduce business borrowing, thereby reducing the upward pressure on nominal interest rates. Similarly, the inflation-related increase in liquidity constraints on households tends to depress household borrowing, which further limits the rise in nominal interest rates.

The simulation shows that these two influences more than offset the Fisher effect; nominal interest rates in the economy rise by only seven tenths of a percentage point for each one percentage point increase in the steady-state rate of inflation. This estimate is similar in magnitude to other estimates that have been obtained using alternative approaches.

Consequently, this simulation suggests that a rise in expected inflation reduces real after-tax interest rates. This means that when expected inflation rises, sectors that tend to respond to real interest rates will gain relative to those that respond to nominal interest rates.

The accompanying table shows the changes in resource allocation caused by a five-percentage point increase in anticipated inflation. Some of the largest impacts are on household investment in consumer durables and residential structures. Because of liquidity constraints, households respond more strongly to changes in nominal interest rates than to changes in real interest rates. Thus, although real interest rates fall in the simulation, higher nominal interest rates reduce household investment in durables by 10 percent and residential investment by 7.5 percent.

Because of the increased costs of investing in consumer durables and housing, households increase their expenditures on nondurables and services by 1.5 percent.

Estimated Effects of 5 Percent Anticipated Inflation

	Percent Change in Sector	Percent Contribution to Real GNP
Consumption		
Durables	−10.0	−1.0
Nondurables and Services	1.5	1.0
Residential Investment	−7.5	−0.4
Nonresidential Investment	−1.0	−0.1
Inventory Investment	0.0	0.0
Government Spending	0.0	0.0
Net Exports	30.5	0.5
		Sum 0.0

Business investment

As previously discussed, the business sector of the economy is not liquidity constrained the way households are. Business investment therefore responds primarily to changes in real after-tax interest rates, rather than to changes in nominal interest rates. The decline in real after-tax interest rates associated with the five-percentage point increase in anticipated inflation tends to stimulate business investment in plant and equipment.

At the same time, however, the higher inflation also increases the effective rate of taxation on business investment, an effect which tends to work in the opposite direction. As it turns out, the latter effect dominates slightly, and nonresidential fixed investment drops by one percent.

Similar tax and real interest rate effects may be present for inventory investment. But like other studies that have investigated this issue, this study did not find a statistically significant relationship between inventory investment and the after-tax cost of capital. Therefore, the impact of inflation on inventory investment is estimated to be nil.

National saving and investment

Although investment spending by households and businesses declines as a result of anticipated inflation, net investment in foreign assets rises. This occurs because the decline in U.S. real interest rates makes investing abroad more attractive. These larger capital outflows act to depreciate the dollar and raise net exports. Net exports are estimated to rise by 0.5 percent of GNP.

The increase in net investment in foreign assets is not enough to offset the decline in investment in domestic assets, however. As a result, the overall rate of saving and investment in the economy falls. As noted above, because consumption becomes relatively less expensive than investment in durables and housing, household spending on nondurables and services rises by 1.5 percent. As a result, national saving (including the saving implied by households' investment in consumer durables) falls by an equal amount. This reduction in saving amounts to one percent of GNP.

The decline in saving is matched by an equal reduction in national investment. Total domestic investment falls by 1.5 percent of GNP, while net foreign investment rises by 0.5 percent of GNP, causing a net decline in national investment equal to one percent of GNP.

Significant distortions

Some of the most widely recognized costs of inflation arise when it is not anticipated. It is less well recognized, however, that even when inflation *is* anticipated, it significantly distorts economic decisions. Increases in anticipated inflation in the U.S. economy raise nominal interest rates and reduce real rates. This raises net foreign investment at the expense of domestic investment, and favors business investment over household investment, even though the effective tax rate on business investment rises. Increases in anticipated inflation also tend to reduce the economy's overall rate of saving and investment. Heightened liquidity constraints created by loan market imperfections primarily are responsible for this shift in resource use, although an increase in the effective tax rate on business investment also plays a role. As a result, the allocation of resources is less efficient than if prices were stable.

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