

Does Inflation Depress the Stock Market?

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The daily ups and downs of the stock market are sources of joy and frustration for people in all walks of life. When nightly newscasters report “The market fell 50 points today,” even the financially naive can feel twinges of concern. For although many individuals are unfamiliar with the details of stock markets, most realize that stocks represent ownership in a

firm, a piece of the American Dream. Falling stock prices are thus thought to signal lower profitability, a weaker economy, and the chance of unemployment.

From the link between stock prices and business fortunes has emerged a curious statistical finding: during the past four decades, stock prices have tended to fall on average as inflation has accelerated, and vice versa. Casual observation is suggestive. During the 1970s, when inflation accelerated rapidly, stocks languished, falling almost 50 percent in real (inflation-adjusted) terms. In contrast, equity values rose markedly in the 1980s, a period of

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disinflation. The inverse relation, which runs counter to conventional wisdom that stocks hold their real value during inflation, has been confirmed by technical, academic studies.

The tendency of stock prices to deteriorate as inflation worsens suggests that inflation might somehow make firms less profitable. There are practical reasons to believe that view. For example, parts of the tax code become more burdensome to corporations as inflation accelerates. Inflation can thus reduce a firm's real *after-tax* profitability, dragging equity values down with it. Still, the relation between stocks and inflation is a matter of debate, and some would argue that the observed link is spurious.

Whether and how inflation affects firms' profitability—and, hence, the value of stocks—have great relevance for public policy. If profitability does decline with higher inflation, investors will be less willing to provide firms with the funds needed to update aging machines and buildings. And outdated plant and equipment retard growth in the economy's capacity to produce and in the nation's living standards. As a result, policymakers might want to respond in ways that mitigate inflation's effects. For fiscal policy, that might mean altering parts of the tax code that allow inflation to harm equity values. For monetary policy, it means retaining and perhaps strengthening the resolve to contain inflation.

THE IMPACT OF INFLATION ON STOCK PRICES

How Are Stock Prices Set? When a person buys a share of stock, he or she obtains a claim on current and future profits of a firm.¹ The price paid for that profit stream determines the stock's *rate* of return—that is, the return to the owner per dollar invested. The more someone

pays for a given stream of real profits, the lower his or her real rate of return.

Stocks, of course, are not the only investment opportunity available. Indeed, financial markets are quite diverse and competitive, offering investors a variety of alternatives. And given the competitive environment, market forces will set a stock's real price so that its real rate of return coincides with those on other investments of similar risk.

Nominal Contracts: The Key to Inflation's Impact on Stocks? Does inflation fit in the foregoing explanation of stock price determination? It could. The most prominent theory focuses on firms' use of nominal contracts.² Nominal contracts are those that hold costs or prices fixed at some current-dollar level for a period of time. An example is a wage contract that fixes a worker's pay at \$8 per hour for the next two years.

To understand why nominal contracts matter, consider first a situation in which contracts are absent. Imagine a firm that produces shirts for \$8 apiece and sells them for \$10, earning profits of \$2 per shirt. The firm had been expecting zero inflation, but unexpectedly inflation rises to 5 percent. The relevant question is, "How will the unexpected inflation affect the firm's future real profits?" The answer: "It will have no effect."

With inflation now at 5 percent per year, the firm anticipates that its costs, unencumbered by contracts, will grow 5 percent per year. However, it also expects shirt prices to rise 5 percent per year, along with all other prices in the economy.³ Thus, it will cost \$8.40 to produce a shirt next year that the firm will sell for

¹This description is based on a standard theory of asset pricing. Fortune (1991) provides an extended discussion and explanations of alternative views.

²An alternative explanation based on investor irrationality has been offered by Modigliani and Cohn (1979). Their theory has been downplayed, since its basic premise runs counter to standard assumptions of rational, informed investors. Moreover, numerous empirical studies reject their hypothesis.

\$10.50. While current-dollar, or nominal, profits rise 5 percent, to \$2.10 per shirt from \$2, *real* profits remain \$2. The 5 percent increase in nominal profits just compensates the firm for the 5 percent increase in the price of everything else. The purchasing power of the firm's profits will not change even though 5 percent inflation was not expected.

A different outcome arises when nominal contracts exist. Suppose that the shirt firm signs nominal contracts that fix revenues at current levels for the next two years. In signing such contracts, firms generally account for inflation expected during the term of agreement to ensure their contracts' real values. This contract makes no provision for inflation, however, since none is forecast. Again, "How will the unexpected inflation affect the firm's real profits?" This time, the answer is, "Real profits will decline."

When inflation rises to 5 percent, the firm will expect costs to rise 5 percent next year, to \$8.40, knowing that revenues will remain at \$10. Future nominal profits thus fall 20 percent, to \$1.60 from \$2. After accounting for 5 percent inflation, real profits decline 25 percent. And once investors expect the firm to be less profitable in real terms than they did before, they will shun its stock. The stock's real price will then be bid down.

The foregoing example illustrates a general point. Real profits equal real revenues less real costs. And absent nominal contracts, both prices and costs can freely adjust to inflation, even if it is unexpected. Neither real revenues nor real costs change. Prices and costs cannot freely adjust when nominal contracts exist, however. Unforeseen inflation, which existing contracts cannot reflect, consequently alters real revenues, real costs, and real profits. In the

³Typically during a period of inflation, individual prices change by different amounts. The text abstracts from such relative price changes for simplicity's sake.

example, nominal revenues are fixed and, so, surprise inflation reduces real revenues. The result is lower real profits and a real stock price decrease.

Inflation's Impact Depends on the Types of Contracts in Force. How unforeseen inflation actually affects real profits depends on the characteristics of existing contracts. For example, since firms hold contracts that fix both revenues and costs, the net effect of unexpected inflation will turn on the relative amounts of revenues and costs held constant. Contract lengths likewise play a key role. As contract maturities lengthen, the period in which real profits can differ from anticipated levels lengthens as well.

In theory, then, unanticipated inflation could either raise or lower a firm's real stock price, depending on the characteristics of existing contracts. The same holds true for inflation's link with overall stock price measures, such as the Dow Jones average or the S&P 500: inflation's aggregate impact is simply an average of its effects on individual firms.

Some Examples of Important Nominal Contracts. Firms face an array of nominal contracts in their normal operations. Familiar examples are accounts payable and receivable, contracts to sell products and lease equipment at fixed prices, and labor and materials contracts. And while all such contracts allow inflation to affect stock prices, two types merit special attention: corporate tax rules concerning depreciation and inventory accounting, and nominal financial assets issued or owned by firms.⁴ Both

⁴Inflation interacts with the tax code to affect real tax burdens in numerous, complex ways. The tax treatment of nominal realized capital gains, the deductibility of firms' interest costs, and "bracket creep," in addition to provisions discussed above, can each play a role. This article focuses on corporate depreciation and inventory accounting rules since they are emphasized in the relevant literature. For a comprehensive theoretical overview of how inflation interacts with the tax code, see Feldstein (1980).

could, according to nominal contract theorists, provide the main link between inflation and the stock market.

Corporate Tax Rules. Taxes were omitted from the previous discussion of how stock prices are set, but only for illustrative purposes. In reality, taxes figure importantly since potential investors care about firms' real *after-tax* profits—that is, real revenues less real costs and real taxes.

The corporate tax code holds special interest because certain of its elements permit unforeseen inflation to alter real corporate tax burdens and, hence, real after-tax profits. One such provision regulates the treatment of depreciation. Tax rules allow firms to deduct the value of wear and tear on plant and equipment when figuring taxable income. The real value of that deduction makes real profits higher than they would otherwise be, since it lowers a firm's real tax liability. The amount deducted, however, is based on the *original* cost of the plant and equipment. So when surprise inflation occurs, the real value of the deduction falls unexpectedly and real tax liabilities rise unexpectedly.

Suppose that machines cost \$10,000 and tax rules allow annual depreciation deductions equaling 10 percent of cost. If no one foresees inflation, then everyone expects the annual real value of deductions to be \$1,000. Firms' real stock prices are set accordingly. But if inflation turns out to be 5 percent, the annual real values of the deduction fall unexpectedly. In the first year, for example, the real value drops to \$952.38. Firms thus experience unforeseen jumps in real tax liabilities, and real stock prices fall. The tax rule essentially represents a nominal contract between firms and the government that fixes the nominal depreciation deduction at \$1,000. And like other nominal contracts, depreciation rules allow unforeseen inflation to alter real profits.

Tax provisions concerning inventory valuation also permit inflation to change real profits.

When calculating tax liabilities, businesses may deduct from income the cost of producing the goods they sell. Firms have some choice about how to value their inventories, and the so-called first-in, first-out (FIFO) option is especially relevant. FIFO rules assume that goods leave inventory in the order that they arrive and, thus, use prices that prevailed when the items were first acquired. By relying on past prices, FIFO rules fix the nominal value of deductions, allowing unforeseen inflation to erode the real value of a firm's tax deductions.⁵

Nominal Assets Issued and Held by Firms. Unforeseen inflation can also affect real stock prices because firms both issue and hold nominal assets. Such assets are contracts between a firm and another party (an individual, another firm, the government) to make or receive periodic payments fixed in nominal terms. When a firm issues nominal assets, it commits to make periodic payments to others. When a firm holds nominal assets, other parties commit to make periodic payments to it. Examples of nominal assets issued and held by firms include conventional 30-year mortgages, commercial paper, and Treasury bills and bonds.

As with other nominal contracts, entities that issue or obtain nominal assets will account for expected inflation when setting the size of periodic payments. But once the payments are fixed in nominal terms, surprise inflation implies new expectations of real payments. Unexpectedly higher inflation, for instance, trans-

⁵Another permissible inventory valuation option, last-in, first-out (LIFO), also allows inflation to affect real tax liabilities, but to a much lesser extent than does the FIFO approach. Under LIFO, items most recently added to inventory are assumed to leave first. Unless firms substantially reduce their inventories—in a close-out sale, say—the cost of goods sold will largely reflect recent prices, and inflation will not substantially increase real tax liabilities. If large inventory reductions do occur and items acquired long ago are sold, then inflation will push up real tax liabilities as under FIFO rules.

lates into smaller real payments than previously thought. Nominal asset holders thus suffer an unexpected decline in real profits, while issuers enjoy a gain. And both the decline and the gain will be reflected in the real stock prices of affected firms.

DO NOMINAL CONTRACTS EXPLAIN THE LINK BETWEEN STOCK PRICES AND INFLATION?

Firms' use of nominal contracts implies that unforeseen inflation could affect real stock prices. But whether such contracts cause inflation to *depress* the stock market is less clear. As mentioned, surprise inflation could leave real stock prices higher, lower, or unchanged, depending on the types and mix of contracts held. And even if inflation leads to lower real stock prices, contracts might play only a small part. Inflation's negative effects might largely be offset by its positive effects. Or nominal contracts might simply be a minor aspect of a typical firm's operations. If so, then the main source of inflation's link with the stock market lies elsewhere.

To break the conceptual deadlock, researchers have provided detailed empirical findings on how surprise inflation *actually* interacts with nominal contracts. Evidence partly comes from simulation and statistical studies that reveal whether and to what extent contracts cause inflation to depress the stock market. It also comes from studies that pit the nominal contract theory against a plausible alternative. In sum, nominal contracts seem to underlie at least part of the negative relation between inflation and real stock prices.

Simulation Studies. Some attempts at mea-

suring the practical importance of contracts rely on simulation models. To develop them, researchers use standard notions of how real stock prices are set. Included are tax provisions that interact with inflation, and nominal assets issued and held by firms, since each is considered a main way by which unexpected inflation affects stock prices. Given the structures of their models, analysts assign realistic values to model parameters and simulate how surprise inflation affects stock prices.

Available studies, which reflect tax rules of the 1970s, indicate that unforeseen inflation can substantially reduce real stock prices. That is,

losses from tax rules and nominal assets held appear to easily offset gains from nominal assets issued. Marcelle Arak, for example, found that 4 percentage points of unexpected inflation lowered real stock prices by almost 17 percent.⁶ If, as she suggests, inflation exceeded expectations by 6 percentage points during the 1970s, real

stock prices would have fallen 25 percent in response. That figure represents *half* of the decade's total decline. Richard Kopcke found an even larger effect: 6 percentage points of unexpected inflation would have decreased

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⁶Arak found that inflation's interaction with the tax system reduces real stock prices by 21.6 percent. Inflation's net interaction with nominal assets held and issued raises real stock prices 4.8 percent. Overall, then, 4 percentage points of unexpected inflation reduce real stock prices by 16.8 percent. Kopcke's study, which follows in the text, found that the tax system causes real stock prices to fall 27 to 40 percent for each 4 percentage points of unexpected inflation. Inflation's net interaction with nominal assets raises prices by 5 to 10 percent. Overall, the unforeseen inflation reduces real stock prices by 22 to 30 percent.

real equity values by between 30 percent and 45 percent, or the majority of the decade's total loss.⁷ Martin Feldstein, Jerry Green, and Eytan Sheshinski provide estimates roughly in line with Arak and Kopcke. Overall, simulation studies strongly suggest that inflation's interaction with nominal contracts depresses real stock prices. Inflation's effects, moreover, appear quite powerful.

Statistical Tests of the Nominal Contracting Hypothesis. As an alternative to simulation models, some researchers have measured the importance of nominal contracts statistically using data from large samples of individual firms. These samples are representative, so the conclusions are generally applicable to the economy as a whole.

The approach involves estimating statistical models that allow unforeseen inflation and other variables to affect a firm's real stock price. The models allow each firm to react differently to surprise inflation, depending on the types of contracts held. With estimated models in hand, analysts can compute the typical response of each firm's stock price to a rise in unexpected inflation, along with the average response for the entire sample. They can also isolate the part of the overall response arising from inflation's interaction with nominal contracts. And if the nominal contracting view has validity, that fraction should be large.

Two early studies, one by Kenneth French, Richard Ruback, and G. William Schwert and another by Victor Bernard, found that nominal contracts had little to do with the inflation/stock price link. But each has empirical short-

comings that bring their conclusions into question. Examples are the way in which unexpected inflation is measured, the exclusion of several important nominal contracts, and the use of restrictive statistical frameworks. A later study, by Douglas Pearce and V. Vance Roley, overcame many of the difficulties encountered by earlier research. And in contrast to the previous studies, their more comprehensive approach revealed that about half the reaction of real stock prices to inflation is due to nominal contracts.

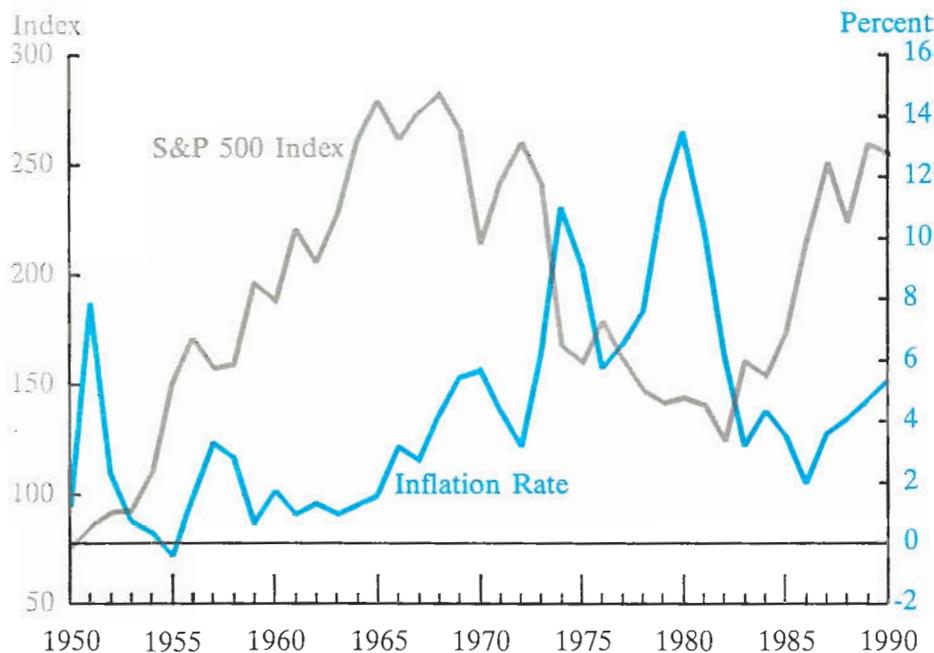
Could the Inflation/Stock Price Link Be Spurious? While the Pearce and Roley study indicates that nominal contracts play a significant role, it also suggests that additional factors might help explain the aggregate inflation/stock price link. One possibility that has received much attention is that most, if not all, of inflation's observed link with stock prices is spurious. In this view, inflation's interaction with nominal contracts has minimal importance in the aggregate. Surprise inflation appears to matter only because it often coincides with more fundamental changes that do affect real stock prices.

The economy's future prospects are especially important. Suppose, for example, that oil prices jump. People can then expect higher inflation and a weaker economy in the future than they did before. The bleaker outlooks for the economy and profits soon cause real stock prices to fall. But since inflation happened to rise unexpectedly at the same time the economic outlook worsened, people wrongly conclude that surprise inflation caused real stock prices to decline.⁸

⁷Bear in mind that inflation's interaction with nominal contracts need not explain the entire decline in real stock prices in order to validate the nominal contracting hypothesis. Other factors, such as falling productivity, can also reduce real stock prices and compound inflation's effects. The key issue is whether inflation's interaction with nominal contracts has a substantial impact on real stock prices, other things equal.

⁸The potential role of oil price shocks in explaining the inflation/stock price link is developed by Kaul and Seyhun (1990). Alternative versions of the proxy hypothesis are offered by Fama (1981) and Geske and Roll (1983). The common thread, however, is that inflation serves as a proxy for changes in expected output, whatever the source of the change.

The Negative Link Between Inflation and Real Stock Prices



The chart above plots the level of the inflation-adjusted S&P 500 against inflation as measured with the Consumer Price Index. The S&P 500, an average of 500 stock prices, is often used to track overall movements in the stock market.

The figures in the chart suggest that real stock prices and inflation have had an inverse relation for most of the 1950-90 period. During the early 1950s, for example, inflation steadily declined as real stock values rose. The inverse relation is especially noticeable since the mid-1960s. After peaking around 1965, real stock prices fell dramatically throughout the 1970s. At the same time, inflation trended higher, rising from about 3 percent to a high of 14 percent. The reverse occurred in the 1980s, as inflation fell back down to around 4 percent and real stock prices skyrocketed.

The inverse relation suggested by the chart has been documented by various researchers using different statistical methods, different indexes of inflation and stock prices, and even data from different countries. Selected relevant studies of U.S. data include Bodie (1976), Nelson (1976), Jaffe and Mandelker (1979), Fama (1981), French, Ruback, and Schwert (1983), Hasbrouck (1984), Pearce and Roley (1988), Kaul and Seyhun (1990), and McCarthy, Najand, and Seifert (1990). For evidence that the negative relation holds in other countries, see Solnik (1984).

Inflation is, of course, only one possible influence on real stock prices. Changes in other important factors, such as alterations of the tax code, can make the relation between stock prices and inflation hard to see on a simple graph like the one above.

In fact, proponents of this view argue that the clearest evidence of an inverse link occurs both in the 1970s, when inflation trended higher and real stock prices plummeted, and in the 1980s, when the opposite occurred. (See *The Negative Link Between Inflation and Real Stock Prices*.) And those periods include major shifts in crude oil prices that could give rise to the spurious inflation/stock price link outlined above. For example, OPEC increased crude oil prices fourfold between mid-1973 and early 1974, and more than doubled them during 1979. Each rise in oil prices coincided with a weaker economy and with higher inflation. Meanwhile, OPEC's drastic oil price cuts of late 1985 and early 1986 coincided with a healthy economy and falling inflation.

If this challenge to contract theory has merit, then the apparent link between inflation and real stock prices should be eliminated by accounting for oil price shocks or, more generally, for changes in expected output and profits. Several studies have tested that proposition using both aggregate and individual firm data.⁹ The evidence is mixed, and a good case that the inverse link is spurious has yet to be made. Indeed, a recent study by Steven Cochran and Robert DeFina finds that unexpected inflation has a consistently significant and negative impact on real stock prices. Moreover, inflation's

estimated impact is robust to alternative estimation techniques, variable selections, and variable measures. The Cochran-DeFina study, which covers the period 1947-89, controls for oil price shocks and changes in expected output. Thus, the inflation/stock price link does not appear to be spurious.¹⁰

CONCLUSION

Does unexpected inflation depress the stock market? It probably does, by depressing real business profits. Nominal contracts, which disallow the immediate adjustment of revenues and cost to price changes, are likely the vehicle.

Strong evidence comes from simulation studies showing that unforeseen inflation can substantially reduce equity values. Those studies are especially convincing because they explicitly rely on standard economic theory and because they include what many regard as the most important nominal contracts. In that regard, certain elements of the tax code, such as the use of historic costs in figuring depreciation deductions, appear to play a prominent role. Recent statistical findings provide further support, including evidence that surprise inflation does not simply proxy for the effects of oil price shocks or, more generally, for changes in expected future output.

⁹Relevant studies include Fama (1981), Geske and Roll (1983), Hasbrouck (1984), Bernard (1986), Coate and Vanderhoff (1986), Kaul (1987), Pearce and Roley (1988), Ely and Robinson (1989), Kaul and Seyhun (1990), McCarthy, Najand, and Siefert (1990), and Cochran and DeFina (1991).

¹⁰The idea that the link is completely spurious is also questionable because early studies that uncovered the inverse relation analyzed data that excluded the experiences of the 1970s and 1980s. Examples are Bodie (1976) and Nelson (1976).

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