

Inflation and Stock Prices

By: George R. Hoguet, CFA, FRM, Global Equities

Executive Summary

Inflation in the developed and the emerging world is rising. At the same time the 12-month-forward price/earnings ratio on the S&P 500® currently stands at a near 14-year low, reflecting in part increasing uncertainty about the future path of inflation and corporate earnings.

This article briefly examines the relationship between inflation and stock prices. We make several observations:

1. There are multiple definitions of inflation, making it difficult to measure.
2. It is useful for investors to distinguish between the absolute level of inflation, the trend of inflation, inflation uncertainty, and inflation volatility. In many cases, the acceleration of inflation is associated with rising inflation uncertainty.
3. Another useful distinction is between anticipated inflation and unanticipated inflation. Historically in the United States, both a high level of anticipated inflation (over 5% per annum) and increasing inflation uncertainty have been associated with declining price/earnings ratios.
4. Stocks appear to be an imperfect inflation hedge in the short- and medium-term, and are much better hedges in the long-term than the short-term.
5. In theory stocks should be inflation neutral, with only unanticipated inflation negatively impacting stock prices. However, for stocks to be inflation neutral, companies must be able to pass on cost increases, and future nominal free cash flows must be equal to real cash flows multiplied by the inflation rate. As well, investors must discount those cash flows at the same real interest rate used before the onset of inflation.
6. Empirically, in the US, price-earnings ratios tend to fall when inflation accelerates, a phenomenon that has puzzled finance academics. There is vast academic literature on inflation and stock prices and multiple theories as to why price-earnings ratios fall when inflation rises.
7. One approach, which might be characterized as the “behavioral approach,” focuses on investor cognitive bias, and argues that investors commit a mistake when they discount real cash flows with a nominal discount rate.
8. Another approach, which might be characterized as the “realist approach,” seeks to explain investor behavior and price-earnings multiple compression in terms of changes to real variables. These variables might include the quality of earnings, increased macroeconomic volatility caused by inflation, and long-term earnings prospects, among others.
9. Since the start of the 21st century to July 31, 2008, the S&P 500 Index has returned -0.04% per annum. Inflation expectations in the US remain reasonably well anchored - 2.3% over 3 years as forecast by the Survey of Professional Forecasters - but uncertainty as to the future path of US and global inflation is growing. The situation is particularly acute in some Asian economies.
10. An understanding of how inflation affects equity prices both in theory and in practice may assist investors in thinking about their strategic and tactical asset allocations. From a strategic standpoint, investors may wish to consider an allocation to assets that preserves purchasing power during inflationary periods. From a tactical standpoint, the rise of inflation in many countries around the world

provides additional incentive for investors to diversify by region and asset class, and to compare countries in terms of their inflation-fighting capability. Finally, should US inflation accelerate sharply and not subside, based on the experience of the 1970s, investors should not be surprised if US equity returns were modest in real terms.

Introduction

A well-known phenomenon in recent years has been the so-called “Great Moderation.” As described by Ben Bernanke in a speech given in February 2004, the Great Moderation refers to the period between 1980 and 2004, when changes in US economic activity, consumption, and inflation experienced a dramatic decrease in volatility. For example, “the variability of quarterly growth in real output (as measured by its standard deviation) has declined by half since the mid-1980s, while the variability of quarterly inflation has declined by about two thirds.”¹

A question now facing investors is whether the “Great Moderation” is coming to an end. According to the International Monetary Fund's latest World Economic Outlook Update, “headline” inflation (i.e. consumer price increases (CPI) including food and energy) in advanced economies has accelerated to 3.5% in the last 12 months and 8.6% in emerging economies during the same period. Inflation in emerging Asia has been particularly noticeable in recent months.

¹Bernanke, Ben S. “The Great Moderation,” remarks at the meetings of the Eastern Economic Association, Washington, DC, February 20, 2004.

Among the causes of rising inflation have been food, oil and other commodity price increases as well as accommodative monetary policies. For example, over the past 2 years, wheat and soybean prices have more than doubled. In a recent study of the 80 largest emerging economies, UBS found that the CPI inflation rate for food items had risen from 6% year-on-year in the middle of 2007 to around 16% year-on-year to date. They also found that non-food core inflation in the sample had increased to 6% in June 2008, up two percentage points from a year earlier. (Source: UBS Investment Research, August 2008.)

Food and energy costs make up roughly 25% of the US CPI. According to the July 2008 CPI reading, annual consumer price inflation in the US is now running at 5.6%, a 17-year high.

Empirical Relationship Between Inflation and Stock Prices

The *MIT Dictionary of Modern Economics* defines inflation as, “a sustained rise in the general price level.”² The measurement of inflation presents many difficult conceptual and practical issues. In the United States, there are several principal inflation indicators, including the consumer price index (CPI) and the core consumer price index. The US CPI is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services. Core inflation typically excludes the food and energy components, but the exact definition varies from country to country.

There are several other US inflation measures, including the Producer Price Index (PPI), the Personal Consumption Expenditure Deflator (PCE), the GDP Deflator (PGDP), and the Employment Cost Index (ECI). The existence of these multiple indicators shows the

Table 1: Recent Asian Inflation (CPI Year-Over-Year)

	Inflation Rates	Date
China	6.3%	July 08
India	7.7%	June 08
Indonesia	11.9%	July 08
Malaysia	7.7%	June 08
Pakistan	24.3%	July 08
Philippines	12.2%	July 08
South Korea	5.9%	July 08
Sri Lanka	26.6%	July 08
Taiwan	5.9%	July 08
Thailand	9.2%	July 08

Source: Bloomberg, August 2008

Table 2: US Average Annual Inflation Rate (CPI)

1950s	2.2%
1960s	2.5%
1970s	7.4%
1980s	5.1%
1990s	2.9%
2000s	2.7%

Source: Bloomberg, June 2008

complexity of measuring inflation accurately.

Proper measurement of inflation is very important both as a political and economic matter. Many contracts in the economy - for example - Social Security benefits, contain automatic inflation adjustments. The complexity of the measurement of inflation is perhaps highlighted by the work of the Boskin Commission, which concluded in 1996 in its final report, titled “Toward a More Accurate Measure of the Cost of Living,” that the CPI overstated inflation by about 1.3 percentage points per year prior to 1996.

While it is generally thought that, given the volatility of food and energy prices, core CPI is a better indicator of underlying inflation trends, some central banks, for example, those of Israel, Canada and

Sweden, actually target headline inflation. In any event, future retirees must purchase food and energy in retirement. Recall that a 5% annual inflation rate implies a doubling of consumer prices in roughly 14 years. Investors, and particularly retirees on fixed pensions, cannot be indifferent to movements in headline inflation.

Table 2 highlights average annual inflation in the US by decade as measured by the CPI. Note in particular the declining trend in inflation since the 1970s.

The 1970s were a period of accelerating inflation and poor equity returns in the US. By December 1980, the federal funds rate stood at 20%, and the ten-year Treasury peaked at 15.3% in September 1981. From December 31, 1968 to December 31, 1981, the S&P 500 returned 1.28 % per annum in nominal terms and -6% in real returns. Put another way, a dollar invested in the US stock market at the end of 1968 twelve years later was worth roughly 45 cents in real terms.

By contrast, following the change in monetary policy implemented by Paul

²Pearce, David W. *The MIT Dictionary of Modern Economics*, 4th Edition (MIT Press, 1992) p. 205.

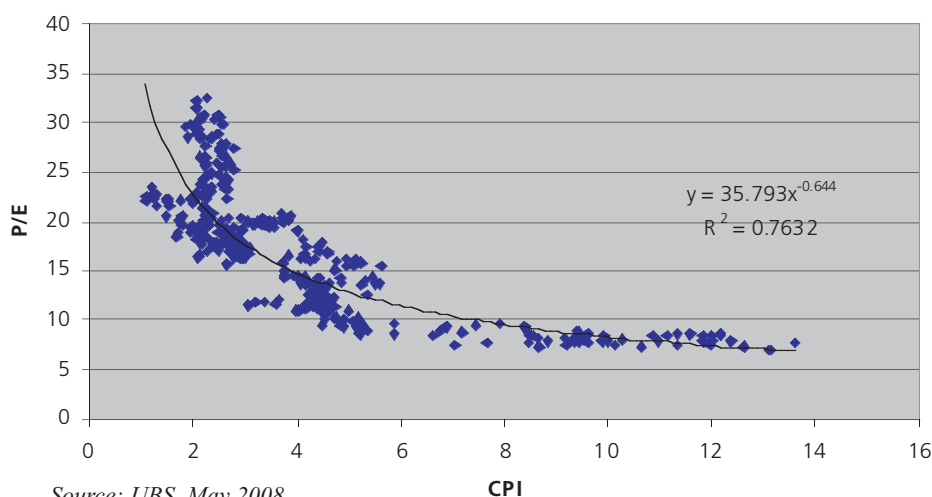
Volcker, from December 31, 1981 to December 31, 2000, when measured inflation fell from 8.4% in 1982 to 3.4 % in 2000, the S&P 500 returned 16.9% per annum.

In the US, there is substantial empirical evidence that high inflation is associated with a high equity risk premium and declining stock prices. Bodie (1976) found from 1953-1972 that common stocks were poor hedges against inflation. Cohn and Lessard (1980) also found that stock prices in many industrial countries are negatively related to nominal interest rates and inflation.

It is important to make the distinction between properly anticipated inflation, and unanticipated inflation. If inflation is correctly anticipated and if companies can in fact pass on costs of doing business, then nominal cash flows should be unaffected by a general increase in prices. However, as inflation rises, it tends to become more uncertain and a component of price increases may not be properly anticipated by firms. Blanchard (1993) found that “an unexpected increase in inflation in year 0 leads to a sharp decrease in stock prices in that year.”³

Other useful distinctions for investors to make are between the absolute level of inflation, the trend of inflation, inflation uncertainty, and inflation volatility (variability around trend.) Both the absolute level of inflation and *the rate of change in inflation* affect price earnings multiples and by extension, equity returns. Blanchard (1993) further states, “A high (equity) premium in the 1970s is

Exhibit 1: US P/E Ratios and Inflation 1978-2008



Source: UBS, May 2008

associated with a sharp increase in inflation, while a low premium is associated with a sharp decline in inflation.”⁴ Ritter and Warr (2002) found that, “Future real (equity) returns ...are negatively related to expected inflation.”⁵ From 1978-1997, they found that “A 100 basis point increase in expected inflation is associated with expected real returns being 242 basis points lower over the next year.”⁶

Fama and Schwert (1977), analyzing the period 1953-1971, noted that common stock returns were negatively related to the expected component of the inflation rate, and probably also to the unexpected component. They claimed, “We can reject the hypothesis that common stocks are a hedge against the expected monthly inflation rate.”⁷

Exhibit 1 shows that as the level of inflation rises price earnings multiples in the US tend to fall.

³ Olivier J. Blanchard, “Movements in the Equity Premium,” *Brookings Papers on Economic Activity*, 1993:2, p.112.

⁴ Olivier J. Blanchard, “Movements in the Equity Premium,” *Brookings Papers on Economic Activity*, 1993:2, p.76.

⁵ J.R. Ritter, and R.S. Warr, “The Decline of Inflation and the Bull Market of 1982-1999,” *Journal of Financial and Quantitative Analysis*, 37(1), 2002, p.30.

⁶ J.R. Ritter, and R.S. Warr, “The Decline of Inflation and the Bull Market of 1982-1999,” *Journal of Financial and Quantitative Analysis*, 37(1), 2002, p.51.

⁷ Eugene F. Fama, and G. William Schwert, “Asset Returns and Inflation,” *Journal of Financial Economics*, November 1977, p.129.

Exhibit 2 clearly shows that after the first oil shock in 1973 US P/E ratios fell.

Exhibit 3 shows that price earnings ratios in the US tend to be highest when inflation is below 4%. Prospects of deflation, such as Japan experienced in the 1990s, also appear to depress P/E ratios. This phenomenon highlights the role of inflation uncertainty.

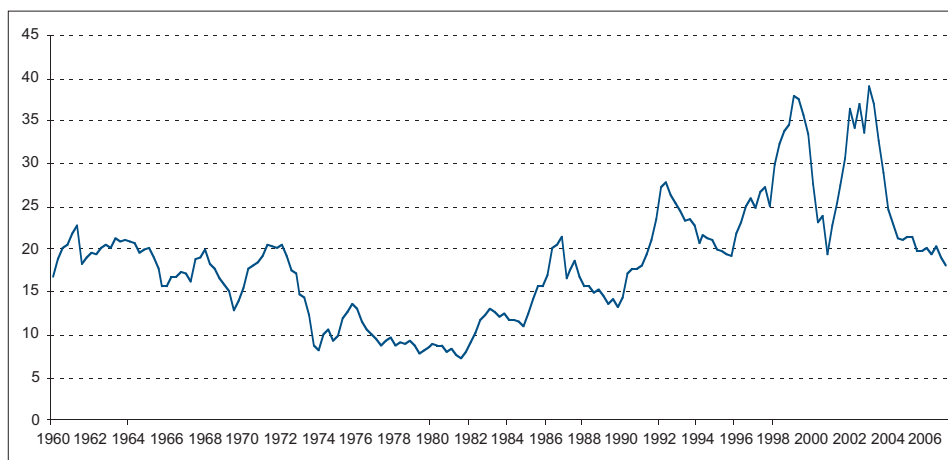
Why Does Inflation Negatively Impact Stock Prices?

In theory stocks should be inflation neutral, and rising inflation should have no impact on stock valuations. This belief is based on two core assumptions as outlined in Giammarino (1999): 1) that companies can pass on one-for-one costs; and 2) that the real interest rate that investors use to discount real cash flows does not rise when inflation rises. It also assumes that inflation has no long-term negative impact on growth. Appendix 1 provides an example of the ability of companies to pass on costs.

In practice, however, as inflation accelerates P/E ratios tend to fall. In the short-term, rising inflation has a negative impact on stock prices. Even in the medium-term stocks appear to be an imperfect inflation hedge as seen from the US experience in the 1970s. But, based on stock indices in six industrial markets, Anari and Kolari (2001) concluded that “stock prices have a long memory from inflation shocks, such that investors should expect stocks to be a good inflation hedge over a long time period.”⁸

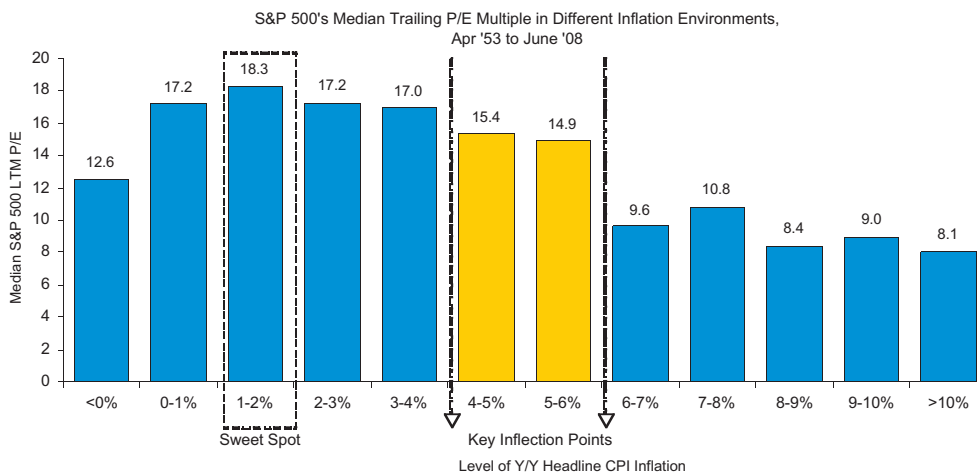
There are several theories as to why inflation negatively impacts equity prices and the precise dynamic remains a matter of considerable debate. A building block for the analysis is the Fisher effect. As Irving Fisher (1930) noted, nominal interest rates may be decomposed into an expected real rate

Exhibit 2: S&P 500 12 month Trailing P/E Ratio



Source: FactSet, December 2007

Exhibit 3: Average S&P 500 P/E Ratios across Inflation Regimes



Source: Morgan Stanley, July 2008

and an expected inflation component. Fisher argued that the expected real return was determined by real factors, and is unrelated to expected inflation. But, Sharpe (1999) argued that rising inflation is accompanied by both 1) lower expected earnings growth and 2) higher required real returns: “A one percentage point increase in expected inflation is estimated to raise required real returns about one percentage point, which amounts to about a 20% decrease in stock prices.”⁹

Writing in 1977, Fama and Schwert argued, “The reliable negative relationship between expected stock returns and

the ex ante interest rate (which we interpret as a proxy for expected inflation rate) remains an economic enigma, but we cannot as yet reliably conclude that it is evidence of a market inefficiency.”¹⁰

⁸ Ali Anari and James W. Kolari “Stock Prices and Inflation,” *Journal of Financial Research*, Vol. XXIV, No. 4, Winter 2001, p. 589.

⁹ Steven A. Sharpe, “Stock Prices, Expected Returns, and Inflation,” *Finance and Economics Discussion Series* 1999-02, 1999, p.1.

¹⁰ Eugene F. Fama and G. William Schwert, “Asset Returns and Inflation,” *Journal of Financial Economics*, November 1977, p.139.

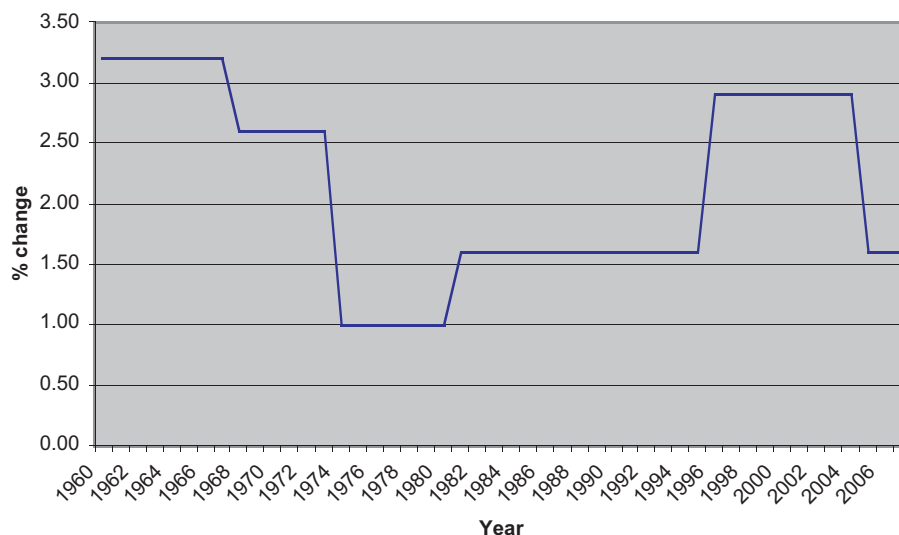
Two major schools of thought have emerged as to why price-earnings ratios fall when inflation accelerates. One, which might be classified as the “behavioral” school, argues that investors make a cognitive mistake and improperly discount real cash flows using a nominal discount rate. Meanwhile, the “rationalist” school focuses on the distortions that a high level of inflation creates for reported profits; it also argues that inflation may affect several of the parameters, such as the risk premium, used to value securities in standard valuation models, such as the Gordon Growth Model (see Appendix 1.) We examine a number of hypotheses as to why P/E ratios tend to fall when inflation rises.

The Inflation Illusion Hypothesis

In a landmark paper, “Inflation, Rational Valuation and the Market,” Cohn and Modigliani (1979) argued that investors fundamentally undervalued stocks in the 1970s because of two important cognitive errors: 1) they use nominal interest rates to discount real cash flows; and 2) they do not take into account the capital gain that accrues to equity holders of firms with fixed rate debt liabilities. The authors maintain that, “One should capitalize the current level of adjusted profits at the very same real rate that prevailed before the inflation, even though the nominal interest rate will have increased.”¹¹

This critique is reminiscent of the critique of the so-called “Fed Model.” This model (which was never endorsed by the Fed) purports to compare the relative attractiveness of stocks to bonds by comparing earnings yields on stocks or E/P with ten year bond yields. As Asness (2003) argues, the “Fed Model” compares a real quantum, forward Earnings/Price ratios (E/P) to a nominal quantum, i.e. ten year bond yields. In other words, stocks are claims on real assets of a corporation; these assets

Exhibit 4: US Non-Farm Business Labor Output per Hour (% Change Year-Over-Year)



Source: FactSet, December 2007

can appreciate with inflation, as can earnings. A bond return is unambiguously a nominal return.

A more robust formulation, per Asness, would be to compare stocks and bonds via a modified formula, i.e. E/P (Earnings/Price) - R (real bond yield) - RP (a risk premium for stocks over bonds). (Asness also suggests a volatility term.) Wilcox (2007) further refines the concept by advancing the notion of the “Adjusted Earnings Yield.” In this analysis, *current* earnings are adjusted for inflation-induced accounting distortions.

Ritter and Warr (2002) also find evidence that investors mis-value levered firms during inflationary times. Campbell and Vuolteenaho (2004) also argue that inflation is highly correlated with stock market mispricing, and that investors fail to adjust their expectations for earnings growth during periods of rising inflation.

Lansing (2004) suggests that the apparent failure of investors to discount expected cash flows using a real yield instead of a nominal yield constitutes a behavioral anomaly, similar to other

behavioral anomalies recently commented on by finance academics.

The Proxy Hypothesis

This view, more fully put forward by Fama (1981), argues that the relationship between high rates of inflation and future real economic growth rates is negative. By contrast, there is a positive relationship between stock returns and anticipated growth rates of real economic activity. As inflation accelerates, investors anticipate slower and more volatile economic growth and require a higher risk premium. Investor expectations of more volatile macro-economic performance help to shape their perceptions of long term earnings growth. Sharpe (1999) argues that market expectations of real earnings growth, particularly in the long term, are negatively related to expected inflation. One reason may be a decline in productivity.

Productivity is a key to a rising standard of living and corporate profitability. Exhibit 4 shows that productivity fell sharply as inflation rose in the US in the 1970s.

¹¹ F. Modigliani and R.A. Cohn “Inflation, Rational Valuation and the Market,” *Financial Analysts Journal* 35, 1979, p.28.

In any event, since 1980, certainly a reduction of inflation in the US has been associated with less macroeconomic volatility.

The Risk Premium Increase Hypothesis

Under this hypothesis, the risk premium on stocks increases during periods of high inflation. Periods of high inflation are frequently accompanied by distortions to earnings. In theory, companies should be able to pass on higher price increases; in practice there may be significant time lags in the pass through or the pass through may not be complete. Companies need to correctly anticipate changes in the price level and consumers may not be willing to pay the markup.

Inflation also can distort economic activity. For example, in the 1970s as individual investors were pushed into higher tax brackets through nominal wage increases, tax shelters proliferated. Moreover, inflation can provoke a sub-optimal policy that can distort the pricing mechanism. For example, in 1971 the US imposed wage/price controls for a period of 3 years.

Importantly, rising inflation is frequently associated with rising volatility of inflation. Devruex and Yetman (2002) found, "Profit maximizing firms respond to higher trend inflation by increasing the average frequency with which they set prices. As a result, inflation volatility is increasing in trend inflation, since price shocks are transmitted more rapidly when a higher portion of firms update their prices each period."¹²

The Inflationary Distortions to Reported Profits Hypothesis

High and persistent inflation has a multiple impact on reported profits. On the one hand, profits may be overstated because of the inadequate depreciation

expense. Inventory gains may also help to overstate profits. On the other hand, profits are understated to the extent that inflation reduces the real burden to companies with fixed-rate liabilities.

At a minimum, inflation renders more complicated the analysis of financial statements, as it becomes harder for analysts to disentangle nominal versus real profits. In the US, the situation became so acute in the 1970s that, from 1976 to 1978, the SEC encouraged companies to report on the estimated current replacement costs of inventories and gross property, plant and equipment.

Feldstein (1980) argues that higher inflation in the US led to a higher effective tax rate on corporate income caused by historic cost depreciation. "As a result, real profits net of the corporate income tax vary inversely with inflation."¹³

In addition, he argued that taxable investors required that they pay less for shares when inflation was high because, via bracket creep and other mechanisms, investors' effective capital gains rate rose, while their after tax returns fell.

The Decline in Profitability Hypothesis

Writing in *Fortune* magazine in 1977, Warren Buffett argued that return on equity of US corporations had not increased despite an inflation rate of 7%. The result was that real returns fell. Buffett assumed a constant return of 12% on equity and gave the following example for a company purchased at book value:

Company A

Book Value (BV), time zero: \$100
Price: (P) = BV = \$100
Return on Equity (ROE): 12%
Earnings (E): \$12
Payout ratio (PAY): 50%

Dividend (D): \$6
Dividend Yield (Y): 6%
Growth rate g: (1-payout ratio)*
ROE: 6%
Book Value at time t+1: 106

Assume an investor acquires the company for book value and inflation is zero. His total real return at the end of year one is 12% or in more familiar Gordon growth model terms:

$$D/P + g = 12\%$$

Now assume inflation is running at 6%. With no change in ROE, the \$6.00 of retained earnings finances a 6% nominal increase in productive capacity (such as plant and equipment), but zero real increase. To safeguard their real returns, investors in the 1970s were only willing to hold stocks at below book value.

Over the past 5 decades, thanks to swings in the business cycle, ROE of the S&P 500 has been very volatile. But it has averaged roughly 14% over the past 38 years. (Source: S&P via FactSet.)

Conclusion

An understanding of how inflation both in theory and in practice impacts equity prices may assist investors in thinking about their strategic and tactical asset allocations. From a strategic standpoint, investors may wish to consider an allocation to assets that preserves purchasing power during inflationary periods. From a tactical standpoint, the rise of inflation in many countries around the world provides additional incentive for investors to diversify by region and asset class. In particular investors need to make an assessment of the long-term institutional independence and

¹² Michael B. Devreux and James Yetman, "Menu Costs and the Long-run Output-inflation Trade-off," *Economics Letters*, Elsevier, vol. 76(1), June 2002, p.4.

¹³ Martin Feldstein, "Inflation and the Stock Market," *The American Economic Review*, Vol. 70, No. 5, Dec., 1980, p.841.

credibility of the central banks operating in the countries in which the investor invests. Moreover, should US inflation accelerate sharply and not subside, based on the experience of 1970s, investors should not be surprised if US equity returns were modest in real terms.

In his book *Stocks for the Long Run* (1994), Wharton Professor Jeremy Siegel reminds investors that, “On a year-on-year basis, inflation reached 26.5% in Britain in 1975, 26.2% in Japan in 1975, and 12.2% in the United States in 1974.”¹⁴ To the modern investor, these figures seem incredible – even imaginary. But, time and again, capital markets are full of surprises. For example, few observers ever would have thought that AAA securities would sell at 42 cents on the dollar.

Furthermore, in their book, *Inflation Targeting: Lessons from the International Experience* (1999) Ben Bernanke and his co-authors observed: “Expansionary monetary policies have long been seen as a quick fix for the economy, because they create more output and more jobs in the short run. However, both experience and extensive research show that expansionary policies cannot sustain such increases for long.”¹⁵

At the moment, in a somewhat anomalous situation, commodity prices remain well bid despite slowing global activity. A key question facing investors is whether the current oil price shock will be accompanied by a decline in corporate profit margins, slowing productivity, and the onset of a more general inflationary process. Inflation targeting is a relatively new phenomenon and the credibility of central banks around the world varies.

Absent a dislocation, such as a pre-emptive strike on Iran that likely could send oil prices to \$200 a barrel, the chances of a sharp rise in core inflation in the US are very low. We believe that pre-emptive policies by the Federal Reserve, growing unemployment, the weakness of labor unions, and the growth of world trade and the internet all will restrain inflationary expectations.

In parts of emerging Asia, however, where real interest rates are negative in some countries, and where exchange rates do not reflect equilibrium values, the dynamic is less clear. As Murilo Portugal (2007), Deputy Managing Director of the IMF observed in a speech on inflation-targeting roughly a year ago, the minimum requirements for successful inflation targeting appear to be: 1) Central Bank autonomy, accountability, and government support, particularly via fiscal discipline; 2) Effective instruments for influencing domestic spending, and a stable financial system; 3) Adequate economic and financial data, and a reasonable understanding of how monetary policy affects inflation.

Rising inflation complicates the already difficult task of valuing risky cash flows and can produce substantial mispricings. Thomas and Zhang (2008), for example, point out that there is disagreement among finance academics whether in the US increasing inflation is associated with rising or falling real earnings per share growth.

Empirically, rising inflation appears to be associated with falling P/E ratios. Stocks appear to be imperfect inflation hedges in the short and even intermediate term. However, in the long term they appear to provide one means of hedging inflation.

Currently the 12-month-forward P/E ratio on the S&P 500 stands at a 14 year low. Even if one excludes financials (where earnings expectations are modest), and energy stocks, where forward multiples impound expectations of lower oil prices, the current 12-month-forward price/earnings ratio stands at 16, well below the average forward P/E of the past 10 years. Possible causes of this phenomenon may include rising uncertainty as to the path of the US economy and earnings in 2009, fears of a pronounced global slowdown, and rising inflation.

Once inflation expectations become embedded in an economy, the process of disinflation can be extremely painful. For example, in 1982 unemployment in the US hit 10.8% following a very sharp monetary tightening. Inflation dynamics vary by country and region; an understanding of how inflation impacts equity prices may assist investors in their asset allocation decisions.

¹⁴ Jeremy J. Siegel, *Stocks for the Long Run: A Guide to Selecting Markets for Long-Term Growth* (Richard D. Irwin Inc. 1994), p. 152-153.

¹⁵ Ben S. Bernanke, *Inflation Targeting: Lessons from the International Experience* (New Jersey: Princeton University Press 1999), p. 311.

Appendix 1: Example of Ability of Companies to Pass Through Inflation Cost

Scenario 1: Zero Inflation

Company A

Balance Sheet

Inventories	\$10,000,000
Equity Capital (\$10 par value)	\$10,000,000

Income Statement

Sales	\$20,000,000
Cost of Goods Sold	\$10,000,000
Other Expenses	<u>\$8,000,000</u>
Net Income	\$2,000,000
Nominal earnings per share (E)	\$2
Real earnings per share	\$2
Dividends per share (D1)	\$2

Other Data

Real growth rate (g)	0%
Nominal growth rate (G)	0%
Inflation rate (i)	0%
Required rate of return (r)	6%
Return on equity (R)	20%
Payout ratio (K)	100%

We value Company A using a standard dividend discount model:

$$\text{Price of the stock } P = \frac{D_1}{r - g} = \frac{KE}{r - R(1 - K)} = 33.33$$

Summary Data for Company A:

Return on Equity (R)	20%
Payout ratio (K)	100%
Plowback ratio (1-K)	0%
P/E ratio (P/E)	16.67
Dividend yield (D/P)	6.0%
Required returns (r)	6.0%
Price/Book ratio (P/B)	3.33

Scenario 2: 10% Inflation

Company A with 10% inflation

Balance Sheet

Inventories	\$10,000,000
Equity Capital (\$10 par value)	\$10,000,000

Income Statement

Sales	\$22,000,000
Cost of Goods Sold	\$10,000,000
(Historic cost. Replacement cost = \$11,000,000)	
Other Expenses	<u>\$8,800,000</u>
Net Income	\$3,200,000
Nominal earnings per share (E)	\$3.2
Real earnings per share	\$3.2
Dividends per share (D)	\$3.2

Other Data

Real growth rate (g)	0%
Nominal growth rate (G)	10%
Inflation rate (i)	10%
Required rate of return (r)	16.60%
Return on equity (R)	32%
Payout ratio (K)	68.75%

We value Company A using a standard dividend discount model:

$$\text{Price of the stock } P = \frac{D_1}{r - g} = \frac{KE}{r - R(1 - K)} = 33.33$$

Summary Data for Company A:

Return on Equity (R)	32%
Payout ratio (K)	69%
Plowback ratio (1-K)	31%
P/E ratio (P/E)	10.42
Dividend yield (D/P)	9.6%
Required returns (r)	17.0%
Price/Book ratio (P/B)	3.33

Note that the stock price remains the same but the P/E ratio falls. In effect all real terms have been adjusted for inflation, that is multiplied by (1+inflation rate). With perfect flow through, the stock price does not fall.

However, frequently companies are unable to pass through costs. Moreover, inflation may impact several terms in the Gordon growth model. For example, in the formula below, E1 may fall; Rf may rise; RP may rise; and g may fall.

Breakdown of Gordon Growth Model

$$P_0 = \frac{D_1}{R - g} = \frac{E_1 \cdot PAY}{R_f + i + RP - g} = \frac{E_1 \cdot PAY}{R_f + i + RP - ROE(1 - PAY)}$$

- D1 dividend expected for year 1
- PAY payout ratio
- R cost of equity
- ROE return of equity
- Rf long-term real risk-free rate
- i expected inflation
- RP long-term risk premium demanded by investors to hold equities
- g company growth rate

September 8, 2008

This material is for your private information. The views expressed are the views of George Hogue only through the period ended August 21, 2008 and are subject to change based on market and other conditions. The opinions expressed may differ from those with different investment philosophies. The information we provide does not constitute investment advice and it should not be relied on as such. It should not be considered a solicitation to buy or an offer to sell a security. It does not take into account any investor's particular investment objectives, strategies, tax status or investment horizon. We encourage you to consult your tax or financial advisor. All material has been obtained from sources believed to be reliable, but its accuracy is not guaranteed. There is no representation or warranty as to the current accuracy of, nor liability for, decisions based on such information. Past performance is no guarantee of future results.

SSGA may have or may seek investment management or other business relationships with companies discussed in this material or affiliates of those companies, such as their officers, directors and pension plans.

Standard & Poor's S&P 500® Index is a registered trademark of Standard & Poor's, a division of The McGraw-Hill Companies, Inc.

Bibliography

- Anari, Ali and Kolari, James W. and "Stock Prices and Inflation", *Journal of Financial Research*, Vol. XXIV, No. 4, Winter 2001.
- Asness, Clifford. "Stocks versus Bonds: Explaining the Equity Risk Premium", *Financial Analysts Journal*, March/April 2000.
- Asness, Clifford. "Fight the Fed Model: The Relationship between Stock Market Yields, Bond Market Yields, and Future Returns", *Journal of Portfolio Management*, 30, 2003.
- Baume, Bernard. *The Secrets of Economic Indicators*. New Jersey: Wharton School Publishing, 2005.
- Bernanke, Ben S. "The Great Moderation", remarks at the meetings of the Eastern Economic Association, Washington, DC, February 20, 2004
- Bernanke, Ben S. *Inflation Targeting: Lessons from the International Experience*. New Jersey: Princeton University Press, 1999.
- Blanchard, Olivier J. "Movements in the Equity Premium", *Brookings papers on Economic Activity*, 1993:2.
- Bodie, Zvi. "Common Stocks as a Hedge against Inflation", *Journal of Finance*, vol. 31(2), 1976.
- Boskin, Michael J., Dullberger, Ellen R. and Gordon, Robert J. "Toward a More Accurate Measure of the Cost of Living: Final Report to the Senate Finance Committee from the Advisory Committee to Study the Consumer Price Index", 1996.
- Boudoukh, Jacob and Richardson, Matthew. "Stock Returns and Inflation: A Long-Horizon Perspective", *American Economic Review* 83, 1993.
- Buffett, Warren. "How Inflation Swindles the Equity Investor", *Fortune*, May 1977.
- Campbell, J. Y., and Vuolteenaho, T. "Inflation Illusion and Stock Prices", *American Economic Review*, v94, 2004.
- Clinton, Kevin and Zelmer, Mark. *Conference Summary: Information in Financial Asset Prices*. Bank of Canada Review, Winter 1998-1999.
- Cohn, Richard A. and Lessard, Donald R. "The Effect of Inflation on Stock Prices: International Evidence", *The Journal of Finance*, Vol. 36, No. 2, 1980.
- Cohn, R.A. and Modigliani, F. "Inflation, Rational Valuation and the Market", *Financial Analysts Journal* 35, 1979.
- Devereux, Michael B. and Yetman, James. "Menu Costs and the Long-run Output-Inflation Trade-off", *Economics Letters*, Elsevier, vol. 76(1), June 2002.
- Fama, Eugene F. "Stock Returns, Real Activity, Inflation, and Money", *The American Economic Review*, September, vol. 71(4), 1981.
- Fama, Eugene F and Schwert, G. William. "Asset Returns and Inflation", *Journal of Financial Economics*, November 1977.
- Feldstein, Martin. "Inflation and the Stock Market", *The American Economic Review*, Vol. 70, No. 5, Dec., 1980.
- Fisher, Irving. *The Theory of Interest*. New York: The Macmillan Company, 1930. International Monetary Fund, World Economic Outlook Update, July 2008.
- Giammarino, Ronald in Cohn, Richard A. and Lessard, Donald R. "The Effect of Inflation on Stock Prices: International Evidence", *The Journal of Finance*, Vol. 36, No. 2, 1980.
- Lansing, Kevin J. "Inflation-induced Valuation Errors in the Stock Market", *FRBSF Economic letter*, Number 2004-30, October 29, 2004.
- Pearce, David W. *The MIT Dictionary of Modern Economics*, 4th Edition. MIT Press, 1992.
- Portugal, Murilo "Perspectives and Lesson from Country Experiences with Inflation Targeting - Remarks at a Panel on Inflation Targeting", Washington, DC, May 17, 2007
- Ritter, J.R., and Warr, R.S. "The Decline of Inflation and the Bull Market of 1982-1999", *Journal of Financial and Quantitative Analysis*, 37(1), 2002.
- Schwert, William G. "The Adjustment of Stock Prices to Information about Inflation", *The Journal of Finance*, Vol. 36, no. 1, Mar., 1981.
- Sharpe, Steven A. "Stock Prices, Expected Returns, and Inflation", *Finance and Economics Discussion Series* 1999-02, 1999.

Siegel, Jeremy J. *Stocks for the Long Run: a Guide to Selecting Markets for Long-term Growth*. Richard D. Irwin Inc., 1994.

Thomas, Jacob and Zhang, Frank. "Don't Fight the Fed Model", Yale University Working Paper, 2008.

Treynor, Jack L. *Treynor on Institutional Investing*. New Jersey: John Wiley & Sons, Inc., 2008.

UBS Investment Research, Emerging Economic Perspectives, "Inflation ... And So What?" 12 August 2008.

UBS Investment Research, Weekly Wight Watcher, "Managing Inflation Risk", 9 May 2008.

UBS Investment Research, Q-Series: GEM Strategy, "What Will Inflation Mean for GEM?" 27 May 2008.

Wilcox, Stephen. "The Adjusted Earnings Yield", *Financial Analysts Journal*, Vol. 63, No. 5, 2007.

The author gratefully acknowledges the research assistance of Jessie Jiang, and the comments of Eric Brandhorst, Alistair Lowe, Chris Probyn, Steve McCarthy, Eldar Nigmatullin, Ritirupa Samanta and Salomon Tadesse.

© 2008 State Street Corporation – All Rights Reserved.