Can The CPI Catch Your Eye?

If you cannot add, then do not trade. Before you protest either your virtue or your arithmetic abilities in whichever order you choose, consider the difficulties posed by Fisher's Law, which states that nominal interest rates are the sum of an underlying real interest rate plus the expected rate of inflation. The problem, of course, is neither the real rate of interest nor the expected rate of inflation can be known exactly at any one time.

Some thought the advent of Treasury Inflation Protected Securities (TIPS) in 1997 solved this problem. TIPS, discussed in greater detail below, are Treasury bonds whose principal is adjusted higher by the non-seasonally adjusted all-urban consumer price index (CPI-U). The CPI-U is a Laspeyres index, which measures the price change p of a fixed basket of goods q over time, from 0 to n in the formula below, and is known to be a highly imperfect measure of inflation. It ignores such economic realities as price elasticity of demand, substitution and technological improvement. Moreover, the Bureau of Labor Statistics surveyors who collect the data are faced with the problems of handling discounting and non-price incentives.

$$P_l = \frac{\sum p_n q_0}{\sum p_0 q_0}$$

The GDP deflator, by contrast, is a Paasche index, which measures the price change p from 0 to n not over the original market basket q_0 but over the final market basket q_n.

$$P_p = \frac{\sum p_n q_n}{\sum p_0 q_n}$$

The Paasche index is more difficult to compile, and it arrives on a leisurely quarterly schedule with the first estimate of GDP. These releases are subject to substantial revision. As a result, the monthly CPI-U with all of its imperfections has become the de facto "good enough for government work" measure of inflation even though the cumulative difference between the two deflators – the GDP deflator is adjusted to the June 1947 CPI level of 22 - is considerable.


Different Inflation Measurements
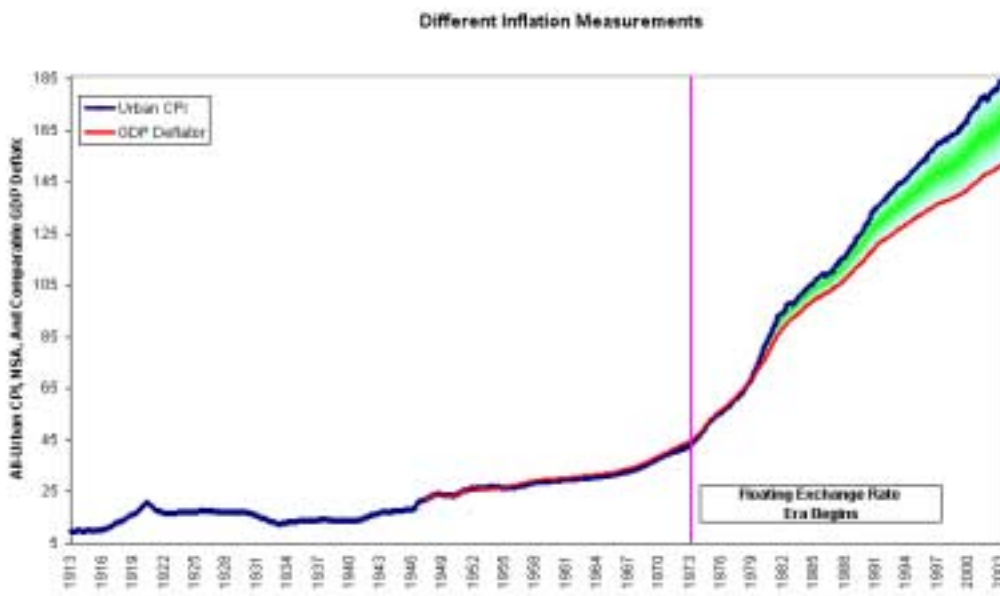
Even more important for our purposes, the CPI-U is once again the basis for a futures contract. Yes, again: The Coffee, Sugar & Cocoa Exchange, now part of the New York Board of Trade, prematurely and unsuccessfully launched a similar futures contract in 1987. The new contract, which commenced trading in February, represents

the Chicago Mercantile Exchange's first foray into a macroeconomic indicator and is designed to serve a growing derivative market on such indicators.

March Forward, Look Backward

Whether from a Laspeyres or Paasche index, the measure of inflation arrived at is a backward looking snapshot while the yield to maturity on Treasury bonds embeds a forward-looking expectation of inflation. If we simply subtract annualized CPI-U changes from the nominal yields on Treasury bonds of ten years' maturity or longer, (ten-years only since July 2000) we derive what appears to be a wildly fluctuating measure of the real rate of interest. This contravention of economic theory is nothing more than an artifact of an apples-and-oranges comparison between a term maturity instrument, the Treasury note, and a datum with no particular time dimension, the CPI-U. The suggestion that one could create a do-it-yourself TIPS by combining a regular Treasury note of any maturity with a futures contract on the CPI-U reflects an imperfect understanding of the dynamics involved for both instruments.

The Difference Is Not The Real Rate Of Interest
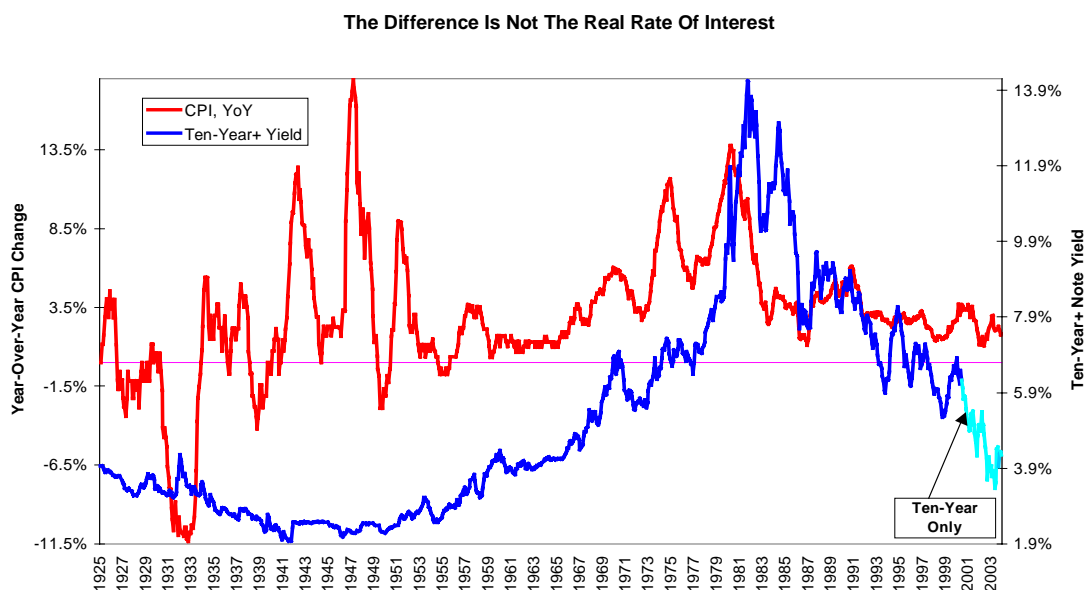
A Peek Behind The FIG

Before delving further into the nature of inflation hedges, let's recognize the work that has been done in trying to forecast inflation. The Economic Cycle Research Institute (ECRI) has developed a forward inflation gauge (FIG) containing:

1. The Journal of Commerce materials price index
2. Growth in real estate loans
3. The insured unemployment rate, treated on an inverse basis
4. The yield spread between the 10-year note and the 6-month bill, also treated on an inverse basis
5. Growth rate in civilian employment
6. Growth rate in federal and non-federal debt
7. Growth rate in non-fuel import prices, and
8. Percentage of purchasing managers reporting slower deliveries

If we are to believe that inflation is, per Milton Friedman, always and everywhere a monetary phenomenon, then the Federal Reserve's aggressive rate cutting in 2001-2003 should give us pause. Monetary largesse produced a very steep yield curve, as measured by the ratio of the forward rate between one and ten years, the rate at which you can borrow for nine years starting one year from now, to the ten-year rate itself. This forward rate ratio led the rise in the FIG by fourteen months between the time the Federal Reserve started to cut short-term interest rates and the middle of 2002. Now, as was the case previously when the Fed was in either a less-accommodating or downright hostile mood, the correlation is far less direct. Lower non-fuel import prices, chiefly from China, and gains in productivity are likely causes of this growing divergence between money and inflation.

**Yield Curve Leads Future Inflation Gauge**
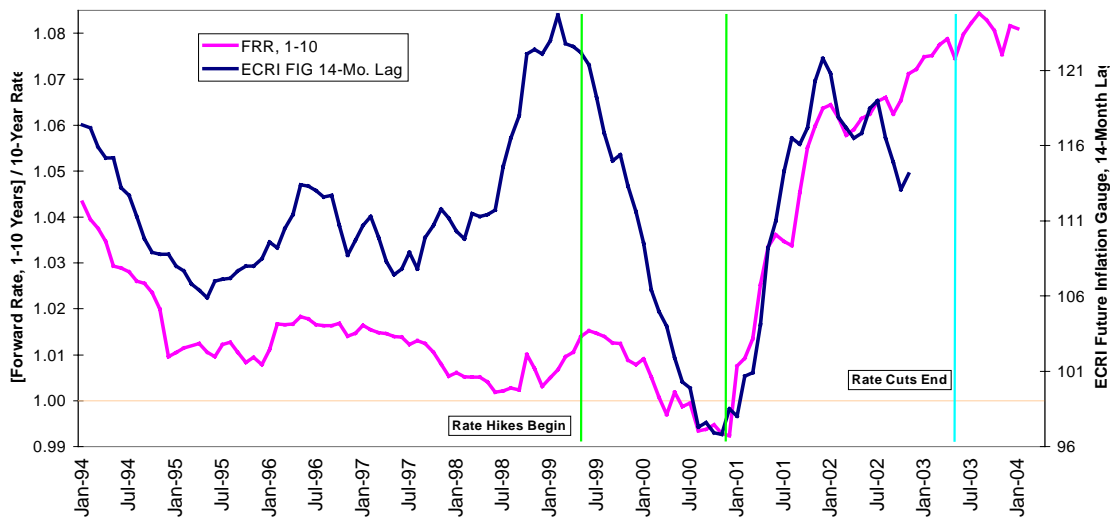
Money Talks. Shut Up And Listen

More important for traders is an understanding of this monetary phenomenon and the question of how we would go about forecasting whether the money supply, however defined, will be expanding at a rate greater than or less than the GDP. A short detour into this process is necessary.

The mechanism by which the Federal Reserve enforces a target fed funds rate, the purchase or sale of Treasury securities from member banks to lower or raise the level of free reserves in the banking system is designed to affect the economy via the expansion of bank credit. Member banks need to keep 10% of their domestic deposits on reserve, which produces a maximum equilibrium expansion of the money supply of ten times the initial deposit base. Eurodollar and other offshore banking deposits do not have a similar reserve requirement.

However, while the Fed can influence the fed funds rate and reserve levels, it cannot force banks to lend these reserves nor can it force businesses to borrow. The collapse of commercial and industrial lending as a percentage of GDP during 2001-2003 (see "One Good Turn Deserves Another," December 2003) was an illustration of just how ineffectual monetary policy can be at meeting its stated objectives.

A Collapse In Bank Loan Demand
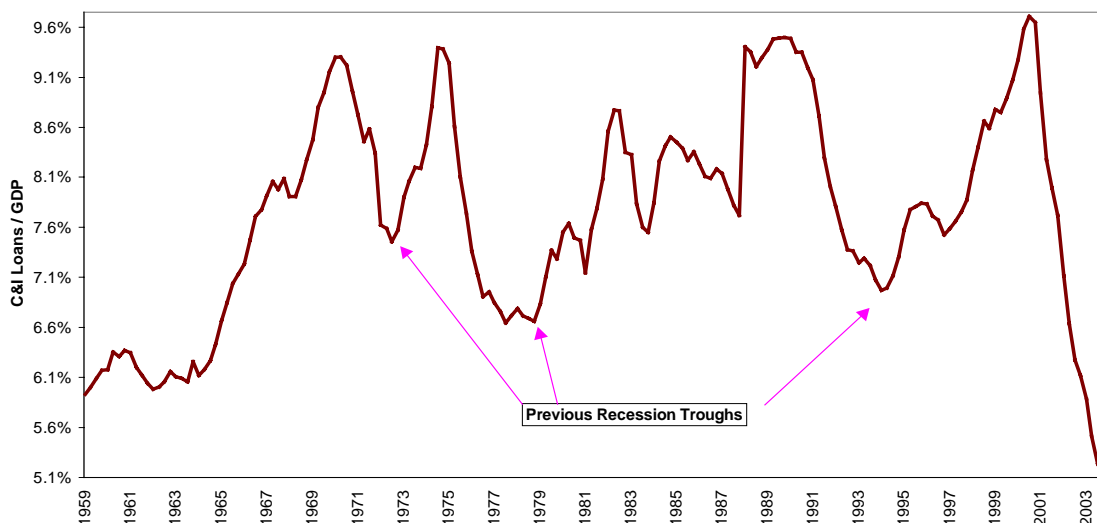
The collapse in loan demand may explain the slow or even negative growth in the monetary aggregates, depending on your choice of timeframe and aggregate, seen in late 2003, but some of this was to be expected. Lending is a lagging indicator of macroeconomic activity; business borrow either to finance expansion of existing plant and equipment or to finance the resulting inventories, and both of those activities trail the onset of an economic expansion. Moreover, the growth of the commercial paper and securitized asset markets means more businesses now bypass the banking system and its ability to expand the money supply via the fractional reserve system.

A second illustration of the failure of monetary policy to achieve its macroeconomic objectives is the decline in velocity, or the turnover of GDP to an available stock of money. This can be illustrated with two monetary aggregates, the familiar M2 (cash, checking accounts, CDs, savings accounts and retail money market mutual funds) and the St. Louis Federal Reserve's MZM, or zero-maturity money supply. This measure strips out the small time deposits, which by definition do not have zero maturity.

Dial V For Velocity
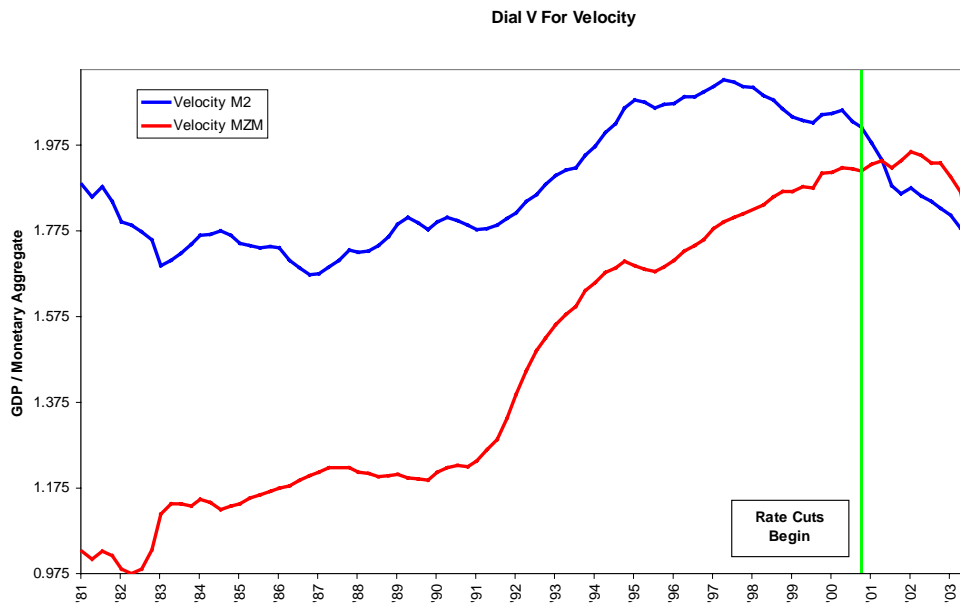
Duration And Convexity Considerations

All note and bond interest rates embed a series of forward rates and what is called a liquidity premium, or protection against the effects of inflation. The liquidity premium is responsible for the generally positive slope of the yield curve, and it counteracts the effects of convexity, the second derivative of a bond's price with respect to its yield, divided by the bond's price.

A bond with positive convexity will see its price rise faster for a given basis point decline in yield than it will fall for an increase in bond yields of the same magnitude. Callable bonds, which include many corporates, convertibles and mortgage-backeds, have negative convexity. Putable bonds have very positive convexity. In the absence of convexity effects, the normal shape of the yield curve would be slightly inverted; investors would accept a lower yield in order to obtain the more convex, longer-dated bonds.

The economic liquidity premium of a bond includes this convexity effect expressed in basis points, which restores a greater recognition of inflation than what is apparent in the yield curve itself. Nominal yield curves, what you see on a chart, do not add back the convexity effect and therefore look flatter at longer maturities than we should expect given a set of inflation expectations.

In addition, unlike common commodity spreads, bond spreads are non-linear in their behavior. The ordinal level of interest rates, the shape of the yield curve, credit issues, embedded options, and different coupons and maturities affect them. For example, the 3.00% TIPS due Jul. 15, 2012 has a modified duration, or expected percentage price change for a given change in yield, of 3.72 and a convexity of 0.16. This is much less volatile than the normal 5.00% Treasury note due Feb. 15, 2011, the cheapest-to-deliver Treasury note against the future at the time of

writing. That bond has a modified duration of 5.81 and a convexity of 0.41. As a result of the lower interest rate sensitivity of the TIPS, only 62 Ten-year note futures would be needed to hedge $1 million of the TIPS. Moreover, the duration of the TIPS will decrease more rapidly than will the duration of the normal bond as the CPI-U increases due to the inflation-linked accrual of the TIPS' principal.

A simple subtraction of the TIPS yield from the normal Treasury yield will produce a distorted picture of the real interest rate unless the effects of duration and convexity are added back into the equation. Given that future price changes in the TIPS will be linked to distant changes in the CPI-U while the CPI-U futures are based upon the current CPI-U, the construction of a do-it-yourself TIPS will be far more difficult than simply adding the future to the normal bond.

Embedded Options
While we classify Treasuries as risk-free for obvious reasons and the Treasury has not issued callable bonds for decades that does not mean Treasury bonds are truly option-free. We do not like to think in these terms, but each and every one of us is short a call option on inflation to the government, as seen in the earlier chart of the CPI-U going back to 1913.

The acceleration of inflation coincided with the creation of Special Drawing Rights, sometimes called "paper gold" by the International Monetary Fund in 1968 and the breakdown of the Smithsonian Agreement on currencies in 1973. Except there is no paper gold, just paper, and currencies floating against nothing but each other can be created in a reckless manner. The CPI-U shot higher as governments exercised their call option on their citizenry and confiscated real purchasing power through inflation. This call option is embedded in all Treasury bonds and therefore by extension in all financial instruments.

A second option exists in the measurement of the CPI-U itself, irrespective of whether it is a Paasche or a Laspeyres index. The CPI-U is subject to huge political pressures; many government contracts, labor union agreements and escalators for Social Security and other pension plans are linked to its value. As we have found to our collective dismay in the matter of executive compensation, if you give someone a large enough incentive to manipulate a number to their benefit, sooner or later they will avail themselves of the opportunity to do so.

A third option exists on index revisions. The CPI-U, like all government releases, is subject to revision after release. The Bureau of Labor Statistics reviews its methodology and occasionally recalculates the history of an index; it did so for the CPI in September 2000. The CPI futures will not incorporate any of these revisions.

TIPS have two additional embedded options. The principal amount of the TIPS bond is adjusted higher by the CPI multiplier, but just as the implied interest of an original issue discount bond is taxed even though your cash flow is zero, the inflation adjustment of TIPS is taxed. As you do not know what future tax rates will be, you are short a call option on tax rates to the government.

A second TIPS option is subtler, and that is a put option on deflation. Should deflation occur, the principal of TIPS will not fall below par. However, the pricing of the CPI futures contract is 100 - (100 * CPI-U). That means the CPI future could get priced above 100. If you choose to create your own TIPS by buying Treasuries and CPI futures, you need to be aware of this effect: The combination can disconnect from a stable relationship with TIPS and make hedging impossible.

Most traders learn sooner or later not to let the best be the enemy of the good, and the considerations above, taken by themselves, need not be fatal. Applications for trading the CPI futures in conjunction with other futures markets will be discussed here next month.