INFLATION

Thomas S. Coleman PhD
28 October 2009

- Economics of Inflation
  - Inflation is always and everywhere a monetary phenomenon
  - Sustained and on-going inflation results from on-going money growth. One-time injections like 2008-2009 do not generate sustained inflation
- Understanding the impact of inflation
  - Hyper-inflation a sign of severe political dysfunction.
  - Inflation tax and paying with the printing press
  - Unexpected inflation is what really hurts – good for debtors, bad for lenders
  - Constant and stable inflation isn't that costly
  - Impact on government debt often overdone – government cannot "inflate away debt" so easily because much is short-term and would be refunded at higher rates
- History of Inflation for US, UK, Italy, France and selected European countries
  - 1970s saw sustained bout of inflation
  - Impact on stocks and bonds from increase in inflation – neither provide a simple inflation hedge
    - Stocks do not reliably rise or fall when inflation increases so are not a reliable hedge. (This is for the whole market - individual stocks may work.)
    - Bonds reliably fall when inflation increases but the interest income offsets so much that a simple strategy of shorting bonds does not work.
- Current Prospects – Risks Going Forward
  - Primary risk for US and Europe is not hyper-inflation but some years of "Moderate" inflation of 5-15%
  - Current prospects
    - Concern over massive liquidity injection over-done – money supply increase not likely to be huge even, and one-time should not generate sustained inflation
    - Concern over deficits and debt burden – also overdone
    - Hyper-inflation highly unlikely – always a sign of severe political dysfunction and the US and Europe do not seem to be in such a situation
      - Benefit to government would not be as large as generally thought.
  - My opinion on most likely outcome
    - Inflation scare that pushes expected inflation (and long-term rates) up sharply
    - Quick and decisive response from central banks that assuages inflation fears and brings down inflation expectations (although possibly over period of a couple years)

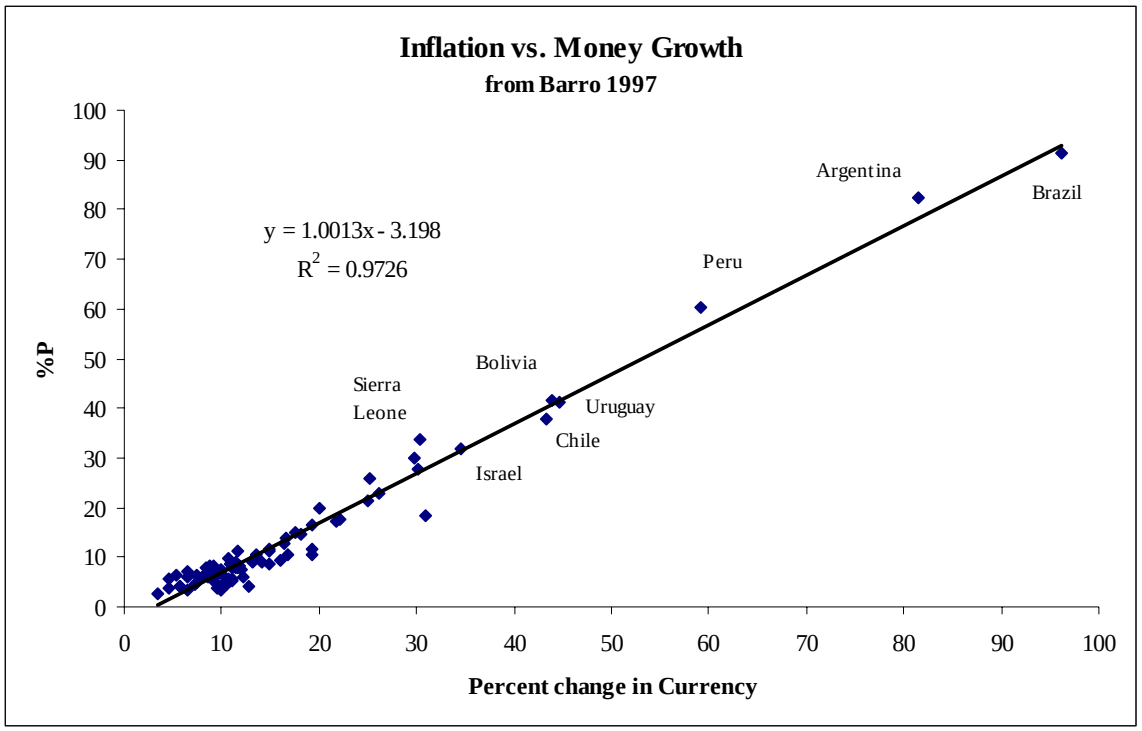
ECONOMICS OF INFLATION

Inflation is a Monetary Phenomenon

As Milton Friedman said, "Inflation is always and everywhere a monetary phenomenon." Bernanke in his textbook says "The existence of a close link between the price level and the money supply in an economy is one of the oldest and most reliable conclusions about macroeconomic behavior."[1]

Inflation is the continuing rise in prices, and must be distinguished from one-off rises in the price level. The only way to get on-going and consistently high inflation is with on-going and consistently high growth in the money supply. Figure 1 shows average annual inflation versus money growth (stock of currency) for 80 countries for 1960-1995, and the relation is one-for-one, particularly for high inflation countries. Hyper-inflation is always, everywhere, and only a monetary phenomenon that occurs when governments debase their currency. In ancient times it was by increasing the base metal content of gold or silver coins (the dictionary definition of "debase"). Today it is through printing and issuing paper currency. Whatever the means, high levels of inflation occur only when the money supply increases at a high rate.

Figure 1 – Relation Between Inflation and Money Growth, 80 Countries 1960-1995



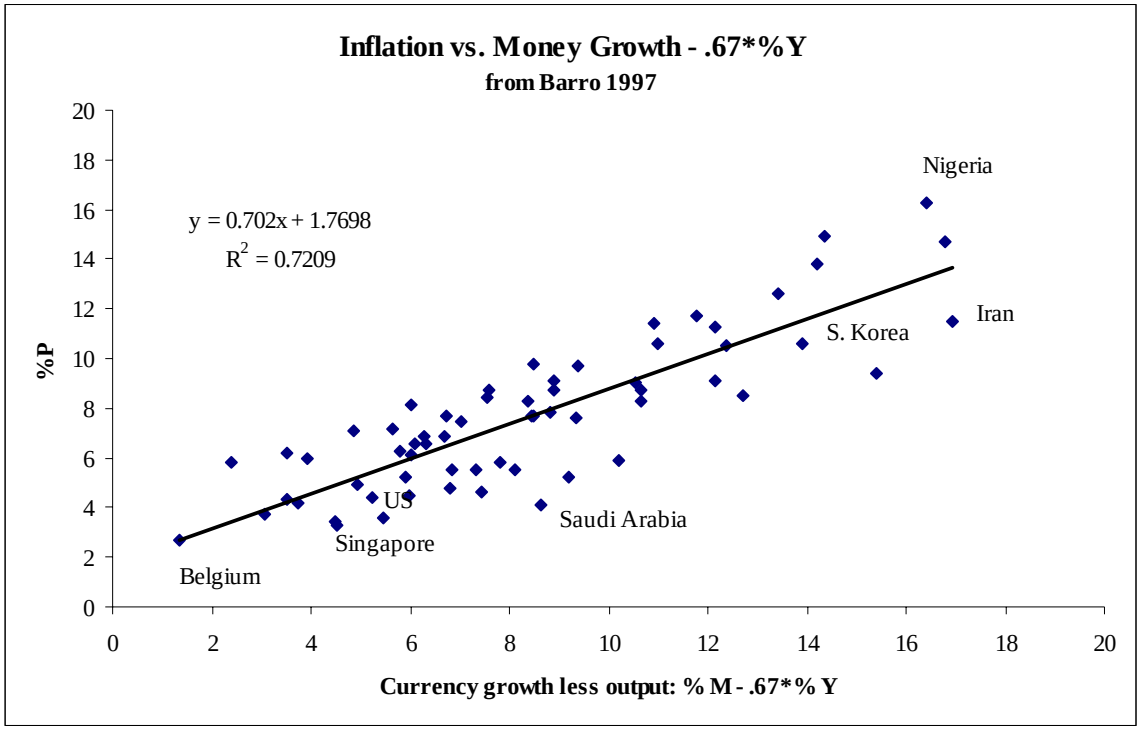
From *Macroeconomics*, Robert Barro, 1997. Original data from International Monetary Fund, International Financial Statistics. All growth rates are annual averages for the sample periods, 1960-1995 for most countries. ΔP/P is the growth rate of consumer prices. ΔM/M is the growth rate of the stock of currency.

[1] *Macroeconomics, 6th ed.*, Andrew B. Abel, Ben S. Bernanke, Dean Croushore, p. 269

Even for "moderate" inflation of 20% and below the relation between money growth and price growth (inflation) is very strong. Figure 2 shows the relation for growth in money less than 20%. In their textbook Abel, Bernanke, Croushore make the same point using data for post-communist eastern-European countries – on-going sustained inflation is the result of on-going sustained growth in money.[2]

This is important because it emphasizes that the only way the US or Europe will experience sustained inflation will be if the Federal Reserve and the ECB produce sustained growth in money. The injection of liquidity during late-2008 and early-2009, while huge, does not appear to be on-going or sustained, and so cannot of itself produce on-going sustained inflation.

Figure 2 –Inflation and Money Growth 1960-1995 for "Moderate" Inflation



The horizontal axis shows currency growth less 0.67*output growth. This adjusts very roughly for the fact that fast-growing economies need more money, and so growth in money will have a lesser impact on price growth (inflation).

The US and Europe have not experienced hyper-inflation in recent memory, but it is not uncommon elsewhere. Brazil's inflation averaged over the period 1960-1994 was 91.2% and hit 2,500% in 1993; something costing 1 Cruzeiro in 1960 would have cost 17bn Cruzeiro by 1994. Latin America has tamed hyper-inflation as residents and trading partners have recognized the connection between money and hyper-inflation, and duly

[2] *Macroeconomics, 6th ed.*, Andrew B. Abel, Ben S. Bernanke, Dean Croushore, p. 270

punished governments that have opted to go down the path towards hyper-inflation.[3] But it has shown up periodically, as in Zimbabwe where annual inflation averaged 161% from 1995 through 2006 and the economy has since dollarized.

UNDERSTANDING THE IMPACT OF INFLATION

It is critical to distinguish between **expected** and **unexpected** inflation, and between **moderate** and **high** (or hyper) inflation.[4]

Expected Inflation – Moderate – when inflation is expected or fully anticipated (particularly when it is stable year-after-year) the costs for individuals and companies are actually relatively low. If everyone knows that inflation is and will continue to be 3%, or 5%, or 15%, then most everything will adjust so that there is minimal cost. Nominal interest rates will equal the real interest rate plus expected inflation, so that the interest earned by holding money in a savings account or as a bond offsets the loss due to inflation. Wages will rise at the rate of inflation to offset the impact of inflation. Prices that a company can charge for goods and services will rise at the rate of inflation, so company earnings and stock prices will rise at the rate of inflation. Basically everything will adjust so that life is pretty much neutral with respect to the inflation.

The world will not be perfect and there will be costs – in particular individuals and companies will spend time and money to minimize the amount of cash they hold, since cash depreciates in value. For moderate expected inflation, however, these costs will not be large.[5] There is also a benefit to the government, in terms of revenue from *seignorage*, commonly called the inflation tax. Basically, for a moderate level of inflation individuals and companies will hold some level of real cash balances (lower than if there were no inflation, but still some level of cash balances). To maintain a fixed level of real cash, the actual number of dollars must be continually replenished. These dollars must be obtained from the government, who earns the benefit of the monopoly on issuing the currency. This is called seignorage but can also be thought of as a tax with the inflation rate being the tax rate.[6] There are offsetting costs to the government, in terms of

[3] The countries with the highest inflation rates – Argentina, Bolivia, Brazil, Chile, Peru, Uruguay were all over 35% for the period 1960-1995 – showed annual average inflation rates of 7.2%, 5.1%, 6.6%, 3.8%, 3.0%, 8.4% for 1997-2008.

[4] For present purposes I will take high inflation to be 50% per annum or higher. There is no precise definition of hyper-inflation but Philip Cagan in his classic study ("The Monetary Dynamics of Hyperinflation," in Milton Friedman, ed., *Studies in the Quantity Theory of Money*, Chicago: University of Chicago Press, 1956) defined hyperinflation as 50% *per month* or more. This translates to 12,900% annualized.

[5] These costs are commonly called "shoe-leather costs" by economists since minimizing cash requires going to the bank more often, thus wearing out the leather soles of one's shoes. For 10% perfectly anticipated inflation the costs have been estimated at about 0.3% of GDP, or now roughly $40bn. (See Stanley Fischer, "Towards an Understanding of the Costs of Inflation: II," in K. Brunner and A. Meltzer, eds., *Carnegies-Rochester Conference Series on Public Policy*, vol 15, Autumn 1981.)

[6] See Abel, Bernanke, Croushore p. 600 ff. The revenue from seignorage will initially increase as inflation rises from zero, but eventually the revenue will reach a maximum and then fall as inflation rises. I don't

deflated value of tax collections, but these will not become significant until inflation become high and are discussed below.

Unexpected Inflation – Moderate – unexpected inflation is where costs start to become interesting. The effects on individuals and companies, however, are quite asymmetric. In general, borrowers will benefit, lenders and holders of nominal assets (in particular bonds) will be hurt, and holders of real assets will be unaffected. Similarly, those paying on fixed-term contracts benefit while those earning income from fixed-term contracts are hurt.

It is also important to distinguish between a one-time increase in prices and an unexpected but more permanent increase in on-going inflation. Usually an unexpected increase in prices is a signal that inflation will also be higher in the future but that need not always be the case. A one-time increase in prices will have a much less dramatic impact than an increase which is seen as the start of a sustained inflationary period. Consider a long-term bond. If there is a one-time increase in prices but inflation in the future is not expected to increase, then the nominal value of the bond will not change and the only loss is the one-off fall in purchasing power: if prices go up by 5% the real value of the bond falls by about 5%.

More commonly an increase in prices is a signal that inflation will be higher for some long period in the future. Higher future expected inflation leads to higher nominal interest rates and all future cash flows will be discounted at higher rates and are thus worth less. This gives the full impact of the higher expected inflation, and it can have a large impact on bonds and larger for longer-duration bonds. Consider a zero-coupon bond. If expected inflation goes from 0% to 5% the nominal rate will rise by roughly 5% and the value of a one-year zero will fall by roughly 5%. For a five-year zero the real value will fall by roughly 20%. As the maturity extends out the loss due to expected higher future inflation rates gets larger.

Those who borrow in nominal terms benefit from expected future inflation. Those who receive fixed nominal payments on contracts (such as a service provider with long-term contracts) are hurt. Net across the economy the impact of unexpected inflation is roughly neutral since the losses for bondholders are gains for borrowers: there are large transfers of wealth from lenders to borrowers.

High Inflation – When inflation is high costs become high. When inflation is expected and stable, shoe-leather costs become high as individuals and companies spend time and effort to avoid holding cash balances. The seignorage revenue (inflation tax) that government earns falls as individuals and businesses reduce their cash balances. Everyone tries to delay payments and speed up receipts because future payments are worth so much less. Eventually the government's

---

know the level at which seignorage is maximized, but it could be high – Cagan estimated the seignorage-revenue-maximizing inflation rate for hyperinflating Germany as 20% per month.

ability to collect taxes is destroyed – individuals delay tax payments as long as possible and with inflation high enough the later payments are worth less.[7]

When inflation is unexpected and variable there is the transfer from lenders to borrowers. This is somewhat less than one might expect, however, since in such an environment everyone tries to avoid lending in nominal terms. Contracts become indexed to inflation and sometimes the economy moves to an alternative currency (for example to dollars as Argentina effectively did during the currency board regime and Zimbabwe explicitly has done today)

Table 1 –Costs and Benefits for Inflation

	Moderate	**High**
Unexpected (variable)	**Individuals and companies**: Wealth transfer from lenders to borrowers. Shoe-leather costs as below. **Government**: Generally benefit from wealth transfer because net borrower. Seignorage as below	**Individuals and companies**: Wealth transfer eventually mitigated as nominal contracts disappear. Shoe-leather costs high (as below). **Government**: Wealth transfer eventually mitigated as nominal contracts disappear. Seignorage and taxes eventually disappear as below.
Expected (stable)	**Individuals and companies**: Shoe-leather costs – generally low **Government**: Seignorage (inflation tax) – generally low/moderate benefit	**Individuals and companies**: Shoe-leather costs become high and everyone works to avoid holding cash **Government**: Benefit from seignorage will first increase, then decrease. Ability to collect taxes eventually destroyed.

A couple points with respect to hyper-inflation. Hyper-inflation is almost always associated with one of both of the following: first, failure to understand the close connection between sustained money growth and sustained inflation; second, severe political dysfunction and particularly an inability or unwillingness to raise revenue via taxes. When the political environment makes it impossible to raise revenue via taxes then the "inflation tax" – i.e. seignorage – is a viable alternative.

The government can pay for goods by printing new money. But such a strategy is generally not stable. If the new money printed is equal to the desired new cash (to maintain individuals' desired real cash balances) then this can be an equilibrium with stable but constant inflation. More often the situation is unstable with the government issuing more new cash than is willingly absorbed in the economy and inflation accelerates.

[7] Consider an individual who earns income and accrues taxes monthly during a year but can delay payment until May of the following year. At an inflation rate of 3% the government effectively collects 97.5% of the real value of the taxes. At 50% inflation the government collects only 71% of the real value of the tax.

Impact of Inflation on US Government Debt

The impact of inflation on US government debt and the ability of the government to "inflate away" the debt is often overstated. Remember that fully anticipated or expected inflation has no impact on the real value of the debt. If inflation is constant and stable and is expected to stay that way, say at 10% per year, the inflation will be embedded in the nominal interest rate. All future cash flows will be discounted to reflect the 10% inflation. The government will have to pay coupons at some rate above 10%, and there will not be any erosion of the real value of the debt.

The only way the government benefits from "inflating away the debt" is when there is unexpected inflation, and the existing stock of outstanding debt is devalued. But this impact is not as dramatic as one might expect because much of the outstanding debt is short-term. Unexpected inflation has a substantial impact on long-term bonds, but a much smaller impact on short-term bonds and bills.

As of September 2009 the marketable debt of the US was about $7.0trn, of which about $6.5trn was not inflation-protected. Fully half of this, however, matures in two years or less and very little has a maturity of more than 10 years. Table 2 shows the break-down in debt by maturity, together with an analysis of the impact of a large surge in inflation. Say that inflation rose from the current roughly zero to 15% per year and was expected to stay there. This would be a huge increase in inflation, higher than anything seen in the US since WWII. Furthermore the US has never seen anything nearly that high for a sustained period – during the worst inflationary period of for the US (1973-1981) inflation averaged 9.2% and never broke above 13%. Such an increase would likely lead to substantial political turmoil

Table 2 – Marketable Debt of the US Government – Impact of Rising Rates ($bn)

	Nominal	PV	% of total	PV at Rates + 15%	% change in PV
TOTAL	6,446	6,787	100.0%	4,709	-30.6%
1yr and less	2,488	2,664	39.3%	2,454	-7.9%
2yrs and less	3,227	3,426	50.5%	3,062	-10.6%
More than 10yr	539	674	9.9%	197	-70.8%

Source: *Monthly Summary of the Public Debt*, available at http://www.treasurydirect.gov/govt/reports/pd/mspd/2009/2009_sep.htm

Even for such a large and sustained increase in inflation the debt would only be reduced by 31%. This is a large reduction in the debt but nothing close to fully eroding the debt. The reason is easy to see – the short-term debt is not very much affected by the large increase in inflation. Even at 100% inflation per year the debt is only reduced by 67%. The short duration of the debt constrains the degree to which the debt can be inflated away.

HISTORY FOR US AND SELECTED EUROPEAN COUNTRIES

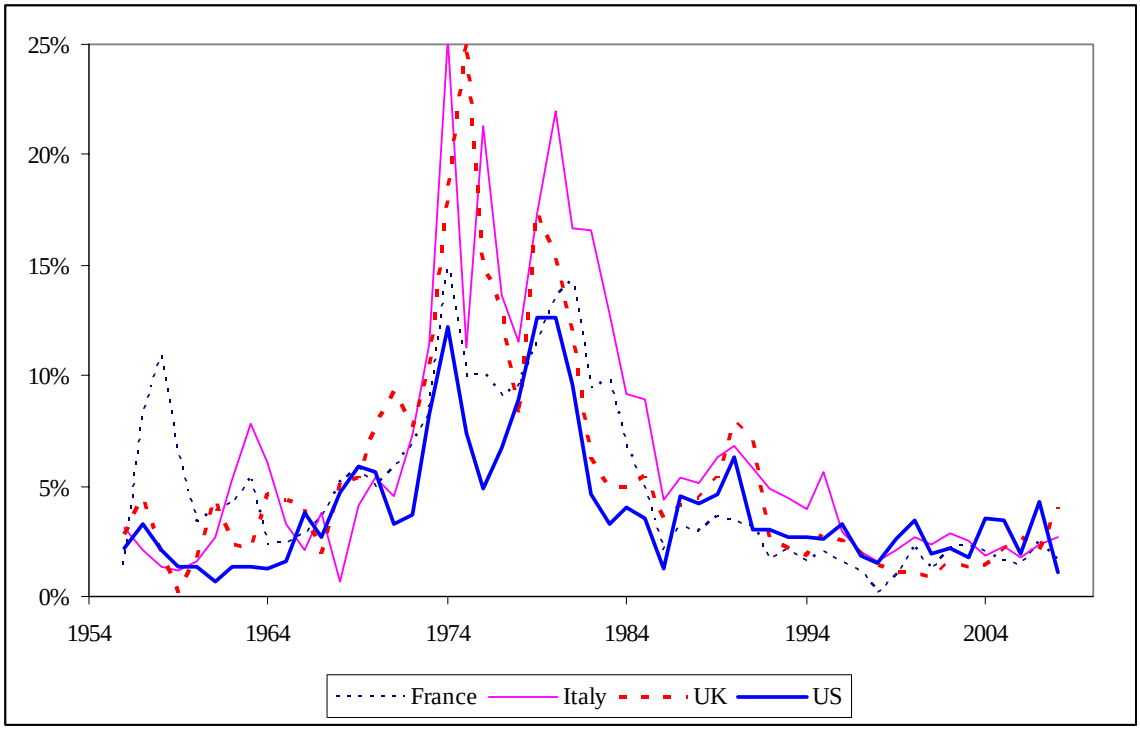
As we all know, the developed world experienced moderate inflation during the 1970s. This was a burst of sustained inflation that started in the late 1960s and ended in the mid-1980s. Since the mid-1980s inflation has been moderate. Table 3 and Figure 3 show the inflation for the US, UK, France, and Italy.

Table 3 – Average Annual CPI Inflation

	France	Italy	UK	US
1968-1985	8.92%	12.22%	10.63%	6.77%
1986-2008	2.02%	3.60%	2.88%	2.95%

Source: Overall CPI, OECD Statistical Extracts

Figure 3 – Annual CPI Inflation for US and Selected European Countries



Source: Overall CPI, OECD Statistical Extracts

Response of Stocks and Bonds to Inflation

We can investigate how stocks and bonds responded during this inflationary period. We should expect that when expected inflation goes up bonds would be badly hurt by inflation and that stocks might roughly neutral (might go up as much as inflation because future revenues would be expected to rise with inflation). In fact the data seem to show:

- Bonds are hurt when inflation expectations go up, as one would expect, but not so much that simply shorting bonds is a reliable inflation hedge

- For stocks there is considerable variability, but contrary to what one might expect on average stocks are hurt somewhat when inflation expectations go up

There is a real problem because we cannot really measure expected inflation, only actual inflation. We might guess that during this period large increases in inflation generally signaled increases in expected inflation, and conversely large decreases in inflation signaled falls in expected inflation. Based on this I measured the real return on bonds and stocks for the periods when inflation increased the most (meaning increasing inflation expectations) and decreased the most.

Table 4 shows that stocks on average decreased (or more precisely increased less than inflation) when inflation increased. For example, in the US stocks fell by 10.3% on average for the nine years when inflation increased by more than 1.8%. Note, however, that there is quite a bit of variation (the standard deviation is quite high) so that in some periods stocks did better than inflation while in others they did worse. Only for the US is the mean real return large enough relative to the standard deviation to have any confidence that it actually is negative. The converse is true when inflation decreases – stocks on average do well but there is considerable variability.

These results for stocks are not really what one would expect. They imply that overall stocks do not increase in value very much when inflation increases, and certainly less than the level of inflation. Further, there is considerable variability meaning that in some periods stocks increased and in others they fell – there is no consistency to the results. The bottom line is that overall stocks are not a reliable inflation hedge, although the results might be different if one looked at particular industries or sectors.

Table 4 – Mean Return for Stocks and Bonds When Inflation is Increasing

	STOCKS - CAPITAL GAINS				BONDS - CAPITAL GAINS			
	France	Italy	UK	US	France	Italy	UK	US
Start year	1956	1957	1959	1958	1961	1992	1961	1957
Number of Obs	52	52	50	51	48	17	48	52
CPI change threshold	1.1%	1.7%	2.0%	1.8%	1.1%	1.7%	2.0%	1.8%
No. above threshold	10	10	9	9	7	10	9	9
Avg change inflation	2.6%	5.1%	4.5%	2.9%	2.3%	5.1%	4.5%	2.9%
Avg inflation	8.0%	12.7%	11.3%	7.3%	8.7%	12.7%	11.3%	7.3%
Avg stock/bond grth	**0.6%**	**10.9%**	**7.3%**	**-3.9%**	**-6.8%**	#N/A	**-5.8%**	**-5.0%**
Standard Deviation	17.4%	40.1%	56.1%	15.5%	6.1%	#N/A	10.5%	4.9%
t-ratio	0.1	0.9	0.4	-0.8	-3.0	#N/A	-1.7	-3.1

Source: OECD Statistical Extracts. Inflation is the December-to-December change in monthly CPI. Stock returns are the capital gain on the stock index. Bond returns are the monthly return implied by the long-term interest rate assuming the yield applies to a 10-year bond and calculating the implied capital gain from rolling 1-month holding periods.

The results for bonds are as one would expect – bonds lose value when inflation increases. Note, however, that this does not provide a simple inflation hedge. Shorting

bonds requires taking into account funding (either directly through repo or implicitly through futures or forward pricing). During these periods of inflation the funding rate was high meaning that the interest income was high and shorting was expensive. The total return for being long a bond was on average positive. Table 5 shows the total return in real terms from shorting a bond (total return meaning interest income plus capital gains, real meaning deflated by the change in CPI). The real returns are substantially negative implying that a simple strategy of shorting a bond does not provide an inflation hedge.

Table 5 – Real Returns from Short Bond Strategy

	SHORT BOND - REAL RETURN			
	France	Italy	UK	US
Start year	1961	1992	1961	1957
Number of Obs	48	17	48	52
Inflation Increasing				
CPI change threshold	1.1%	1.7%	2.0%	1.8%
No. above threshold	7	10	9	9
Mean real return	**-9.7%**	#N/A	**-12.9%**	**-8.5%**
Standard Deviation	3.7%	#N/A	11.5%	4.1%
t-ratio	-6.9	#N/A	-3.4	-6.3

Source: OECD Statistical Extracts. Inflation is the December-to-December change in monthly CPI. Bond returns are (the negative of) the monthly return implied by the long-term interest rate assuming the yield applies to a 10-year bond and calculating the implied capital gain from rolling 1-month holding periods, with interest earned at the yield.

The conclusion is that neither stocks nor bonds provide a simple inflation hedge, although for different reasons. Stocks are not a reliable hedge because they do not reliably rise or fall when inflation increases. Bond capital gains are reliably negative when inflation increases but the interest income offsets so that the total return is slightly positive, meaning that a simple strategy of shorting bonds is slightly negative in nominal terms and large and negative in real terms.[8]

CURRENT PROSPECTS – RISKS GOING FORWARD

I believe hyper-inflation is not a realistic risk for the US and Europe, although some years of "moderate" inflation of 5-15% might not be impossible. The concern over the massive liquidity injection from the past 18 months is over-done. It is absolutely true that the monetary base has exploded since the third quarter of 2008. But rather than flowing into the money supply, banks have held this increase as additional reserves. Indeed the Federal Reserve increased the monetary base precisely because banks desired additional reserves.

[8] The results in the tables assume 10-year bonds. Even assuming 30-year bonds the capital change is not enough to offset the interest income.

The desire of banks to accumulate additional reserves relative to deposits during a financial crisis is common; it was a major reason for the decrease in money during the crises of 1893-94 and 1907-08.[9] In contrast to those periods, when reserves were more-or-less fixed and banks decreased deposits, during the current crisis the Fed has increased reserves which meant deposits (and the money supply) did not collapse. Banks have willingly soaked up reserves. The deposit-to-reserve ratio has plummeted. My hypothesis is that there has been a one-off change in the desire of banks to hold reserves. The massive increase in the monetary base has thus been willingly absorbed.

In terms of supply and demand, the liquidity injection was an increase in money supply, but the increased demand for reserves was an increase in money demand. Given that supply and demand appears to be relatively well-balanced, it is not clear that the one-time liquidity injection will have any impact on prices.

Some commentators have expressed concern that banks will revert to their prior level of reserve holdings and that the higher level of reserves will lead to a catastrophic increase in money supply. Total reserves were about to about $850bn by August 2009, up from about $63bn in June 2008. As reserves have increased the ratio of deposits to reserves has plummeted, to just below 1.0 versus about 10 just a year or two ago. The argument is that if banks decided to revert to levels of deposits-to-reserve ratios seen in the recent past, this might imply an increase of deposits on the order of $6trn, versus the total money supply now of roughly $1.5trn. This would be a catastrophic increase in money supply.

This argument ignores the basics of the monetary mechanisms. M1 money supply is made up of both Deposits and Currency (split roughly 50/50):

M1 = DEP + CUR

The supply of currency is under the direct control of the Fed, while the level of deposits depends on both banks' willingness to lend and create deposits, and account-holders' desire to hold money as deposits versus currency. To measure the first (bank willingness to create deposits) it is useful to consider the Deposit-to-Reserve ratio:

DEP/RES = deposits / bank reserves (considered by Hayman)

To measure the second (account-holder's desire to hold money as deposits versus currency) it is useful to consider the Deposit-to-Currency ratio:

DEP/CUR = deposits / currency

These two ratios are graphed below and we can make a few observations:

- DEP/RES plummeted during the financial crisis, from roughly 9 to 1.
- DEP/CUR did not change during the crisis
- DEP/CUR has fallen over the past 50 years, from an average of 3.4 for 1959-1979 to 0.97 for 2000-2006.

So far the increase in reserves has not flowed through to money, and thus not led to inflationary pressure. To understand what might happen in the future we need to consider both banks' response (focusing on DEP/RES) and account-holders' response (focusing on DEP/CUR)

[9] For a discussion of past financial and liquidity crises see "The Liquidity Crisis In Historical Perspective" at www.closemountain.org/papers/macro_liquid_0901.pdf

- Account-holder response
  - Account-holders decide how much money to hold as cash versus deposits. Roughly this is provides the demand for deposits (keeping currency fixed). Banks cannot force account-holders to drastically increase or decrease their holdings of deposits versus currency.
  - During the financial crisis the Deposit-to-Currency ratio has not changed significantly. There is no reason to think it will change substantially in the short-term future.
  - Thus the most likely scenario is that account-holders keep roughly the same ratio. An extreme scenario might be that they move from 1.0 to 2.5 (close to the average for 1975-1995), although I see no earthly reason why they should.
- Bank response
  - Banks have traditionally held little excess reserves, holding roughly $1 of reserves for every $6-10 of deposits (the figure below shows that DEP/RES has been roughly 6-10 for most of the past 50 years). One reason for doing this is the cost of holding reserves (vault cash earns not interest and until last year neither did reserves held at the Fed).
  - Currently banks are happy holding roughly $1 of reserves for $1 of deposits.
  - In the future banks may wish to hold less reserves, but the future is likely to be very different from the past.
  - First, banks have suffered a severe shock and their preferences have changed: they are likely to hold more reserves relative to deposits than in the past.
  - Second, banks are now paid interest on their reserves held at the Fed. This reduces the cost of holding reserves, and banks will be likely to hold more reserves for every $1 of deposits than in the past.
  - I don't know what the new level of desired DEP/RES might be, but it will certainly be far less than the historic 6-10.

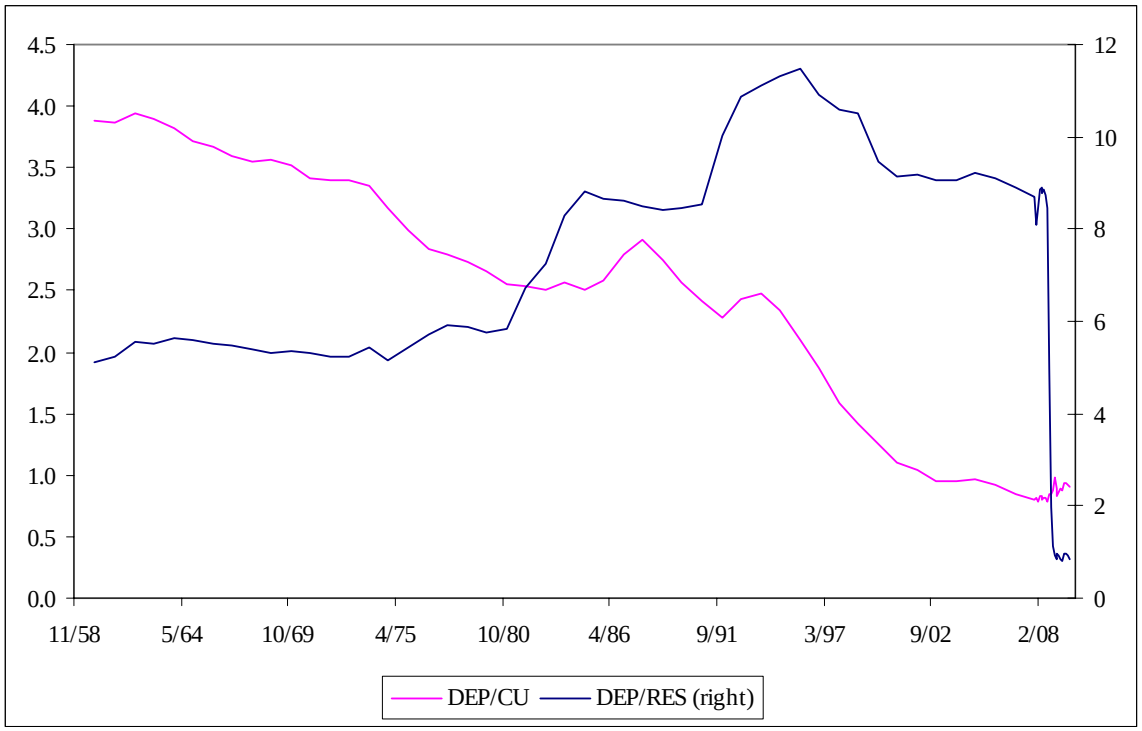
Basically, this is a supply-demand issue with banks supplying deposits and account-holders demanding deposits. I think the binding constraint will be account-holders' desire to hold deposits, not banks' willingness to supply deposits. When banks decide to hold less reserves relative to deposits, whatever that level might be, they can either increase deposits or decrease reserves. But banks can only increase deposits if account-holders want them. Banks are likely to be constrained by account-holders' demand for deposits (relative to currency).

Further, even if there is an impact it is likely to be a one-off increase in prices and not sustained inflation. The monetary base has been growing fast but not excessively (8.8% annualized since January 2009 versus 108% for the prior year).

Changes in US Currency, Monetary Base, and M1

	Currency	Mon Base	Bank Res	Total	Deposits	M1	RATIOS Depo-reserve	Depo-curren					
	CU	MB	=MB-CU	Reserves	DEP	=CU+DEP	DEP/RES	DEP/CU	CU	MB	=MB-CU	DEP	M1
2002	609.0	662.9	53.9	40.1	587.3	1,196.3	10.89	0.96					
2003	647.6	704.5	56.8	42.5	625.8	1,273.5	11.01	0.97	6.3%	6.3%	5.4%	6.6%	
2004	680.7	741.1	60.4	45.4	663.8	1,344.4	10.98	0.98	5.1%	5.2%	6.4%	6.1%	5.6%
2005	710.1	772.8	62.7	46.0	661.7	1,371.8	10.55	0.93	4.3%	4.3%	3.8%	-0.3%	2.0%
2006	740.1	803.1	63.0	43.9	634.2	1,374.4	10.07	0.86	4.2%	3.9%	0.4%	-4.1%	0.2%
2007	756.4	819.9	63.5	43.1	616.8	1,373.2	9.71	0.82	2.2%	2.1%	0.8%	-2.7%	-0.1%
2008	776.1	979.5	203.4	183.8	652.9	1,429.0	3.21	0.84	2.6%	19.5%	220.3%	5.9%	4.1%
Q1 2008	758.3	822.8	64.5	44.0	622.1	1,380.4	9.65	0.82					
Q2 2008	764.2	828.2	64.0	44.7	623.0	1,387.2	9.73	0.82	0.8%	0.7%	-0.7%	0.1%	0.5%
Q3 2008	777.7	862.2	84.5	44.7	639.8	1,417.5	7.57	0.82	1.8%	4.1%	32.0%	2.7%	2.2%
Q4 2008	804.3	1,405.0	600.7	582.2	726.7	1,531.0	1.21	0.90	3.4%	63.0%	610.9%	13.6%	8.0%
Q1 2009	836.4	1,634.6	798.2	779.8	730.0	1,566.4	0.91	0.87	4.0%	16.3%	32.9%	0.4%	2.3%
Q2 2009	850.9	1,733.5	882.6	864.0	762.5	1,613.4	0.86	0.90	1.7%	6.1%	10.6%	4.5%	3.0%
6/08	769.0	832.4	63.4	44.4	624.7	1,393.7	9.85	0.81					
7/08	774.4	838.4	64.0	44.3	634.9	1,409.3	9.93	0.82	0.7%	0.7%	0.8%	1.6%	1.1%
8/08	777.0	843.0	66.0	45.5	614.5	1,391.5	9.31	0.79	0.3%	0.6%	3.1%	-3.2%	-1.3%
9/08	781.6	905.2	123.6	102.8	670.0	1,451.6	5.42	0.86	0.6%	7.4%	87.3%	9.0%	4.3%
10/08	796.5	1,130.3	333.8	315.5	678.2	1,474.7	2.03	0.85	1.9%	24.9%	170.1%	1.2%	1.6%
11/08	804.3	1,433.5	629.2	609.9	718.8	1,523.1	1.14	0.89	1.0%	26.8%	88.5%	6.0%	3.3%
12/08	812.1	1,651.3	839.2	821.0	783.2	1,595.3	0.93	0.96	1.0%	15.2%	33.4%	9.0%	4.7%
1/09	826.3	1,703.1	876.8	858.4	750.0	1,576.3	0.86	0.91	1.7%	3.1%	4.5%	-4.2%	-1.2%
2/09	837.7	1,557.5	719.8	701.0	721.8	1,559.5	1.00	0.86	1.4%	-8.6%	-17.9%	-3.8%	-1.1%
3/09	845.1	1,643.1	798.0	780.0	718.2	1,563.3	0.90	0.85	0.9%	5.5%	10.9%	-0.5%	0.2%
4/09	849.8	1,749.8	900.0	881.6	743.4	1,593.2	0.83	0.87	0.6%	6.5%	12.8%	3.5%	1.9%
5/09	849.9	1,770.2	920.3	901.3	747.1	1,597.0	0.81	0.88	0.0%	1.2%	2.3%	0.5%	0.2%
6/09	853.1	1,680.6	827.5	809.0	797.0	1,650.1	0.96	0.93	0.4%	-5.1%	-10.1%	6.7%	3.3%
7/09	853.5	1,666.2	812.7	795.6	801.2	1,654.7	0.99	0.94	0.0%	-0.9%	-1.8%	0.5%	0.3%
8/09	858.4	1,705.4	847.0	829.4	791.5	1,649.9	0.93	0.92	0.6%	2.4%	4.2%	-1.2%	-0.3%
9/09		1,801.5		922.8						5.6%			

Ratio of Deposits to Currency (DEP/CU) and Deposits to Bank Reserves (DEP/RES, right scale) – annual through 2007, then monthly



Data are from the Federal Reserve. Deposits are "Demand Deposits" plus "Other Checkable Deposits", NSA, from h6hist4. Currency is "Currency, NSA" from h6his4. Bank Reserves are calculated as "Monetary Base (not adjusted for changes in reserve requirements, NSA)" from h3hist2 less "Currency" NSA from h6hist4. This definition of bank reserves is slightly higher than the "Total Reserves" reported in h3hist2 because it includes items such as excess vault cash, adjustments for float, etc., that are appropriately considered reserves in comparing with deposits.