Price Behavior, Inflation and Deflation

Problems and solutions

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What is inflation?

- A general increase in the price level as measured by some index like the CPI..
  - 0-2% Traditional/healthy
  - 3-6% Moderate
  - 7-15% High
  - 15+% Runaway
  - 50+% Hyper-inflation
# The German inflation of the 1920s

<table>
<thead>
<tr>
<th>Date</th>
<th>$1 equals in Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 1914</td>
<td>4.2</td>
</tr>
<tr>
<td>July 1919</td>
<td>14.0</td>
</tr>
<tr>
<td>July 1921</td>
<td>39.5</td>
</tr>
<tr>
<td>July 1922</td>
<td>483.2</td>
</tr>
<tr>
<td>July 1923</td>
<td>353,412</td>
</tr>
<tr>
<td>Aug 1923</td>
<td>4,620,455</td>
</tr>
<tr>
<td>Sept 1923</td>
<td>98,869,000</td>
</tr>
<tr>
<td>Oct 1923</td>
<td>25,260,208,000</td>
</tr>
<tr>
<td>Nov 1923</td>
<td>4,200,000,000,000</td>
</tr>
</tbody>
</table>
21 April 1910 10,000 Mark Note
6 February 1920 10 Mark Note
The back (10 Mark Note)
9 August 1923 2 Million Mark Note
1 Sept. 1923 50 Million Mark Note

Fünfzig Millionen Mark


Berlin, den 1. September 1923

REICHSBANKDIREKTORIUM ΔΣ 45

[Signature] [Signature]
The Back (50 Million Mark Note)
According to the 2008 CIA Factbook, Zimbabwe, with an unemployment rate of 80% and with 20% of the adult population identified as HIX-positive, had an inflation rate estimated to be 100,000% per year in 2007.
In 2014: 

Argentina Finally Owns Up To Its Real Inflation Rate: 3.7 Percent. A Month, That Is

By Patricia Rey Mallén on February 14, 2014 4:08 PM

from International Business Times, Feb 14, 2014, by Patricia Rey Mallen.

... also Ukraine, Venezuela, Brazil, Turkey, South Africa.
How inflation is measured

- **Consumer Price Index (CPI)**
  - Measures “cost of living” for consumers
- **Producer Price Index (PPI)**
  - Measures input costs for manufacturers
- **Implicit Price Deflator (IPD)**
  - Used to adjust GDP to real GDP
- **Employee Cost Index**
  - Used by FRS as early inflation indicator
CPI for urban consumers, U.S. city average, all items, NSA. Source: Bureau of Labor Statistics
The CPI

- Prices collected monthly and bimonthly in 85 urban areas from about 45,000 housing units and 20,000 retail establishments for 80,000 items
- Personal visits and telephone calls
- Base year (average of 1982-84) set to 100
- “Market basket” weights are based upon consumer surveys conducted 2009-2010, 7,000 families keeping diaries of everything they bought for 2 weeks, another 7,000 in a more general survey covering 3 months.
- The index is a weighted sum.
Calculating the Inflation Rate

1. Each month (year) the value of the market basket is calculated: the alphas are weights based upon a consumer survey.

2. The CPI is calculated by taking the value of the market basket for each month (year) is divided by the value for the base year (average of 1982-1984), then multiplied times 100.

3. The inflation rate is calculated from the CPI.

\[
MBV_t = \sum_{i=1}^{n} \alpha_i P_i
\]

\[
CPI_t = \frac{MBV_t}{MBV_b} \times 100
\]

\[
IR_t = \frac{CPI_t}{CPI_{t-1}} - 1
\]
# Jan 2014 CPI category weights and values

<table>
<thead>
<tr>
<th>Category</th>
<th>Weight</th>
<th>Index</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All times</td>
<td>100</td>
<td>233.9</td>
<td>1.6%</td>
</tr>
<tr>
<td>Food and Beverage</td>
<td>13.9</td>
<td>238.9</td>
<td>1.1%</td>
</tr>
<tr>
<td>Housing</td>
<td>32.0</td>
<td>266.8</td>
<td>2.6%</td>
</tr>
<tr>
<td>Apparel</td>
<td>3.4</td>
<td>124.3</td>
<td>-0.3%</td>
</tr>
<tr>
<td>Transportation excl fuel</td>
<td>5.7</td>
<td>280.7</td>
<td>1.2%</td>
</tr>
<tr>
<td>Gasoline</td>
<td>5.0</td>
<td>286.6</td>
<td>0.1%</td>
</tr>
<tr>
<td>Medical Care</td>
<td>5.8</td>
<td>459.6</td>
<td>2.5%</td>
</tr>
<tr>
<td>Recreation</td>
<td>5.8</td>
<td>115.3</td>
<td>0.4%</td>
</tr>
<tr>
<td>Education</td>
<td>3.2</td>
<td>228.3</td>
<td>3.0%</td>
</tr>
<tr>
<td>Tuition, other fees</td>
<td>1.8</td>
<td>636.0</td>
<td>3.5%</td>
</tr>
<tr>
<td>Communication</td>
<td>3.8</td>
<td>82.6</td>
<td>-2.0%</td>
</tr>
<tr>
<td>Energy Services</td>
<td>3.7</td>
<td>197.9</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

The weights are market basket weights. Note Medical. Other than tobacco, the highest disaggregated category is college tuition.

Current data can always be found by clicking on the most recent CPI news release on the front page of the BLS website.

Note: Not all categories are shown, there are small amounts of overlap, and weights do not sum to 100.

**Purchasing power of the dollar**

| 1982-84 = 100 | $0.428 |

Source: BLS Economic News Release, 2/10/2014 Tables 1, 2, and 3.
The CPI (all items) less food and energy (Core Rate)

Jan 2007 - Jan 2014, monthly growth rate, NSA

0.8%, if sustained, would equal 10% inflation annually

The core rate excludes food, and energy. The core rate is far less volatile. Energy and food costs explain why All Items is higher, then lower.

... right while the stock market was crashing

Source: Bureau of Labor Statistics
The Producer Price Index (PPI)

The Producer Price Index is a family of indexes that measures the average change over time in the selling prices received by domestic producers of goods and services. PPIs measure price change from the perspective of the seller.

Over 10,000 PPIs for individual products and groups of products are released each month, including finished goods, commodities, and raw materials and food. PPIs are available for the products of virtually every industry in the mining and manufacturing sectors of the U.S. economy.

Currently, most PPIs have an index base set at 1982 = 100.

The PPI is assembled by and very comprehensive data are available from the U.S. Department of Labor Bureau of Labor Statistics:

http://bls.gov

Note: Original source for this slide, which is mostly quoted, but since modified, was lost. It probably came from the BLS.
### Finished Goods and Commodity PPI vs. CPI-U, monthly @ annual rates, 2007-2014 NSA

<table>
<thead>
<tr>
<th>Year</th>
<th>CPI-U %</th>
<th>PPI Finished Goods %</th>
<th>PPI Commodities %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note the high volatility of the PPI measures compared to CPI. CPI sometimes acts like a weighted moving average. Monthly numbers of PPI at release are too volatile to have much meaning. But over time ...

Source: BLS
BLS Employment Cost Index
Total compensation, all civilian, annualized change, quarterly, 2001-2013, NSA

This is the inverse of what is called “productivity” and is probably the variable that most mitigates and inflation threat.

This progress is mostly technological (computing, robotics, the internet) – anything that reduces the labor component of cost, but also crummy job market.
Costs of inflation

• Distributes income and wealth unfairly
  – To: owners of real assets, borrowers, those who understand the system
  – From: renters, savers & lenders, semi-skilled and unskilled

• Affects financial markets
  – raises interest rates
  – reduces the value of debt

• Tends to lower real income
  – nominal income doesn’t keep up

• Interjects yet more uncertainty
  – which retards economic growth

• Tends to be self-compounding
Costs of Deflation

- Effects during Great Depression
  - Made loans impossible to pay
  - Destroyed banking structure
  - Resulted in 1933 Roosevelt Banking Holiday
- Generally undermines any economy with large levels of debt contracts in nominal (nor adjusted for prices) amounts
- Today a problem in commodity exporting nations
  - Especially raw materials exports
Deflation during the Great Depression
CPI annualized monthly rates, 1920 to 1940

Post WWI

The Great Depression, although we were an agricultural economy then.

Source: BLS
Theories of inflation (a review)

• Aggregate Supply/Aggregate Demand
  – Inflation can be demand pull or cost push
  – Impact of variables depends upon context
  – Inflation tends to get worse automatically

• Loanable funds model
  – Inflation and interest rates are correlated
  – To cure inflation, interest rates must rise
The Effects of a Surge in Aggregate Demand Upon the Inflation Rate

Case (b): Near the end of an expansion

Some growth, but mostly inflation
The Secondary Effects of Inflationary Expectations

- Due to Monetary Expansion
- Due to Inflationary Expectations

- P1
- P2
- P3

AD1 → AD2 → AD3

RGDP
Inflation and Recession!

How to we explain this?

![Graph showing the relationship between GDP growth and inflation from 1970 to 1984.](image)
Stagflation, or Cost-Push Inflation

Due to severe cost increases or supply-side shock, like the OPEC oil embargo

AD

RGDP

P

inflation

recession
Wage Increases Without Productivity Gains
Anti-inflation policies

- **Monetary policy approach**
  - Tighten up credit conditions
  - Raise interest rates

- **Price controls don’t work**
  - Causes acute shortages
  - Encourages black market
  - Easy to circumvent in non-commodity economy with “new product design”
The last FRS tightening 2005-2006

The FRS tightens while …

Continued through 2006.

… consumer borrowing continues to grow strongly

The last FRS anti-inflation policy was during this period. When QE3 stops, this might happen again. To what effect??
Quantitative Easing Programs (2007-2013)

Using programs called quantitative easing (QE1 - QE3), the FRS is severely cutting target interest rates to ease a credit crunch and prevent a serious recession.

Consumer and business demand for credit fell, and lenders curtailed certain types of lending (like mortgages), but U.S. Government demand for credit has hugely risen (to finance stimulus package). Hence DF_{1,2,3}. 
2014: Tapering of QE3

QE3 purchases $45b U.S. Treasuries and $40b mortgages monthly. The first taper reduces that by $5b each monthly, the second taper by another 5 …

The government demand for funds is falling sharply (smaller deficits) and consumer and business demand for funds is stable but could grow some or shrink some, so the effect upon interest rates is unclear,
… a general tightening after June 25, 2003, to forestall inflation and curb low interest speculation, followed by recent severe reductions to combat credit crisis and prevent recession, finally dropping rate to 0-0.25% in Dec 2008.