



# Price Behavior, Inflation and Deflation

## Problems and solutions



# What is inflation?

- A general increase in the price level as measured by some index like the CPI ..
  - <0%      **Deflation**
  - 0-2.5%    **Traditional/healthy/stable**
  - 2.5-5%    **Moderate**
  - 5-8%      **High/Serious**
  - 8-12%     **Runaway/self-compounding**
  - 12-20%    **Hyper-inflation**
  - 20%+      **Explosive**

... and deflation is a general decrease in the price level.

# The German inflation of the 1920s

Date	\$1 equals in Marks
July 1914	4.2
July 1919	14.0
July 1921	39.5
July 1922	483.2
July 1923	353,412
Aug 1923	4,620,455
Sept 1923	98,869,000
Oct 1923	25,260,208,000
Nov 1923	4,200,000,000,000

# 21 April 1910 1,000 Mark Note



# 6 February 1920 10 Mark Note



# The back (10 Mark Note)



# 1 March 1920 1 Mark Note



# 9 August 1923 2 Million Mark Note



# 1 Sept. 1923 50 Million Mark Note



# The Back (50 Million Mark Note)

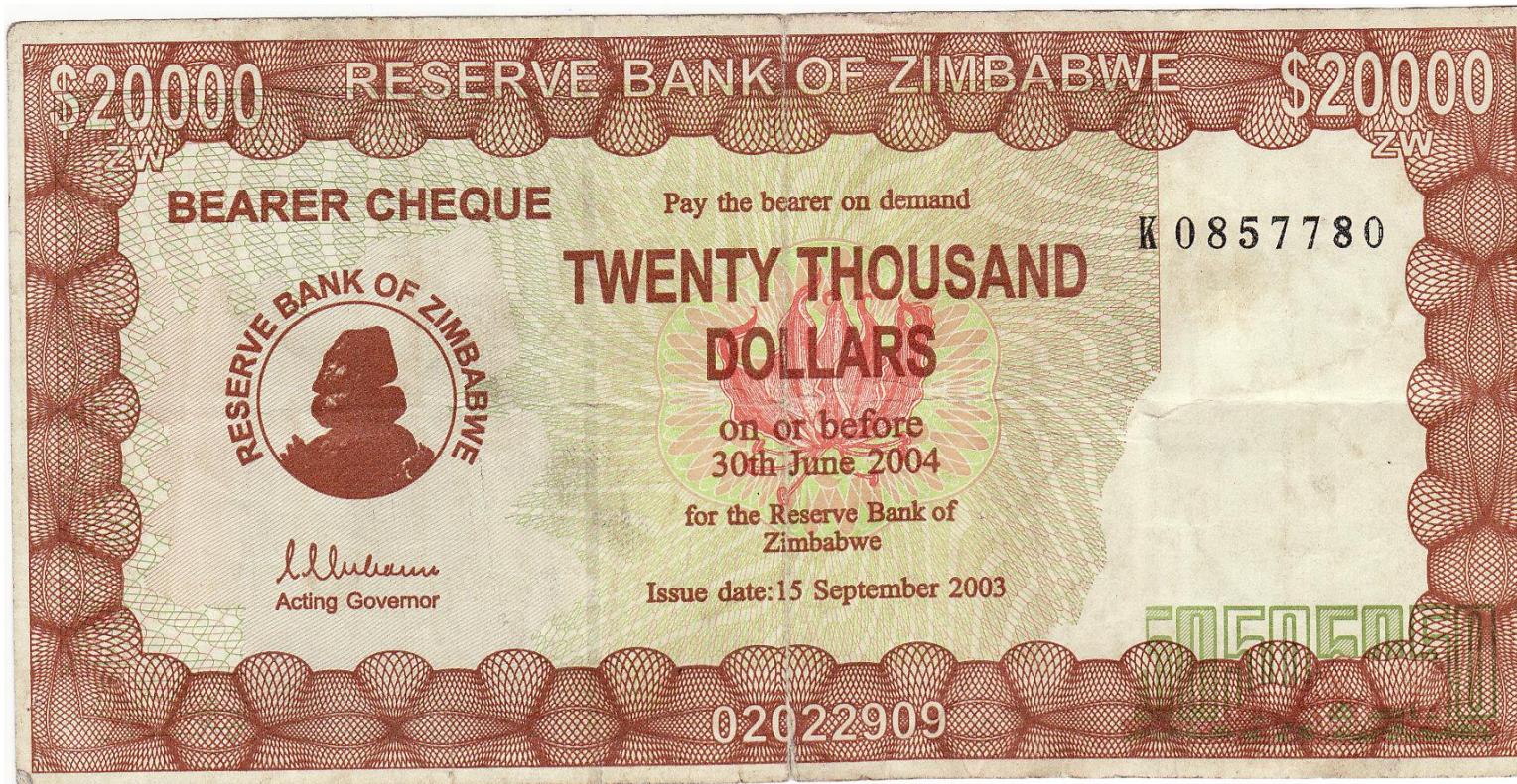


... all of this with dire results

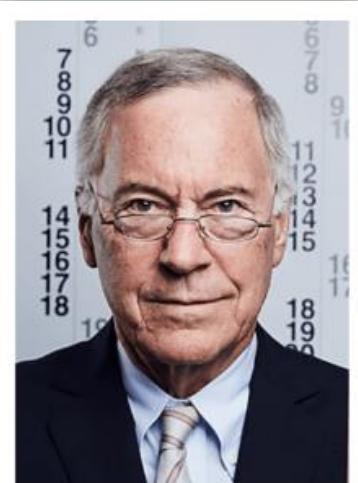


Adolf Hitler receives the adulation of a crowd on the evening he is inaugurated as Chancellor, January 30, 1933.

(Source: Wikipedia)



According to the 2008 CIA Factbook, Zimbabwe, with an unemployment rate of 80% and with 20% of the adult population identified as HIV-positive, had an inflation rate estimated to be 100,000% per year in 2007. Zimbabwe currently (2016) has an inflation rate of 1.6%



# Inflation in Venezuela.. as of 27Feb20

... estimated by Prof. Steven Hanke, *John Hopkins University* and the *Cato Institute*

<https://www.cato.org/research/troubled-currencies>



## Hanke Inflation Weekly

Country	Free-Market Exchange Rate	Date of Hanke Measurement	Hanke Annual Measured Inflation Rate <sup>1</sup>	IMF Year-End Inflation Projection <sup>2</sup>	Hanke - IMF Differential
Venezuela†	69,722.40 USD/VES	02/27/20	2,077%	200,000%	-197,923% pts.
Zimbabwe	29.90 USD/"dollars"	02/27/20	776%	182.9%	593% pts.
Syria	1045.00 USD/SYP	02/27/20	104%	N/A	-
Sudan	106.00 USD/SDG	02/27/20	81%	56.9%	24% pts.
Argentina	64.03 USD/ARS	02/27/20	68%	57.3%	11% pts.

Computed by Steve H. Hanke, The Johns Hopkins University.

<sup>1</sup> Hanke annual inflation rates are implied using PPP from free and black market exchange rate data.

<sup>2</sup> These are the International Monetary Fund's year-end inflation projections for 2019 as of the October 2019 World Economic Outlook.

† The redenomination ratio of Venezuela's new sovereign bolívar (VES) to old bolívar fuerte (VEF) is 1:100,000.

# How inflation is measured ..

- **Consumer Price Index (CPI)**
  - Measures “cost of living” for consumers
- **Producer Price Index (PPI)**
  - Measures input costs for manufacturers
- **Chain-weighted GDP Price Deflator**
  - Used to adjust GDP to real GDP
- **Employee Cost Index**
  - Used by FRS as early wage-cost inflation indicator
- **Personal Consumption Expenditures (PCE) inflation index**
  - Used by the FRS as their primary price indicator

# 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 2013, 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.

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

$$CPI_t = \frac{MBV_t}{MBV_b} \times 100$$

$$IR_t = \frac{CPI_t}{CPI_{t-1}} - 1$$

# Dec 2019 CPI category weights and Jan 20 values

**Table 2**  
**CPI and Weights for All Urban Consumers**  
**Weights CPI-U NSA, December 2019**  
**Index and Rate are January 2020**

Category	Weight	Index	Rate
All items	100	251.2	2.5%
Food and Beverage	13.8	256.4	1.8%
Housing	42.1	262.3	2.7%
Rent	32.7	325.6	3.8%
Owner equivalent	24.1	320.1	3.3%
Apparel	2.8	122.4	-1.3%
Transportation	15.7	202.6	2.8%
Gasoline	3.4	201.2	12.8%
Medical Care	8.8	490.2	4.5%
Recreation	5.8	120.7	1.4%
Education	3.0	263.1	1.5%
College tuition and fees	1.6	874.1	1.9%

Purchasing power of the dollar      \$0.398

**1982-84 = 100**

Rate shown is annual January 19 to January 20.

College tuition and fees are net of financial aid.

Source: BLS Economic News Release, 2/13/2020 Tables 1 and 3.

The weights are market basket weights. Note Medical. Other than tobacco (952.3), the highest disaggregated category is college tuition.

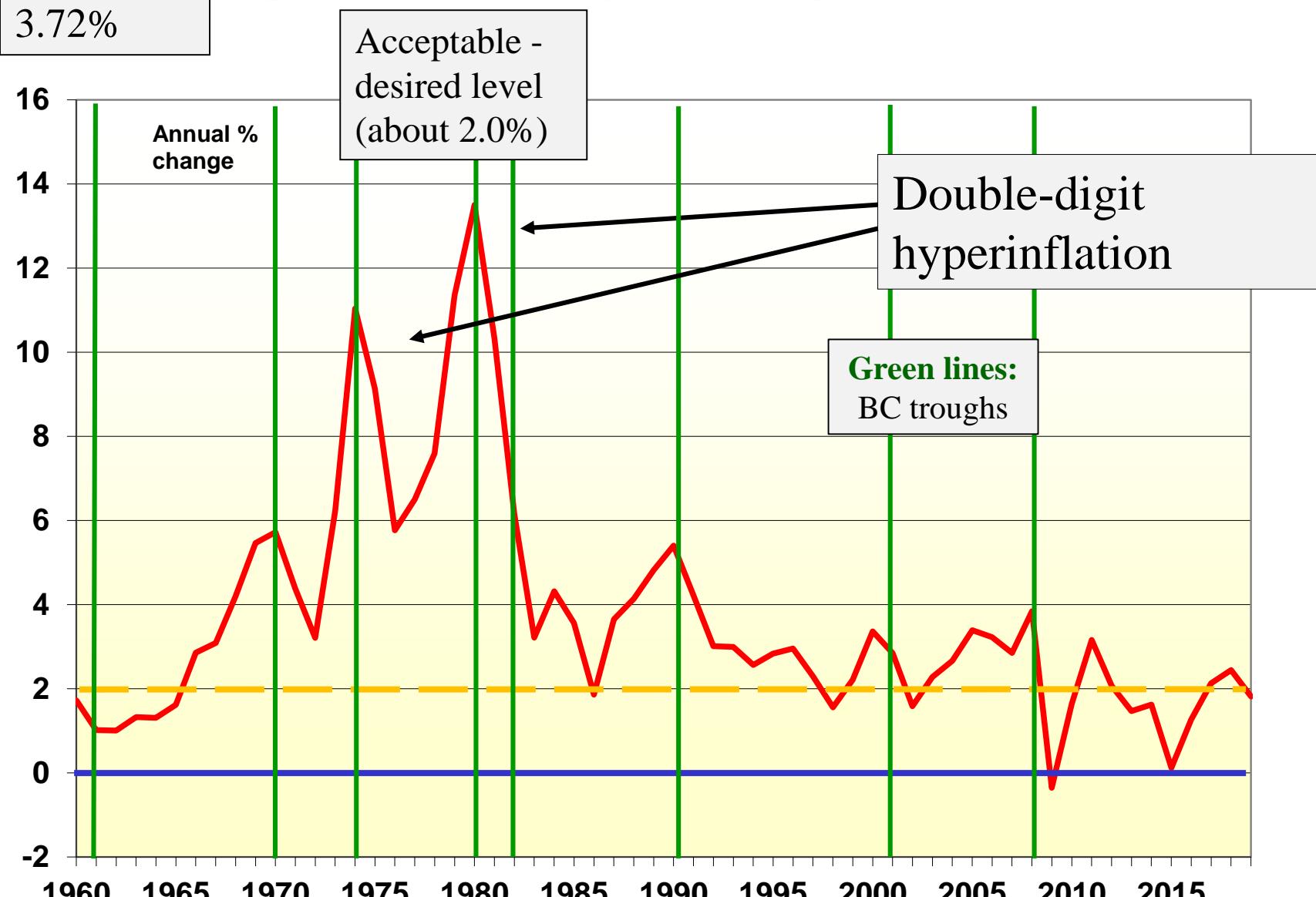
Current data can always be found by clicking on the most recent CPI news release on the front page of the BLS website.

Bananas: 0.078%

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

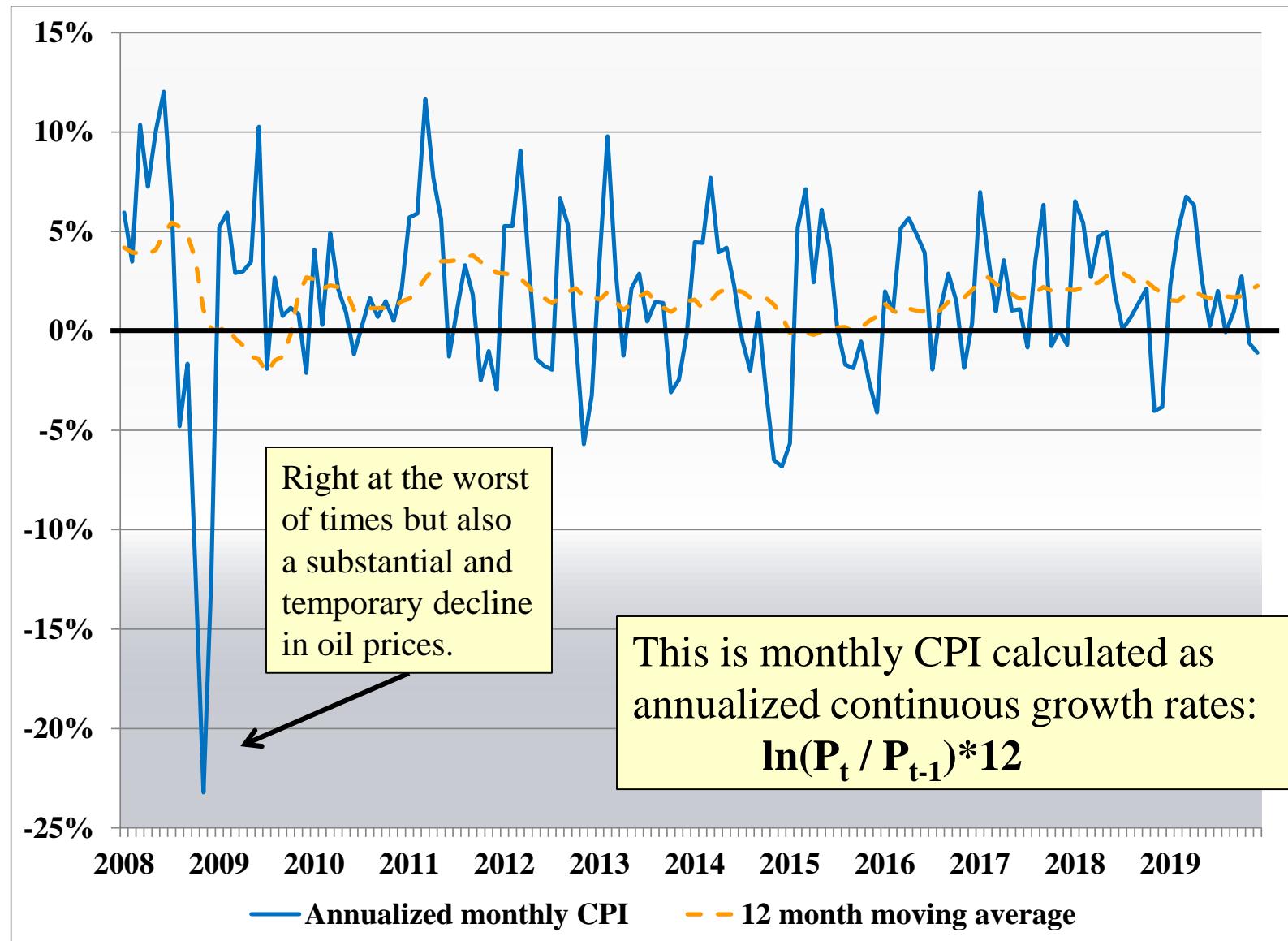
Average:  
3.72%

# CPI Inflation Rate: 1960-2019



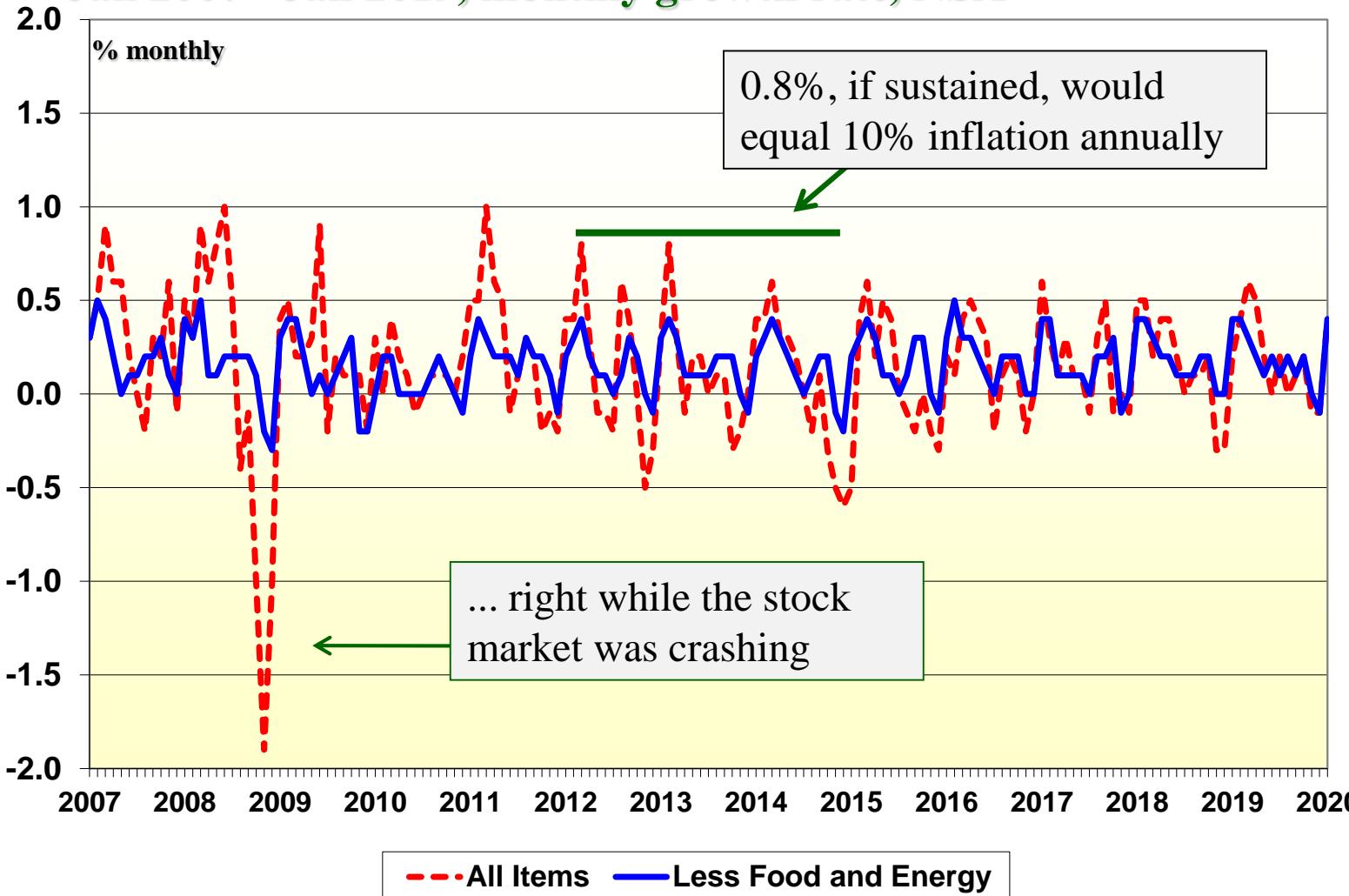
CPI for urban consumers, U.S. city average, all items, NSA. Source: Bureau of Labor Statistics

# 2019: Still a low-inflation era ...



# The CPI (all items) less food and energy (Core Rate)

Jan 2007 - Jan 2019, monthly growth rate, NSA

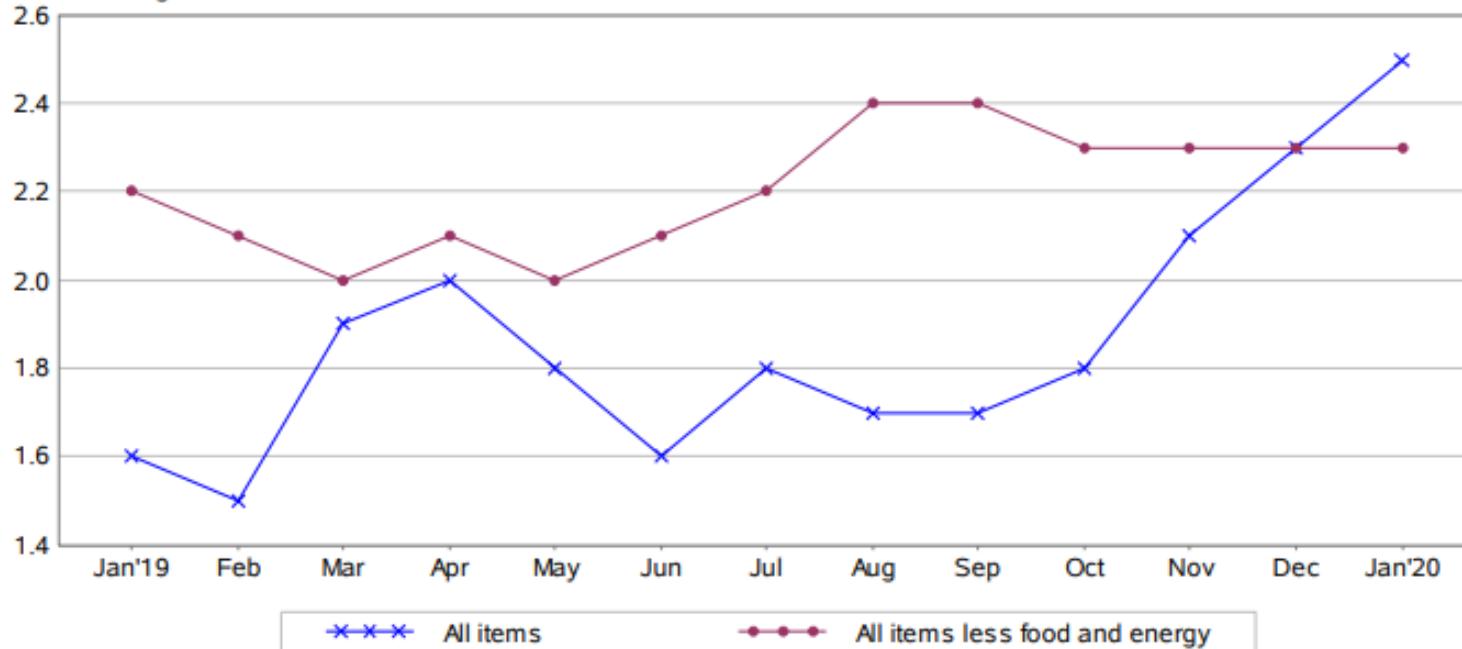


The core rate excludes food, and energy. The core rate is far less volatile. Energy and food costs explain why “all items” is higher, then lower.

Source: Bureau of Labor Statistics

# ... from the perspective of the BLS:

Chart 2. 12-month percent change in CPI for All Urban Consumers (CPI-U), not seasonally adjusted, Jan. 2019 - Jan. 2020  
Percent change



Due to declining fuel prices

Note how remarkably stable the core rate is compared to the all-items. This measures the 12-month (Dec to Dec, Jan to Jan etc.) so is automatically smoothed, whereas the data in the previous slide are month to month.

Source: BLS News Release, Consumer Price Index - January 2020, Feb. 13, 2020.

# 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.

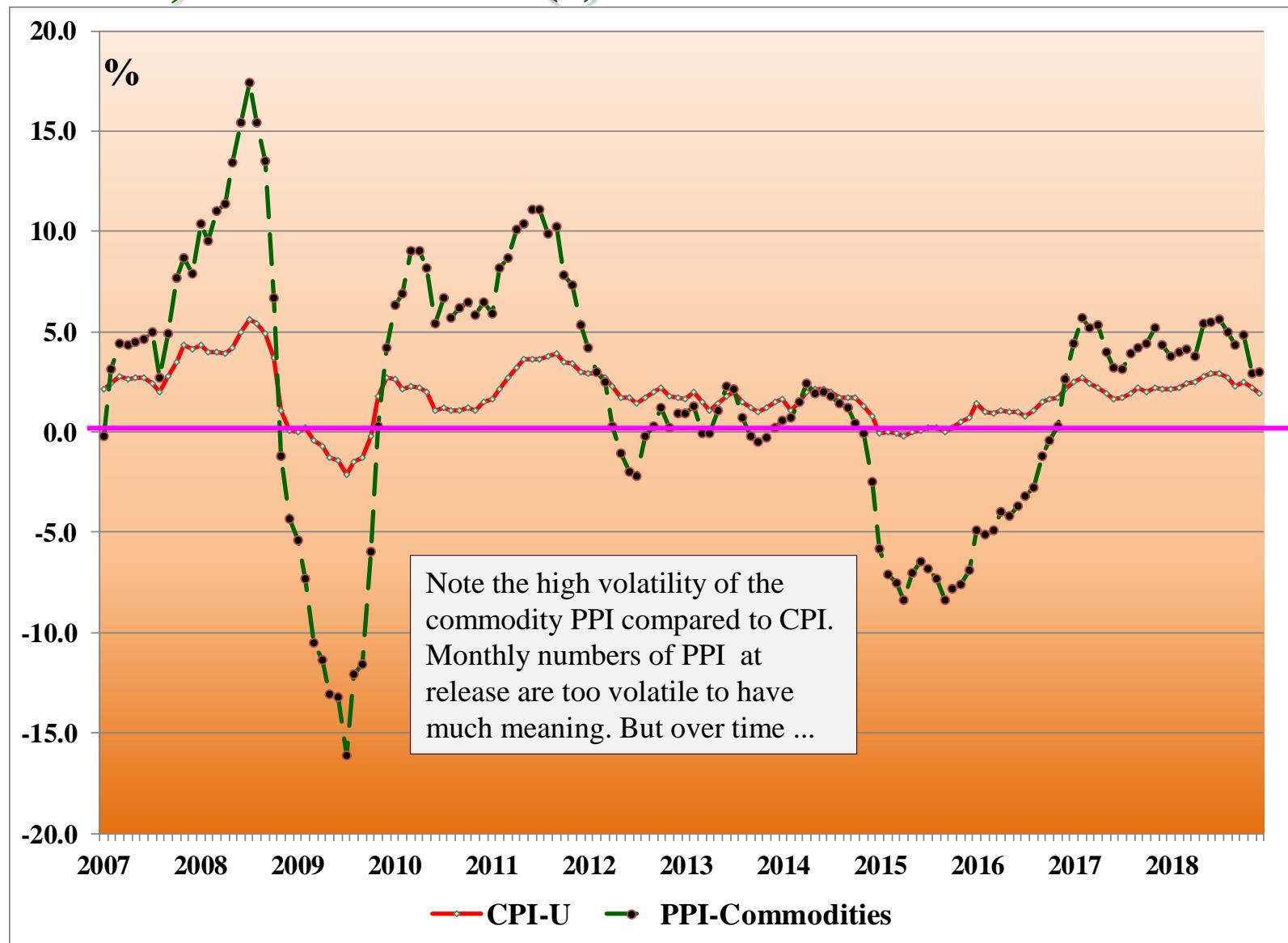
Currently, most PPIs have an index base set at 1982 = 100.

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>

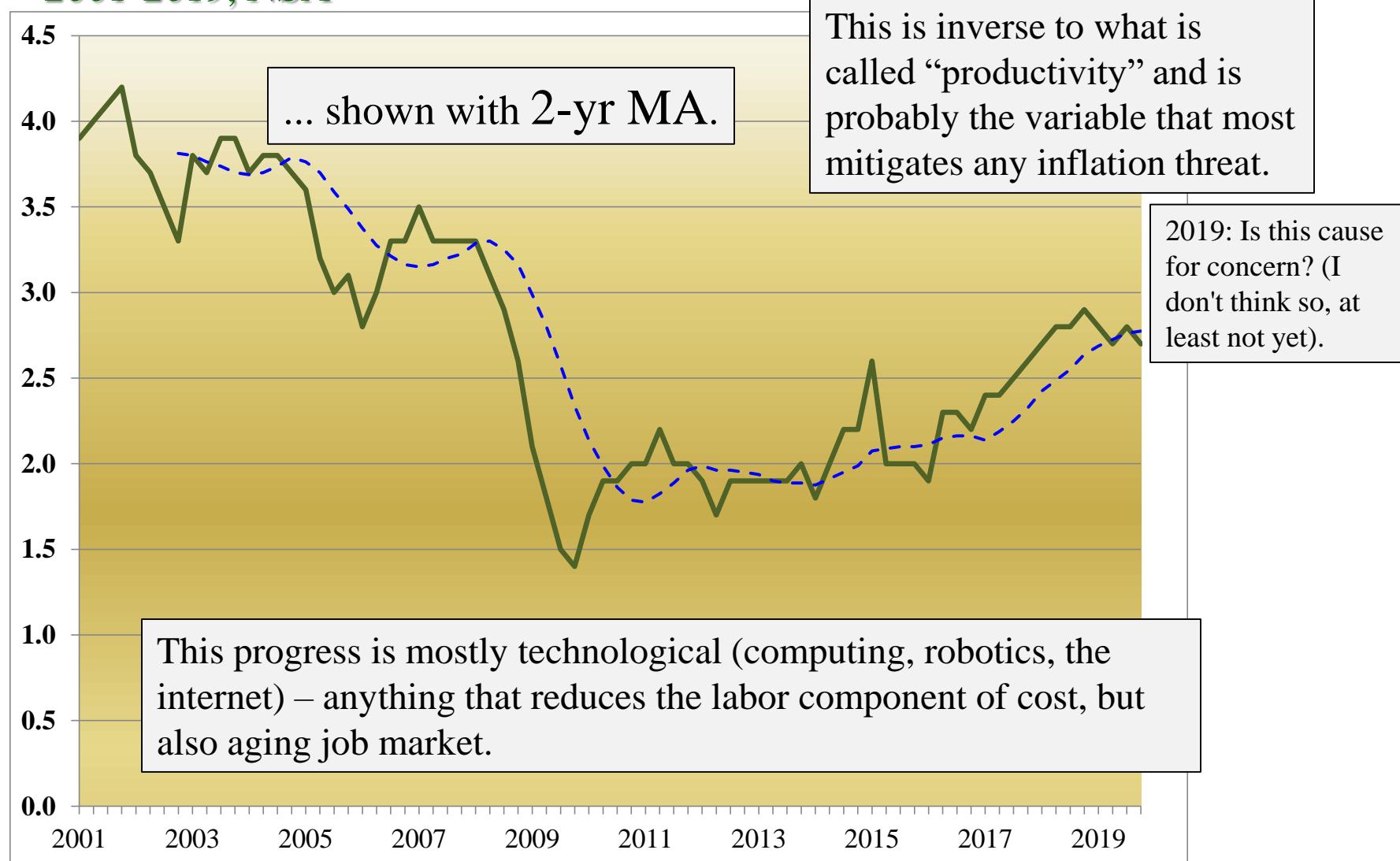
Note: Original source for this slide, which is mostly quoted, but since modified, was lost. It probably came from the BLS.

# Commodity PPI vs. CPI-U, monthly @ annual rates, 2007-2018 (f) NSA

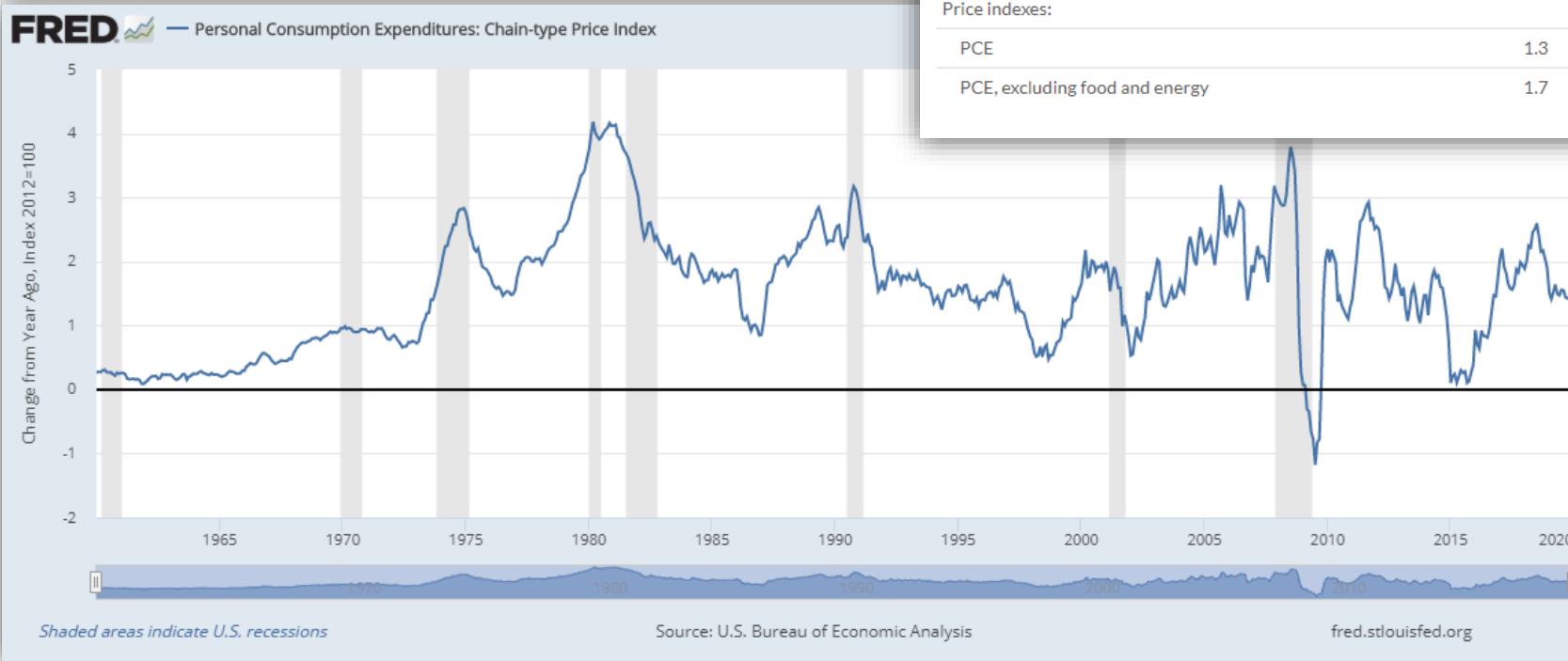


# BLS Employment Cost Index

Total compensation, all civilian, annualized % change, quarterly,  
2001-2019, NSA



# The recent FRS inflation indicator .. the chain weighted price index for Personal Consumption Expenditures from the NIPA accounts



	2019					2020
	Sep.	Oct.	Nov.	Dec.	Jan.	
Percent change from preceding month						
Personal income:						
Current dollars	0.2	0.1	0.5	0.1	0.6	
Disposable personal income:						
Current dollars	0.3	0.0	0.4	0.1	0.6	
Chained (2012) dollars	0.3	-0.1	0.4	-0.1	0.5	
Personal consumption expenditures (PCE):						
Current dollars	0.2	0.2	0.3	0.4	0.2	
Chained (2012) dollars	0.2	0.0	0.2	0.1	0.1	
Price indexes:						
PCE	0.0	0.2	0.1	0.3	0.1	
PCE, excluding food and energy	0.1	0.1	0.1	0.2	0.1	
Price indexes:						Percent change from month one year ago
PCE	1.3	1.3	1.3	1.5	1.7	1.7
PCE, excluding food and energy	1.7	1.6	1.5	1.5	1.6	1.6

Personal Income and Outlays, January 2020, BEA news release, Feb. 28, 2020

# 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

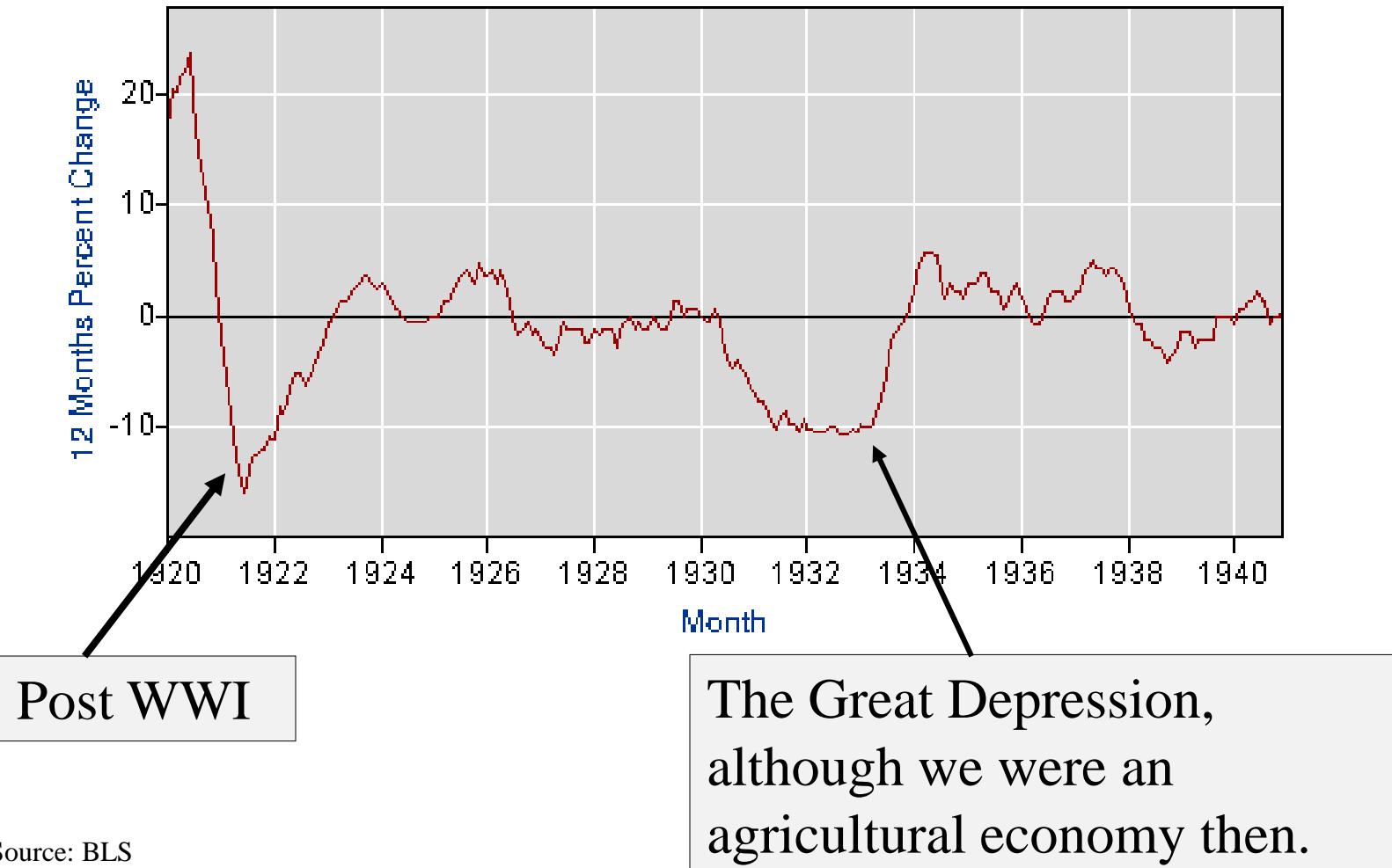


# Costs of Deflation

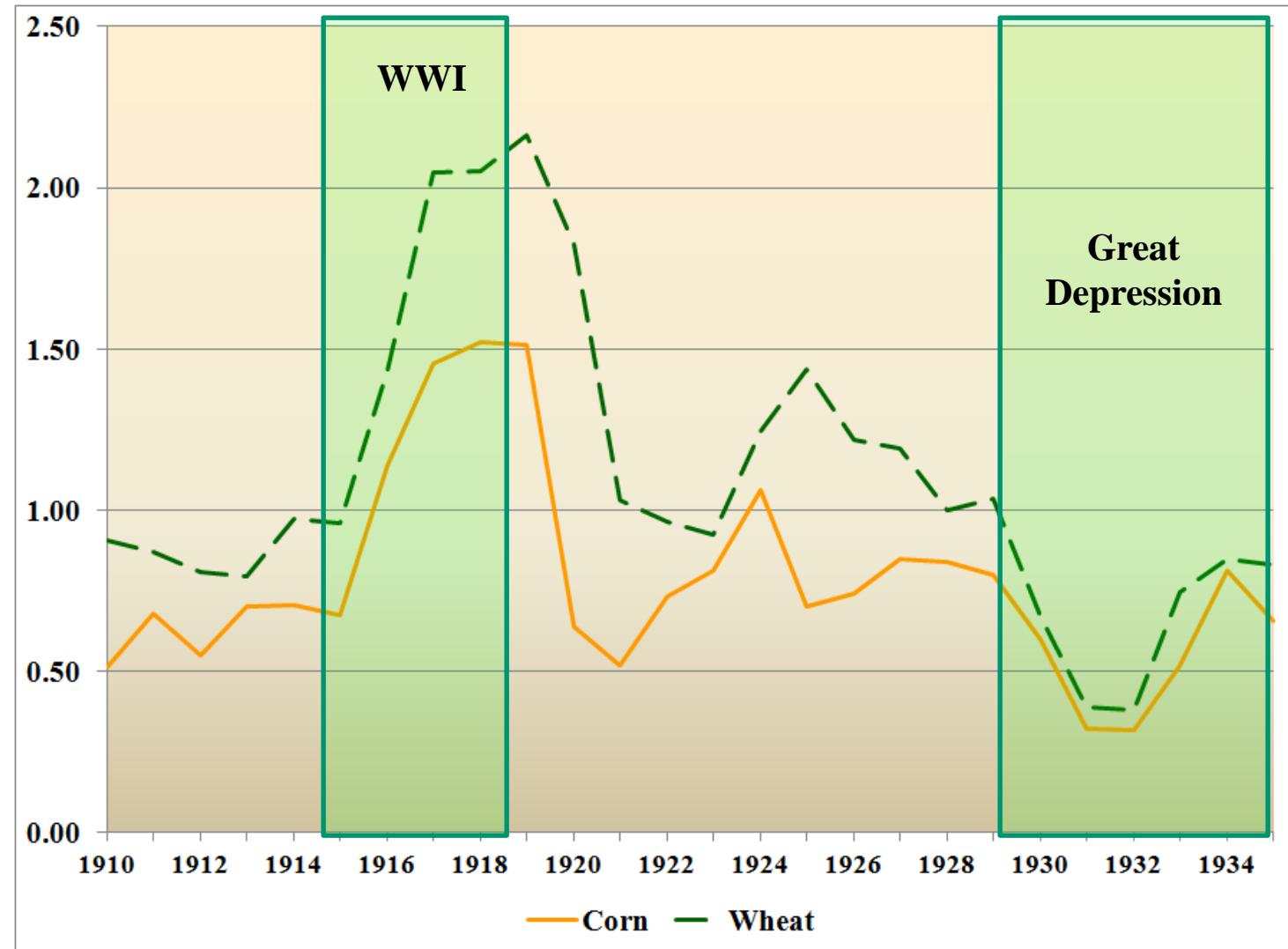
- Effects during Great Depression
  - Made loans impossible to pay
  - Destroyed banking structure
  - Resulted in 1933 Roosevelt Banking Holiday
- Generally undermines any economy with large levels of debt contracts in nominal (nor adjusted for prices) amounts
- Today a problem in commodity exporting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

# Deflation during the Great Depression

CPI annualized monthly rates, 1920 to 1940



# The Price of Corn and Wheat during WWI and the Great Depression, \$ per bushel, U.S. annual national average



Source: Historical Statistics of the United States 1789-1945, published by the U.S. Department of Commerce, Bureau of Census

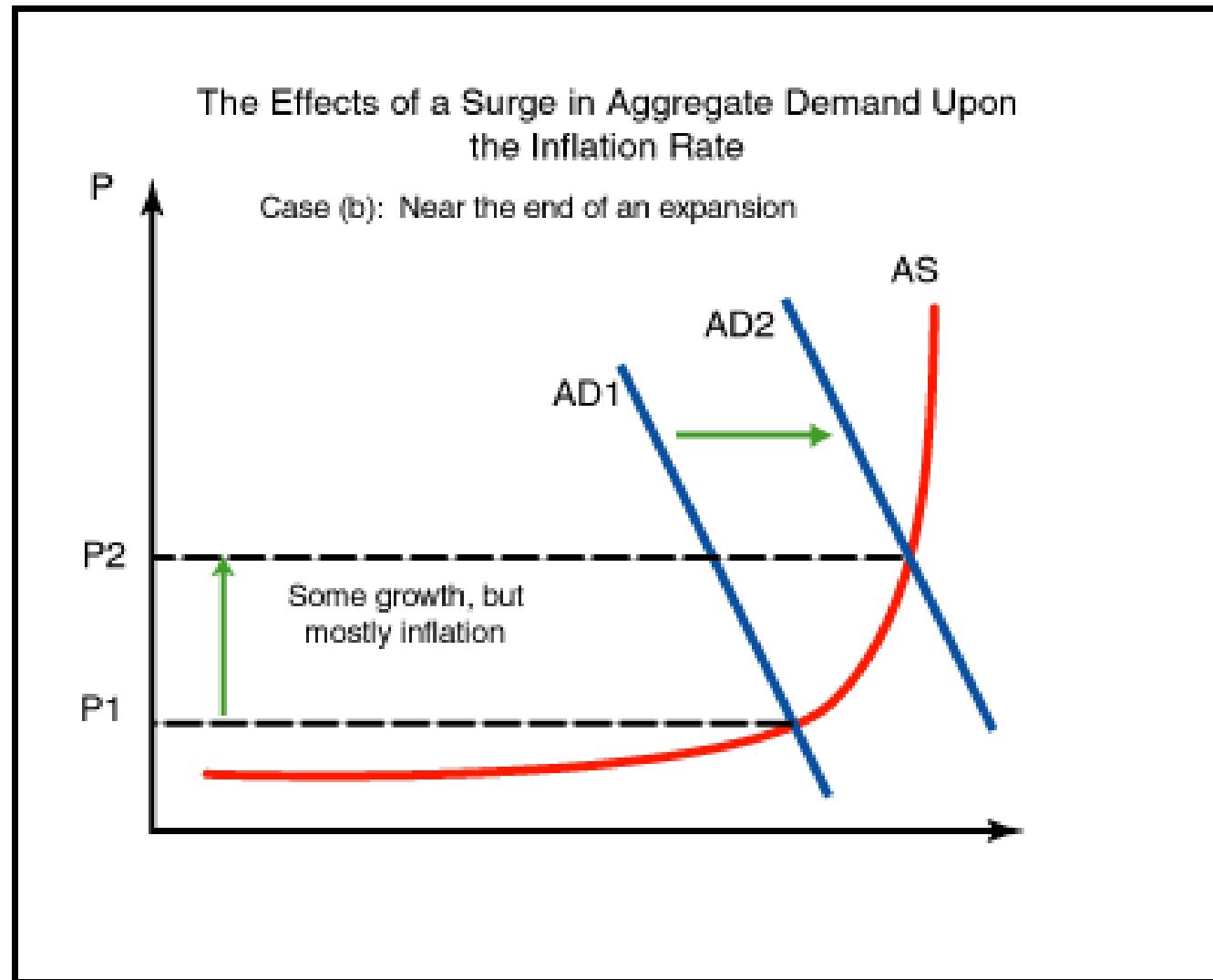
## Deflationary Fears: Context 2016

- (From Japan): Corporations in a deflationary environment find it more profitable to hoard cash at very low nominal rates (1%), but real 2% if deflation is 1%, than to put the money at risk creating capital goods that will manufacture commodities that will fall in value,
- (From Europe): The all-important real estate and possibly durable goods sales will tumble with deflationary expectations.
- Corporations generally do not like a deflationary environment, especially if they have stick wage contracts.
- Deflationary expectations puts relentless downward pressure on nominal interest rates, even pushing them into negative territory (shown below).

# Theories of inflation (a review)

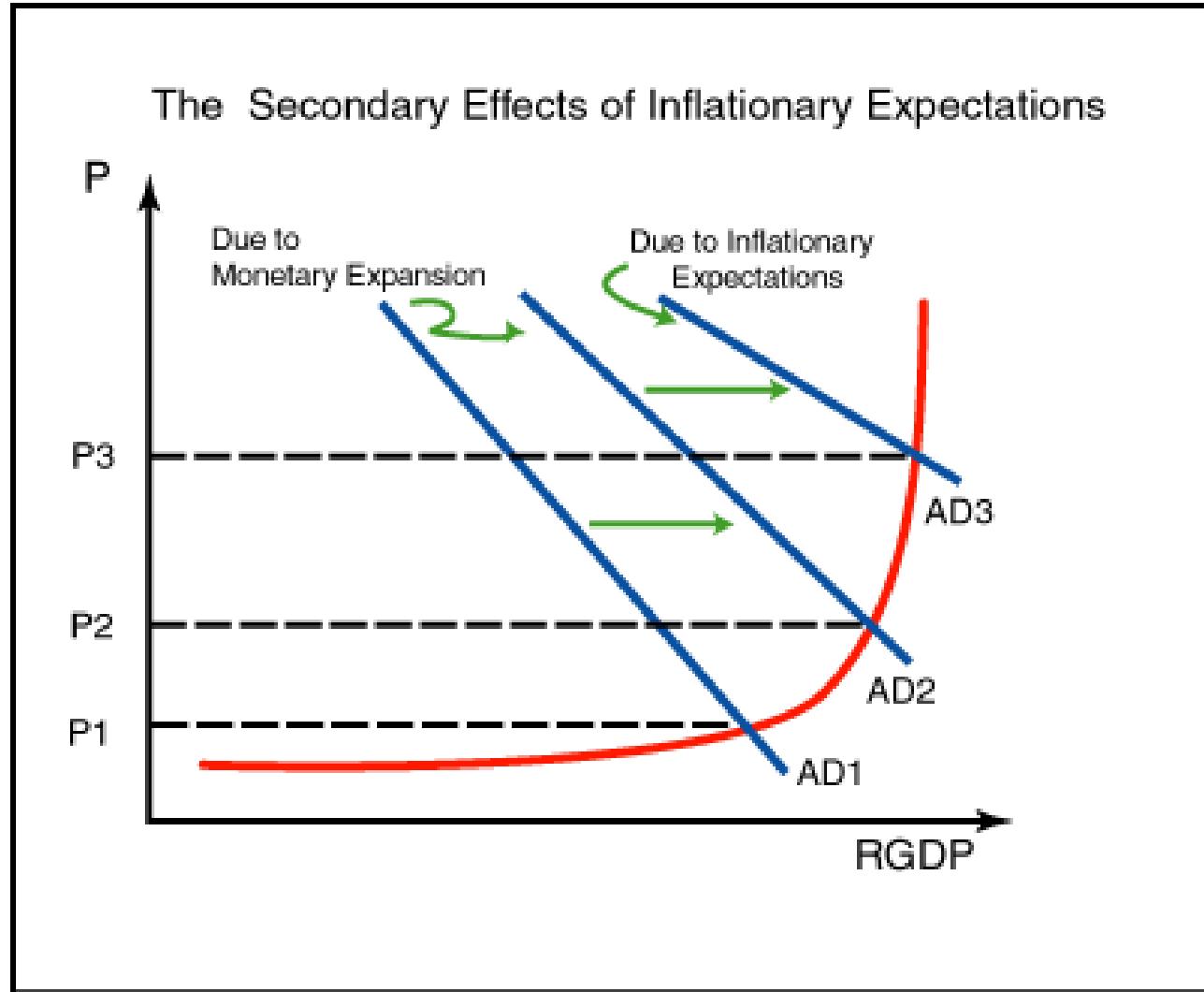
- Aggregate Supply/Aggregate Demand
  - Inflation can be demand pull or cost push
  - Impact of variables depends upon context
  - Inflation tends to get worse automatically
- Loanable funds model
  - Inflation and interest rates are correlated
  - To cure inflation, interest rates must rise

# Reminder .. what we learned when modeling



The inflationary effects of any surge in aggregate demand depends upon context ...

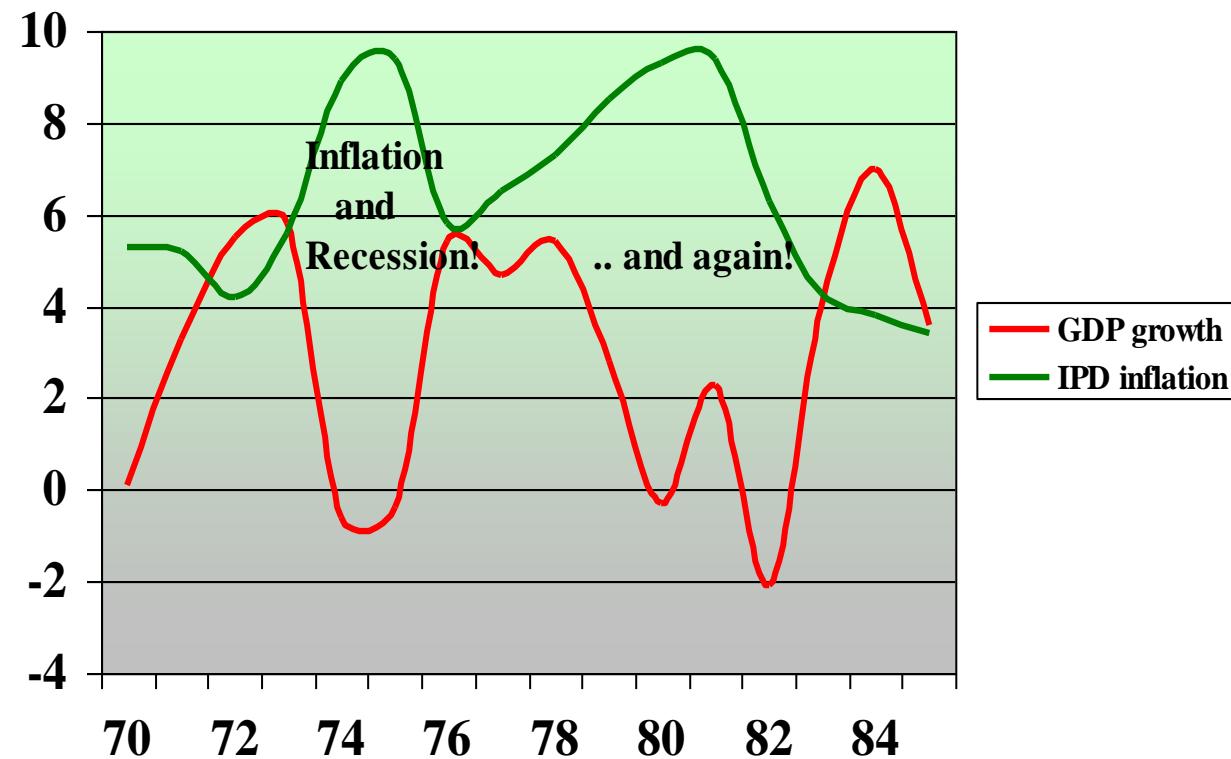
# Reminder .. what we learned when modeling



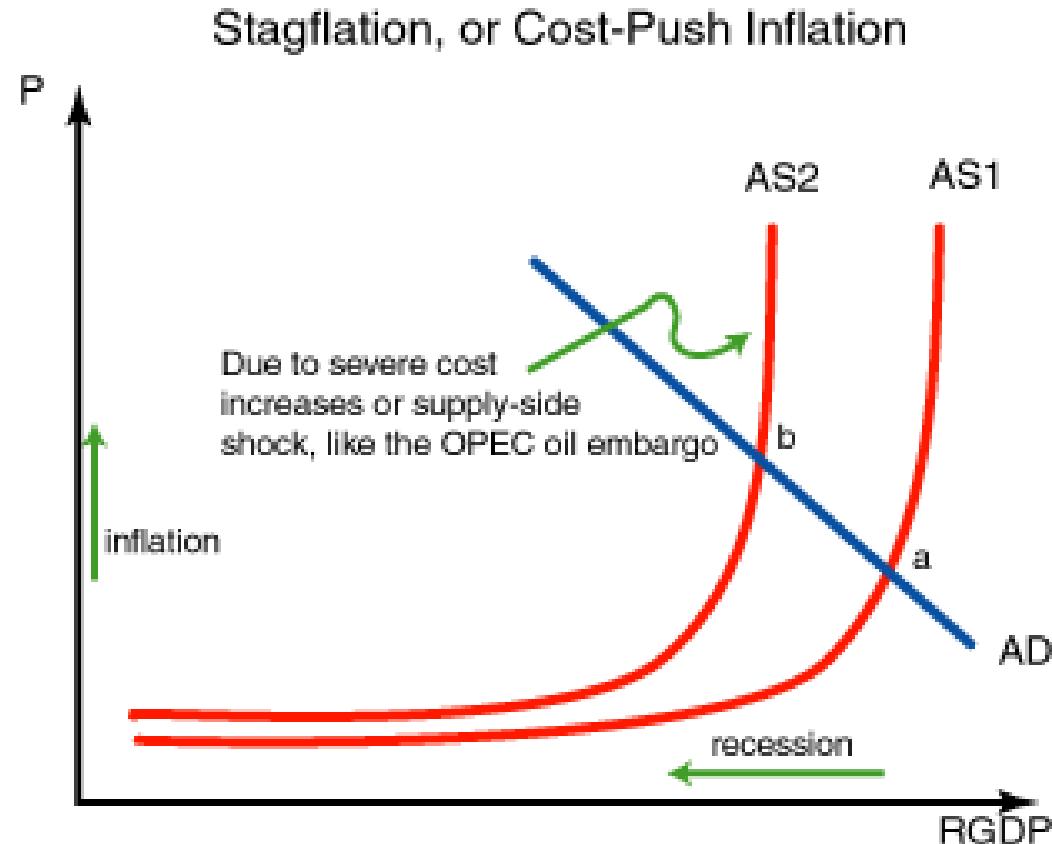
... but once into the inflationary region of the AS curve, then the presence of adaptive expectations makes the inflation worse ... compounds it.

# Inflation and Recession!

How to we explain this?

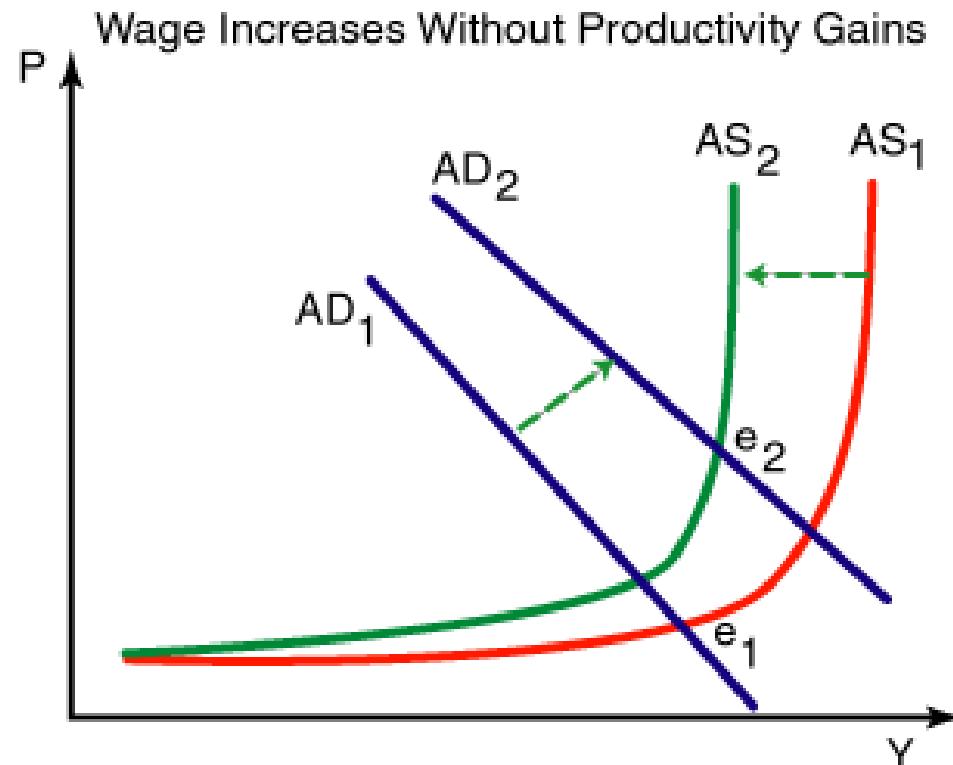


# Reminder .. what we learned when modeling



Severe cost inflation in key commodities or labor can push aggregate demand backwards, producing the worst possible combination ... inflation with recession. This is a more likely problem for small economies reliant upon import-export trade subject to currency swings, but can happen even in large economies.

# Reminder .. what we learned when modeling

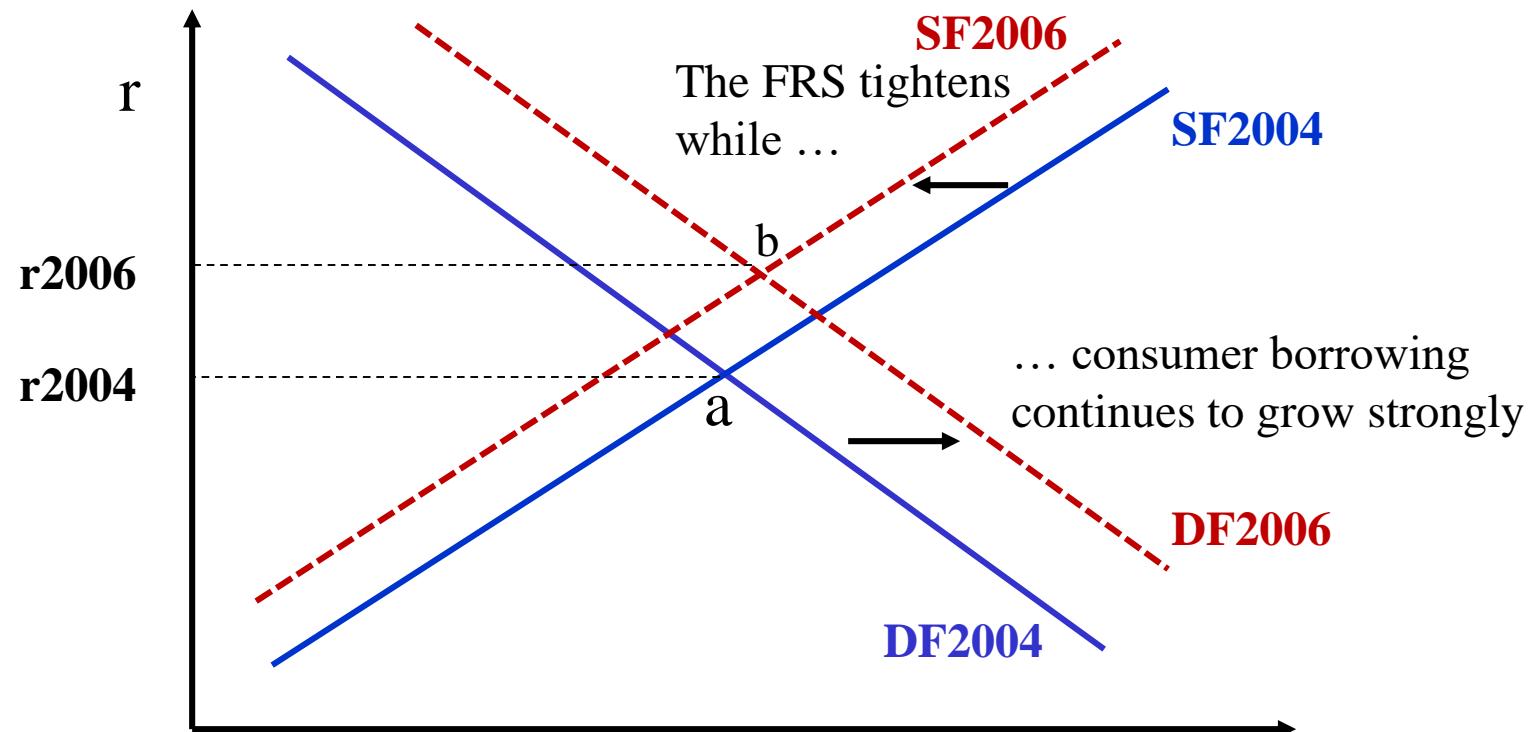


I used to call this the “European problem” because of the power of labor unions to enforce wage gains that cannot be paid for, but that reflects political bias. This is an example of “bad socialism” but is not emblematic of all socialist experiments.

# 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”

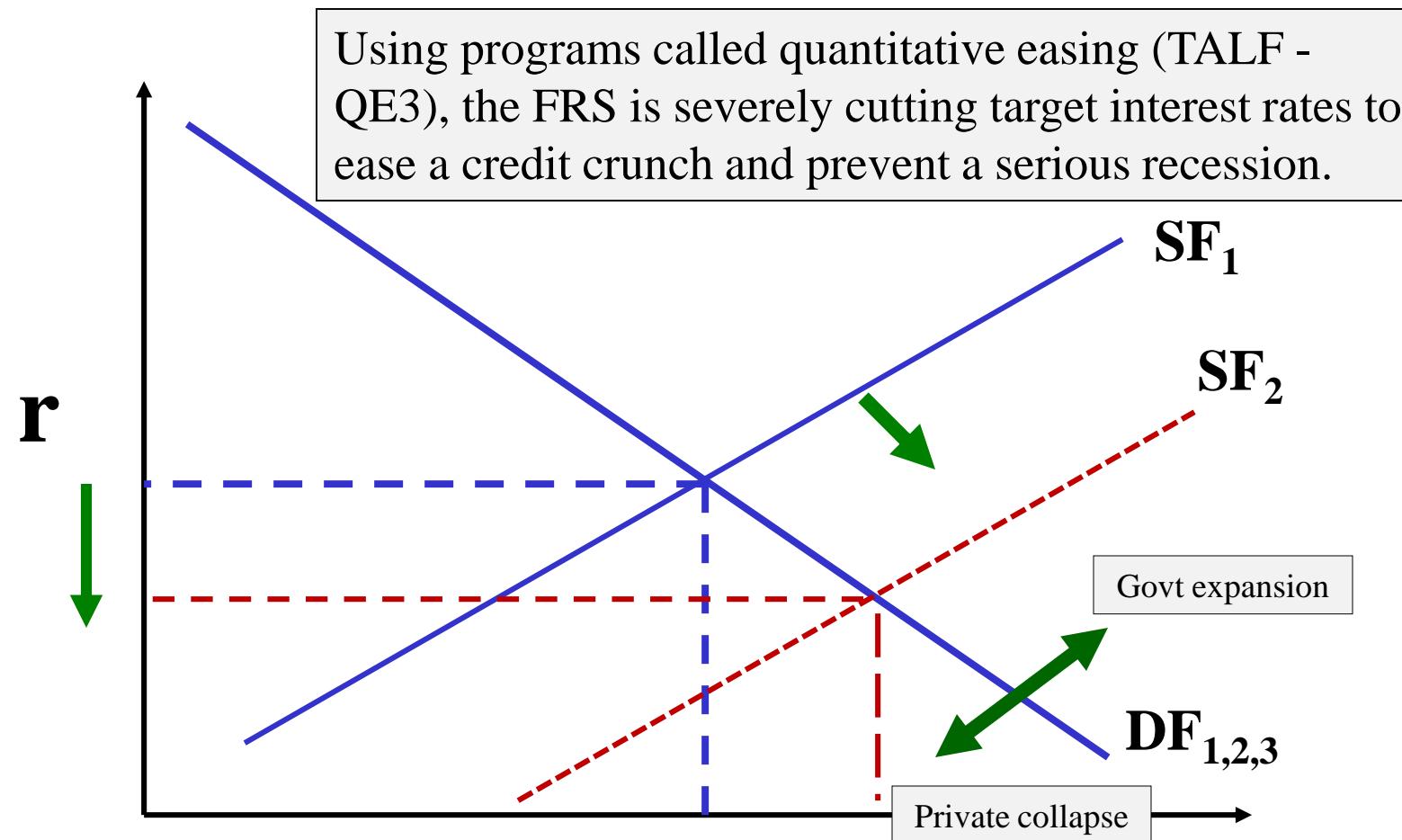
# The 2004-2006 FRS tightening



The last FRS anti-inflation policy was during this period. We tried to restore this policy (with less emphasis) in 2014, but that failed.

Volume of Credit

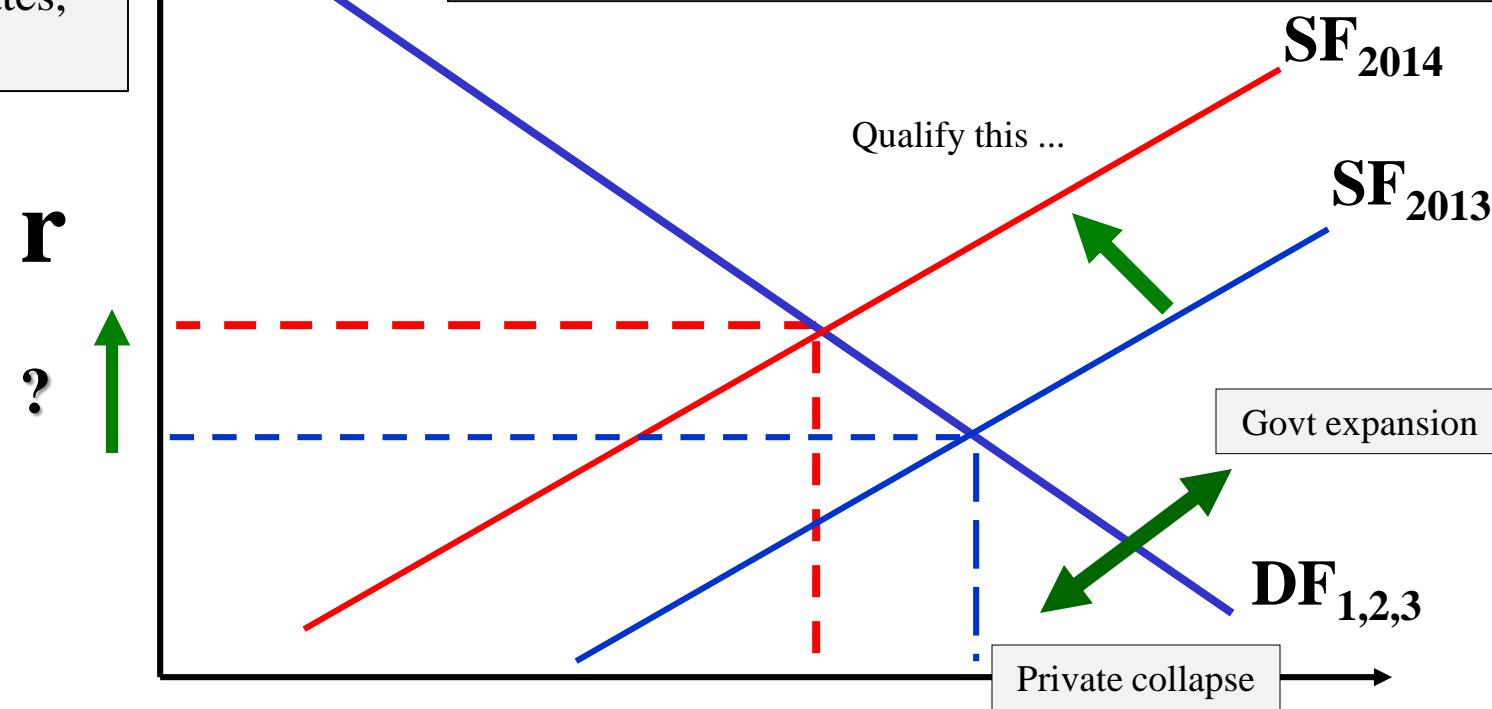
# Quantitative Easing Programs (2007-2014)



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<sub>1,2,3</sub>**.

# 2014: Tapering/Ending of QE3

In 2015, FRS promised to slowly raise interest rates, but ....!!

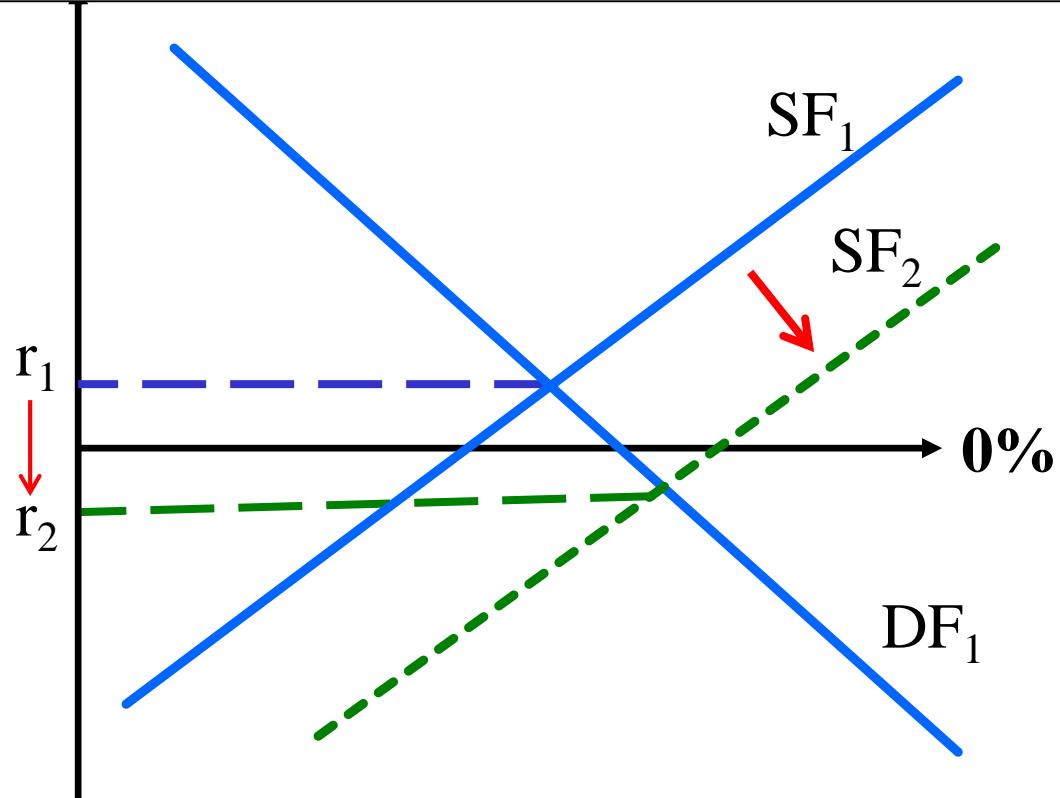


QE3 purchased \$45b U.S. Treasuries and \$40b mortgages monthly. The first taper reduced that by \$5b each monthly, the second taper by another 5, program ended in Nov 2014, kind of ...

The government demand for funds is falling (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,

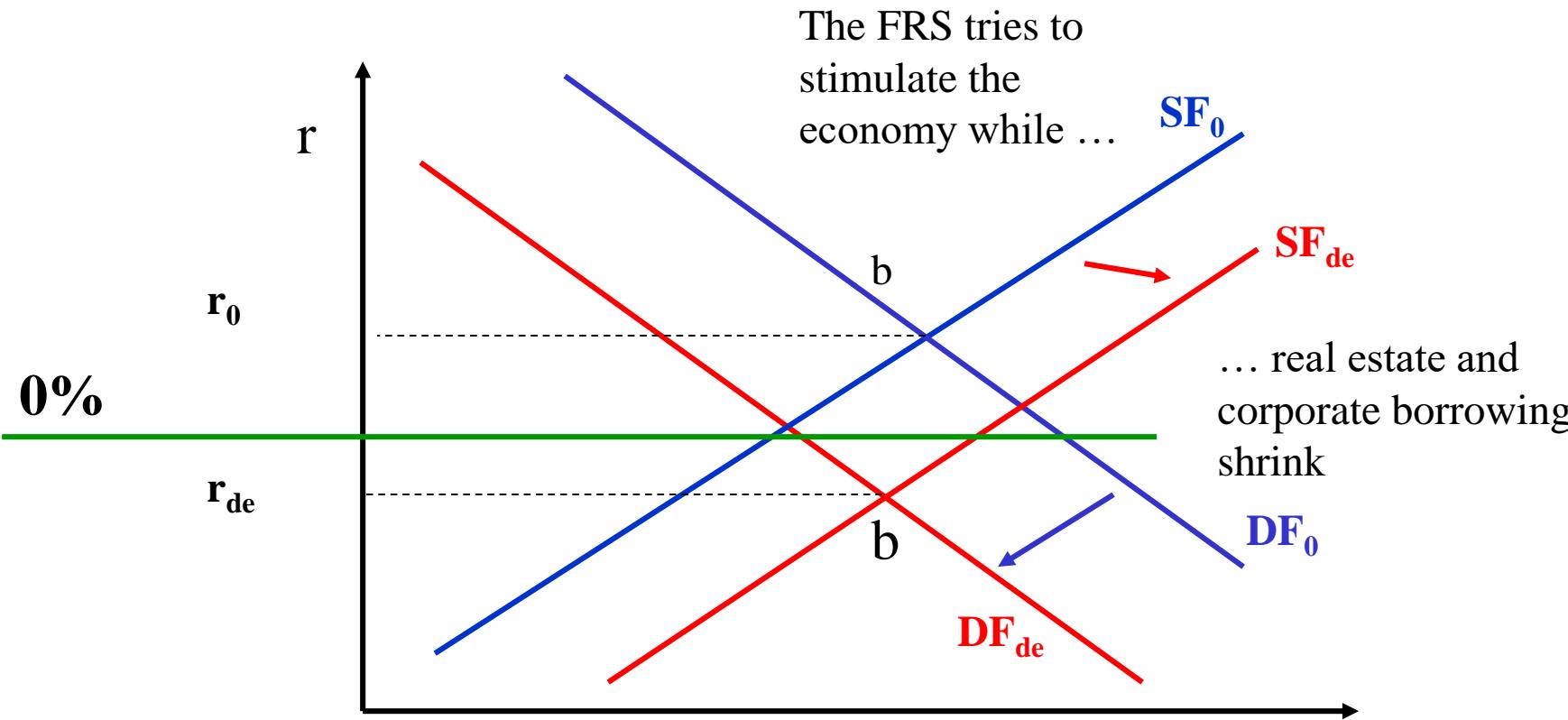
# Negative Nominal Interest Rates by Central Bank Policy!

In this scenario, a central bank like the Bank of Japan, the European Central Bank or the Federal Reserve System increases the supply of funds until targeted nominal market rates are negative.



If you made a deposit in a bank account, the balance would gradually go down. If you bought a bond, you would owe periodic interest payments **to** the borrower (perhaps implicitly).

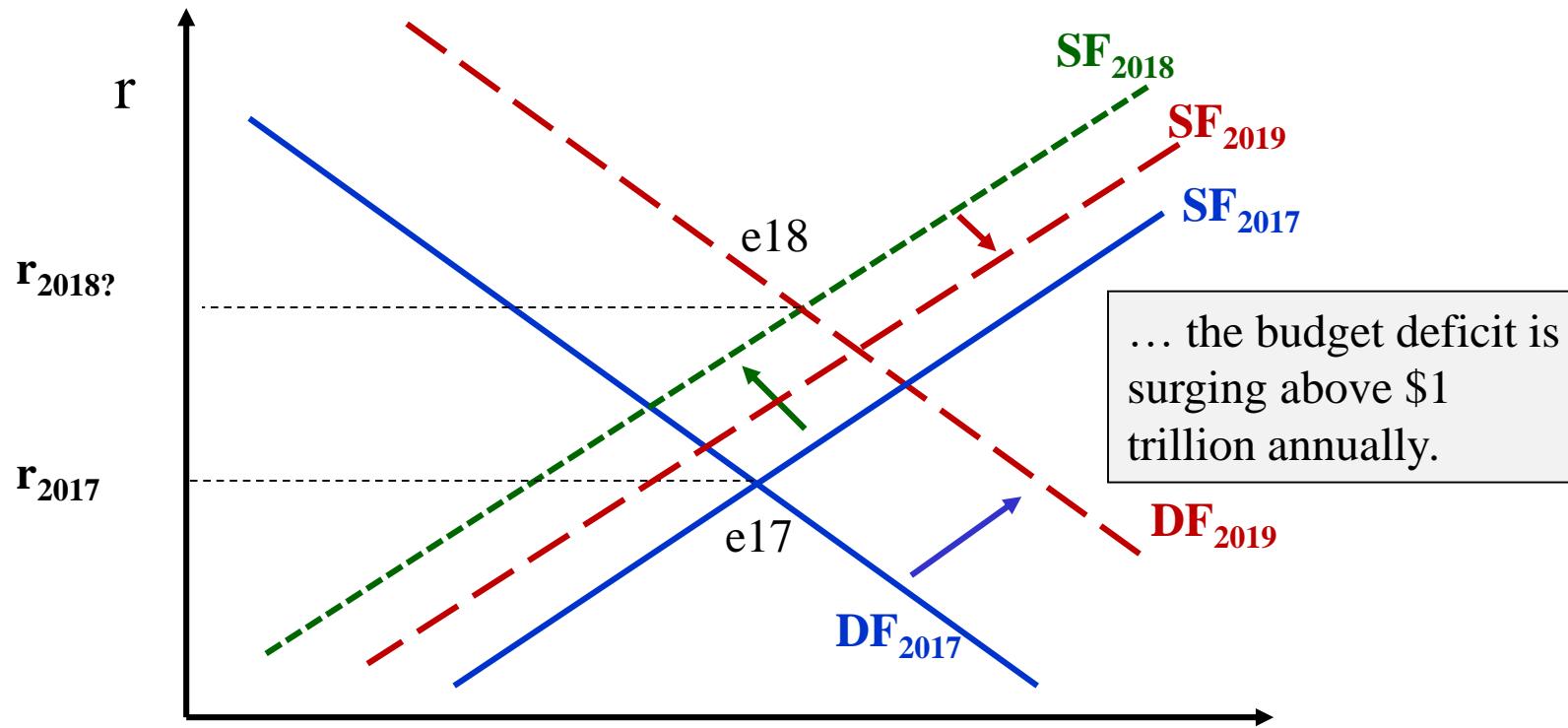
# Possibly compounded by the impact of deflationary expectations upon nominal interest rates ...



The central bank tries to stimulate the economy back to life as corporations hoard cash while credit demand for real estate etc. sinks (who wants to buy a home in a declining real estate market)?

# Context 2018-20: Fiscal side cuts taxes and increases spending while the FRS tightens ... or doesn't!!

The FRS wanted to raise rates slowly but about two months ago suspended that activity...



The shift outward in the DF is already underway and unavoidable. The FRS stated that they want to tighten and raise rates. [Note: DF is so large the FRS can actually increase funds and still raise rates].

Volume of Credit