## Lecture 3: The Big "3" Economic Activity Variables

Economic forecasters differ from seers and clairvoyants. Generally, forecasters' visions have to do with the outlook for material progress. The focus is on a subset of human endeavors. Economic forecasters care about the dynamics of human interaction, only to the degree that money exchanges hands. Forecasters charged with the task of generating opinions about the overall shape of things to come, care about aggregations of economic interactions. Macroeconomic theory and macroeconomic data combine to define the world for most economic forecasters.

Again, the focus of concentration is on economic interactions.
The proverbial zany college sophomore who drives fellow students into uproarious laughter by breaking beer cans over his forehead, no doubt generates much psychic income for his buddies. He is, however, invisible to an economist. John Belushi, in contrast, received millions, and millions have paid real money to watch him bend beer cans round his head in *Animal House*. His comic efforts continue to register in economic statistics, notwithstanding his untimely death in 1982.

More formally, economic activity involves the creation, transformation, and distribution of things of value. Lawyers define consideration, the exchange of dollars, as "evidence of intent to contract". For economists, the exchange of things of value puts the human interaction onto their radar screen.

To generate an opinion about overall economic activity, some profound level of simplification needs to be performed. Macroeconomic statistics summarize millions of economic interactions. Macroeconomists—in an attempt to conquer—aggregate, multiply and divide.

For our purposes, three macroeconomic aggregations will suffice. A measure of the overall flow of an economy's output, an estimate of the change in the overall level of prices, and a snapshot of the economy's jobs market will provide us with a barebones model of the economy.

### REAL GROSS DOMESTIC PRODUCT (GDPR)

In macroeconomics, job #1 is to calculate an estimate for the combined production of the overall economy. The ideal aggregate output measurement serves as a report card for the economy, and can profoundly influence policy makers, financial markets and Main Street decision makers. Gross domestic product (GDP), the dollar value of the flow of all final goods and services, occurring over a specified time period, is close to that number. We estimate this figure by combining expenditures on these goods and services by consumers, businesses, government and foreigners. Increases in dollars spent, however, may reflect increases in output or price increases. Real gross domestic product (GDPR), removes the effect of price changes from the changes in GDP, and gets us to an estimate of the flow of output.

GDP is a flow of dollars—how much is spent on autos.
GDPR is a flow of output—how many autos are produced.

GDP, the dollar value flow of all finished goods and services, is a fantastically useful aggregation. The sum of the dollar value of all final goods and services produced also provides an estimate of two other critically important aggregates:

The *value added* of all intermediate and final goods and services.
The $ payments made to all economic entities involved in production.

Imagine an economy solely in the business of the manufacture and sale of rocking chairs. As the spread sheet below details, the 100$ sale price for the economy's only final product—the rocking chair—equals the total value added from each part of the production process, *and* equals the total income collected by economic entities in this economy.

| | Value Added | Finished Product Selling Price | Total Income Payments = | Wages + | Rents + | Interest + | Profits |
|---|---|---|---|---|---|---|---|
| **Alpha Lumber Company** | $10 | $10 | $10 | $8 | $1 | | $1 |
| **Beta Furniture Factory** | $60 | $70 | $60 | $55 | | | $5 |
| **Gamma Retailer** | $30 | $100 | $30 | $20 | $2 | $3 | $5 |
| **Totals** | $100 | | $100 | $83 | $3 | $3 | $11 |

Thus GDP, although it exclusively measures finished goods and services, completely captures the net contributions of intermediate producers. In addition, total dollars spent on finished goods and services equals the total dollars collected by economic agents involved in the production of economic output (note: economic agents are called factors of production).
More formally, dollars spent on output equal dollars of income collected.

Again, GDPR, GDP with the effect of price changes removed, is the most complete measure of aggregate output.

Other measures, closely related to GDPR, come at the question of aggregate activity measurement from slightly different vantage points. The box below provides a look at the some of these other measures and at how they are related to GDPR and GDP.

| |
|---|
| **Gross Domestic Product** (Flow Of Dollars On U.S. Soil) |
| |
| **Plus**: Income Receipts From The Rest Of World (IBM Profits Earned In Europe) |
| |
| **Less**: Income Payments To The Rest Of World (U.S. Government Interest Payment To Chinese Owners Of Treasuries) |
| **Equals: Gross National Product** (Flow Of Output To U.S. Citizens/U.S. Companies) |
| |
| **Less**: Consumption Of Fixed Capital (Depreciation) |
| |
| **Equals: Net National Product** |
| **Less:** Statistical Discrepancy |
| |
| **Equal: National Income** |

Key Point:
In theory, output = income.
To get to a comparable measurement, we first go from GDP to GNP.
Gross National Product includes investment simply made to replace obsolete capital. We adjusted for investment used to replace aging capital by subtracting the consumption of fixed capital (depreciation).
Net national product, the resulting figure is in theory, is a better number, BUT HARD TO MEASURE!

NNP equals NATIONAL INCOME, in theory.
The two series, however, are estimated using completely independent source data.
Therefore, they never add up to the same figure in practice.
The statistical discrepancy is the plug factor used to square the circle:

**NNP – STATISTICAL DISCREPANCY = NATIONAL INCOME**

GDPR aggregates expenditures by consumers, business, and government on final goods and services. The box below details the composition of GDPR.

| |
|---|
| **Personal Consumption Expenditures** |
| Durable Goods (Cars, Household Durables, Computers) |
| Nondurable Goods (Food & Clothes) |
| Services (Travel, Entertainment, Imputed Costs Of Home Ownership) |
| |
| **Gross Private Domestic Investment** |
| Fixed Investment |
| Nonresidential |
| Structures (Factories, Office Building) |
| Equipment & Software (Forklifts, Computers, Software) |
| Residential (Homes, Apartments) |
| Change In Private Inventories (End Of Period To End Of Period) |
| |
| **Government Consumption Expenditures & Gross Investment** |
| Federal |
| National Defense |
| Nondefense |
| State & Local |
| |
| **Net Exports Of Goods & Services** |
| Exports |
| Goods |
| Services |
| Imports |
| Goods |
| Services |

National Income =

Labor Compensation: wages, bonuses, exercised employee options
Rents
Interest income
Dividends
Proprietor's income
Corporate profits

**Real World Approximations**

The Bureau of Economic Analysis (BEA) of the Department of Commerce (BEA) provides both annual and quarterly estimates of GDPR, and the related aggregates and components listed in boxes 1 and 2. BEA estimates the flow of expenditures on goods and services by consumers, businesses, governments and foreigners. In late January, the BEA provided an estimate of the annual GDPR for the previous year. In January of 2011, BEA estimated 2010 GDPR to be $13.248 trillion.

Recall, GDPR and its related measures and component parts are all flow estimates. Thus 2010 GDPR = $13.248 trillion means;

> In the calendar year 2010, the value of all final goods and services produced, in constant prices, equaled $13.248 trillion.

If an economist states, in 2010, the U.S. economy expanded by 2.9%, shehe will be referring to the year-over-year change. This number provides a comparison of the average flow of output in one year, to the performance one-year back.

BEA also provides quarterly estimates for GDPR. Typically, late in the month, one month after the conclusion of a quarter, BEA provides an "advanced" estimate for GDPR, followed one month later by its "preliminary" tally, and one month hence, by its "final" estimate for said quarter's GDPR.

Quarterly estimates are provided as annualized figures. In other words, the figure quoted represents the flows of goods and services that would accumulate in a year, if the flow over the three month period continued for a full 12 months. They are also adjusted for recurring seasonal patterns—they are "seasonally adjusted". Thus the figures provided for quarterly GDP and GDPR (and for a great many other economic time series) are presented as *seasonally adjusted annual rates*, "S.A.A.R".

Thus 2010:Q4, GDPR = $13.382 trillion means;

> In the fourth quarter of 2010, the value of all final goods and services, in constant dollars, accumulated at a seasonally adjusted $13.382 trillion annualized rate.

Quarterly sequential growth rates for GDPR compare quarterly annualized levels of GDPR, and provide a figure of what the annual growth rate would be if the quarterly percent change was replicated for a full year.

In formulaic terms:

$$\left((Q4 \div Q3)^4 - 1) \times 100\right)$$

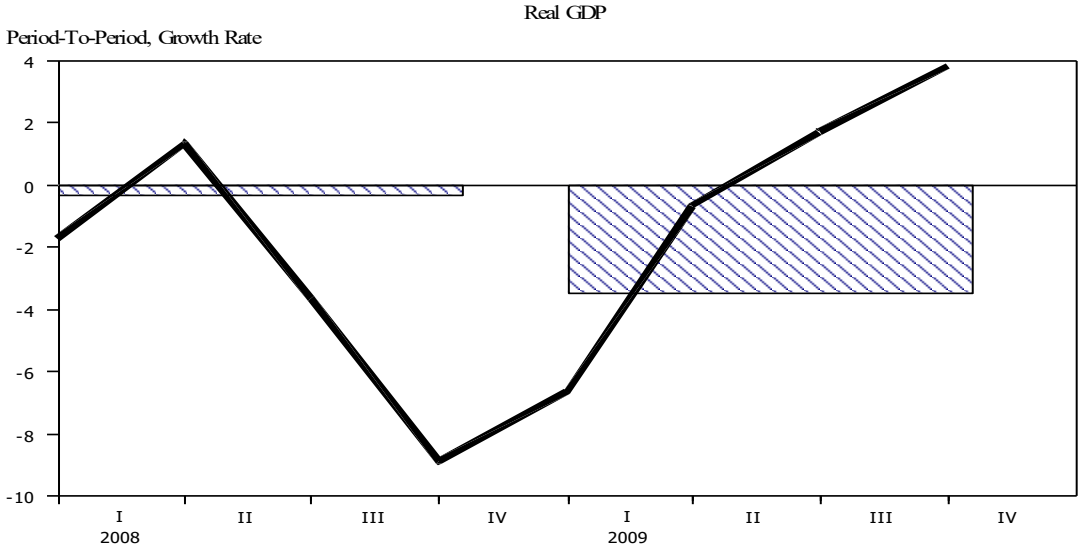
For 2010:Q4,

$$\left(\left((13{,}382 \div 13278)^4 - 1\right) \times 100\right) = 3.2\%$$

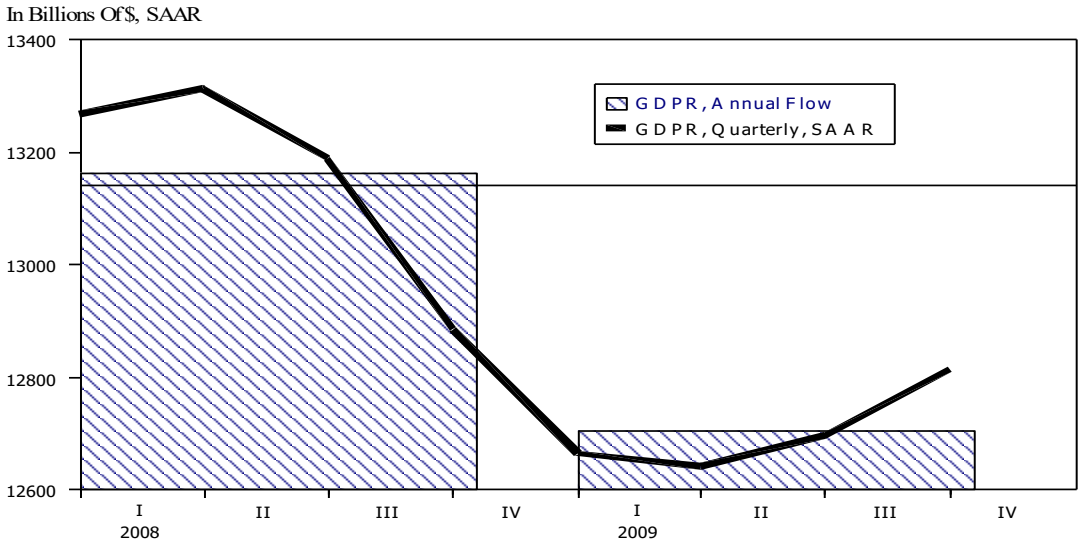
## Fourth Quarter-To-Fourth Quarter: A Timely Measure of Yearly Performance

In some instances final quarter to final quarter changes are used to characterize growth in GDP over the course of a year. In 2009 economic growth built momentum, quarter to quarter,. after plunging late in 2008 and in the first quarter of 2009. Real GDP growth, fourth quarter over fourth quarter, was 0.2%. The full year change, a comparison of the average level of GDPR in 2009 vs. 2008, reveals that GDP contracted by 2.6%.

**The Yearly Average For 2009 Real GDP Fell By 3.5%.**
**The Quarterly Growth Pattern? A Swoon Followed By Sharp Acceleration.**




**The Yearly Average For 2009 GDPR Fell By $459 Billion.**
**Fourth Quarter 2009 Real GDP Was $70 Billion Lower Than Q4:2008.**



## Inferences Gained From Accounting Identities:

Forecasting quarterly profits from unfolding news about consumer spending and jobs.

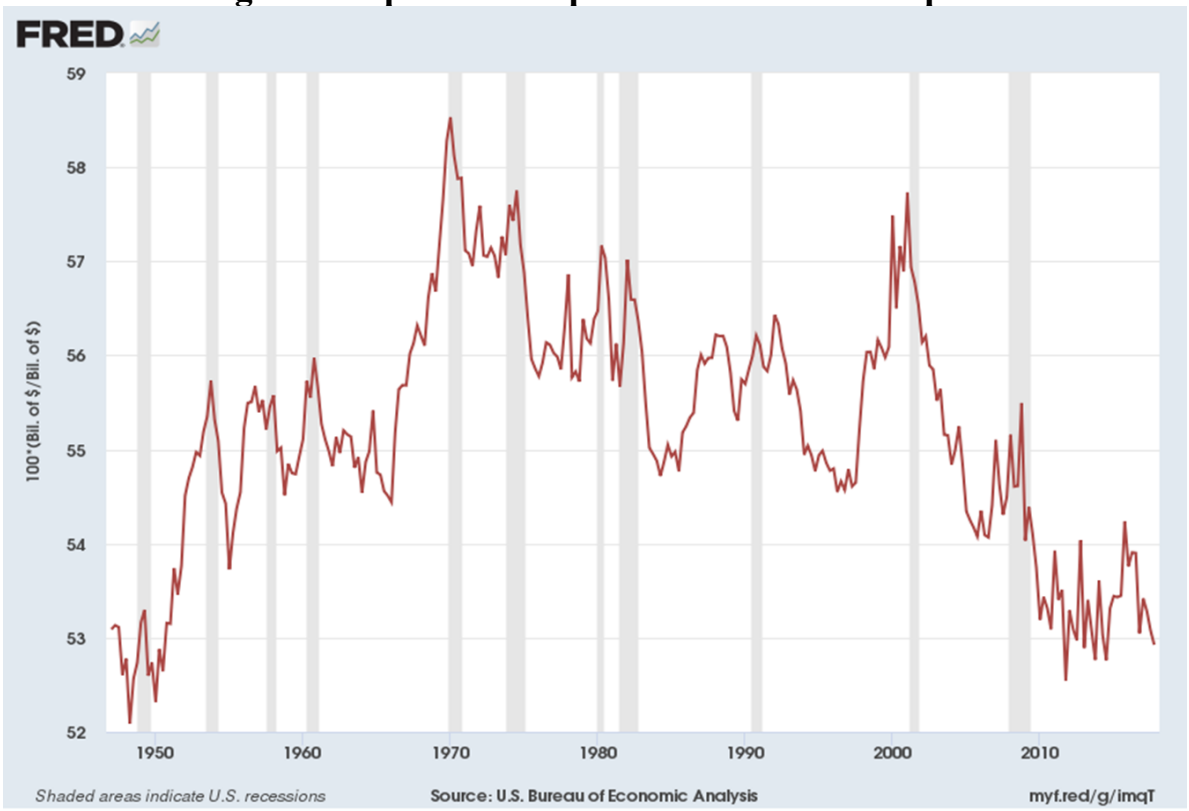
Gross National Product = Gross National Expenditure = Gross National Income
2/3 of output is consumer spending
65% of national income is labor compensation.

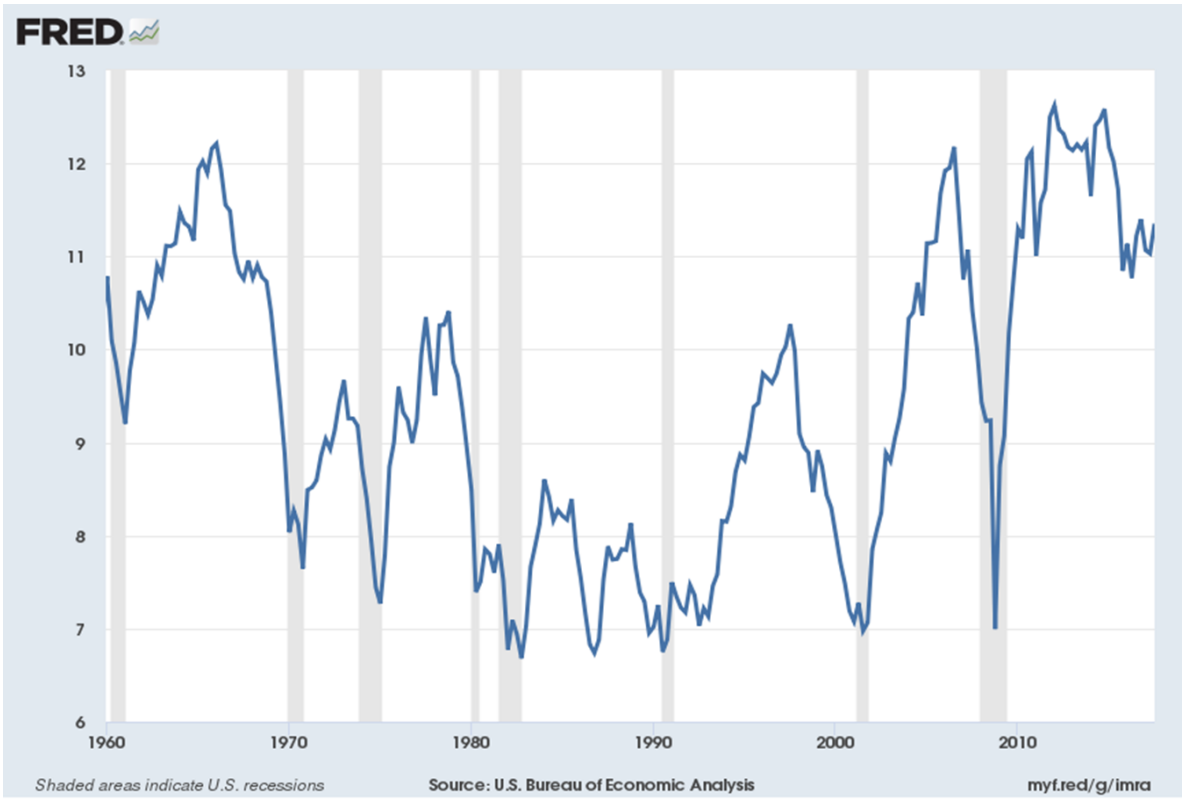
As recession's end, a burst of strong consumer spending appears.
In most instances, that spending gain occurs ahead of any sharp gain for jobs.
If consumption is rebounding, 2/3 of GDP is on an upswing and GDP growth will be recovering.
How can output rebound without a rebound for jobs? Productivity jumps early in business cycles.
Since output = income, strong GDP means strong National Income.
But if payroll gains are muted, 65% of national income, labor comp, is up little.
Ergo, corporate profits, 10% of national income, must be surging.

**Consider The Dynamics From Q4:2001 to Q4:2002**

| | GDP | National Income | Wages & Salaries | Corporate Profits | Other Income |
|---|---|---|---|---|---|
| Q4:01 | 10,373 | 9,189 | 4,927 | 777 | 3,486 |
| Q4:02 | 10,767 | 9,531 | 5,016 | 937 | 3,578 |
| Difference(Billions Of $) | +394 | +342 | +90 | +160 | +92 |
| Q4/Q4 Growth Rate | 3.8% | 3.7% | 1.8% | 20.6% | 2.6% |

**Check out the gains for profits and pressure on labor compensation:**



## EMPLOYMENT

Employment trends are a critical macroeconomic issue at all times. Two measures, the unemployment rate and the number of payroll jobs, combine to give economists a timely picture of net changes in the aggregate jobs market. Both the monthly unemployment rate and the change in non-farm payroll totals are compiled by the Bureau of Labor and Statistics of the U.S. Department of Labor. Usually the data are released on the first Friday of each month. Taken from two separate surveys, these barometers give complimentary—though sometimes contradictory—information about the state of aggregate U.S. employment

### The Household Civilian Unemployment Rate

Household: The data are collected from a monthly survey of 60,000 households.
Civilian: Pertains to the Non-Military Labor Force.
Unemployment: Those in the workforce but without a job.
Rate: Divides unemployed total by total who label themselves in the workforce.

### How does the household survey build into an unemployment rate?

(A) Population estimate (extrapolation from census data)
(B) Labor force (percent of phone tally that label themselves in labor force times "A")
(C) Labor force participation rate: $(B \div A) \times 100$
(D) Household employment (percent of tally labeled employed times "A").
(E) Household unemployment (percent of tally labeled unemployed times "A").
(F) Unemployment rate: $(E \div B) \times 100$

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| | Household | Labor | Labor Force | Household | Household | Jobless |
| | Population | Force | Participation Rate | Employed | Unemployed | Rate |
| 2008Q1 | 232.8 | 153.9 | 66.1 | 146.2 | 7.7 | 5.0 |
| 2008Q2 | 233.4 | 154.2 | 66.0 | 145.9 | 8.3 | 5.4 |
| 2008Q3 | 234.1 | 154.6 | 66.0 | 145.2 | 9.4 | 6.0 |
| 2008Q4 | 234.8 | 154.8 | 65.9 | 144.1 | 10.7 | 6.9 |
| 2009Q1 | 234.9 | 154.2 | 65.7 | 141.6 | 12.6 | 8.2 |
| 2009Q2 | 235.5 | 154.7 | 65.7 | 140.3 | 14.4 | 9.3 |
| 2009Q3 | 236.7 | 154.2 | 65.1 | 139.3 | 14.9 | 9.7 |
| 2009Q4 | 237.0 | 153.7 | 64.9 | 138.3 | 15.4 | 10.0 |
| 2010Q1 | 237.0 | 153.6 | 64.8 | 138.7 | 14.9 | 9.7 |
| 2010Q2 | 237.5 | 154.2 | 64.9 | 139.3 | 14.9 | 9.6 |
| 2010Q3 | 238.1 | 154.0 | 64.7 | 139.2 | 14.8 | 9.6 |
| 2010Q4 | 238.7 | 153.9 | 64.4 | 139.1 | 14.8 | 9.6 |
| 2011Q4 | 238.7 | 153.2 | 64.2 | 139.3 | 13.8 | 9.0 |
| | | | | | | |
| | | | | | | |

As the table on the previous page makes clear, the estimates of levels of both employment and unemployment are the product of two distinct BLS efforts. Each January BLS estimates the level of non-military working age population. They also decide upon a monthly population growth rate. Separately, they do the monthly phone survey. This means that each January LEVELS of employment and unemployment are calculated from a new estimate of population. And that means they cannot be compared to the LEVELS estimates of December.

To simplify, imagine a world wherein BLS estimates population in December at 1,000. Their phone survey reveals that all claim to be in workforce and 50% claim to be unemployed. Thus the December estimate for employment level would be 500 (50% of 1000). Now imagine that the once per year calibration of the population level substantially lowers the figure, labeling the U.S. population only 800. Independently the phone survey once again reveals that everyone claims to be in the labor force. This time, however, 60% claim to be employed. The January employment level is 480 (60% x 800). But BLS DOES NOT re-estimate December's employment level. Ergo, the BLS data indicates that employment fell by 20,000 from December to January. In a footnote they do better. They calculate the month-to-month change in employment that would have resulted IF THEY HAD RECALCULATED December's POPULATION LEVEL:

| | **December Revised** | **January** |
|---|---|---|
| Population | 798 | 800 |
| Employment | 399 | 480 + 81,000 NOT DOWN 20,000 |

## THE JOLTS DATA

Starting in 2000 BLS began providing data on gross trends in hiring and firing. These figures, the JOLTS report, attempt to capture total hiring and total firing in a given month in contrast to the net hiring figures provided by the payroll report.

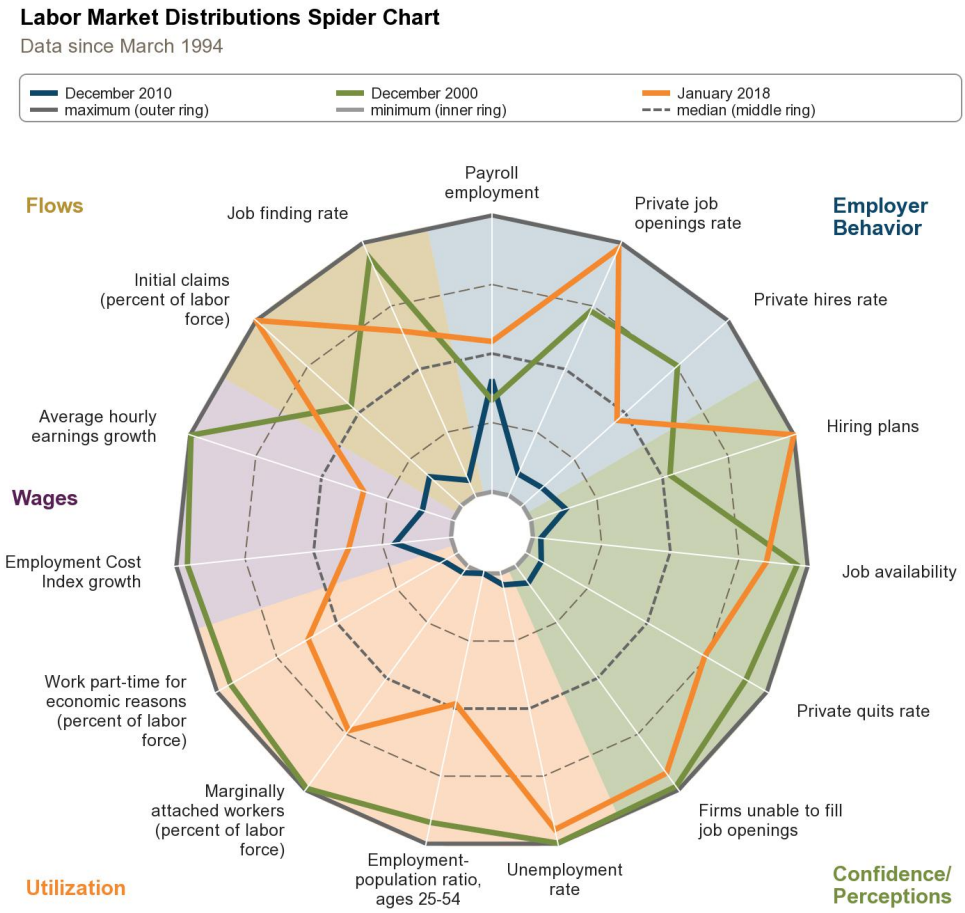
THE TABLE BELOW SHOWS THE LEVEL OF GROSS HIRES AND SEPARATION FOR SELECTED PERIODS

| | **Monthly Hires** | **Monthly Separations** | **Hires-Separations** | **Job Openings** |
|---|---|---|---|---|
| | | | | |
| **Year** | In Millions | | In 000s | In Millions |
| 2000 | 5.7 | 5.5 | 210 | 4.9 |
| 2005 | 5.3 | 5.1 | 204 | 4.1 |
| 2009:Q2 | 3.7 | 4.3 | -580 | 2.4 |
| 2010:Q4 | 4.1 | 3.9 | 175 | 3.0 |
| 2014:july | 4.9 | 4.6 | 215 | 4.7 |

These data remind us that the monthly payroll series is a net number. Gross employment gains (hires), even in the worst of times (like 2009:Q1) still total to several million per month.

Note that the improvement in net hires minus separations, from early 2009 to late 2010, reflects a big decline in firing. Hiring is still weak. But it's still more than 3 million per month.

The **Atlanta Fed's** spider chart tracks real-time tracks broad labor market developments. It compares current conditions to those in the fourth quarters of 2007 (prerecession peak) and 2009 (post-recession trough in employment). Indicators of labor market status are in four groups: Employer Behavior, Confidence, Utilization, and Leading Indicators. The data are updated twice monthly. https://www.frbatlanta.org/chcs/labormarket.aspx




Sources: U.S. Bureau of Labor Statistics, U.S. Department of Labor, National Federation of Independent Business, The Conference Board, and Haver Analytics



FEDERAL RESERVE BANK of ATLANTA

## The Establishment Non-Farm Payroll Employment Survey:

**(http:www.bls.gov/bls/empsitquickguide.htm)**

Series covering all employees' hours and earnings were officially added by CES on February 5, 2010, with estimates beginning in March 2006. Historically, CES hours and earnings series covered only production and nonsupervisory employees.

### Estimation Methodology

CES monthly employment estimates are made using a two-part estimator. The sample reports are used to estimate month-to-month employment change from continuing businesses and a birth/death model is used to account for new firm births that otherwise would not be sampled in a timely fashion.

***Sample-based estimator.*** CES uses a matched sample concept and weighted link relative estimator to produce employment, hours, and earnings estimates. These methods are described in **table 2-A** of the CES technical notes documentation. For more information on the CES sample-based estimator, see the **CES technical notes on Monthly Estimation**.

***Birth/death model.*** The sample alone is not sufficient to estimate a total employment level because each month new firm births generate employment growth, and there is an unavoidable lag between an establishment opening for business, appearance on the sample frame, and availability for inclusion. To account for these components of total employment, CES uses a net business birth/death model.

Benchmark revisions to the payroll report occur with nine month lag. BLS receives unemployment insurance statistics that cover virtually the entire population of the employed persons and they use this to revise their sample/ birth-death based estimates.

Revisions In Direction of Inflection:

The Birth/death model has a tragic flaw. It extrapolates trends, which means it helps get the data right, in 'normal' times, but misconstrues the situation at business cycle turning points. To put it simply, the methodology looks for trend rates of growth for new business creation and for rates of bankruptcy. But in a recession business creation grinds to a halt and bankruptcies soar. So the birth/death model will add jobs to

the estimate, while in reality new business minus bankruptcy calculations will be stripping away jobs. Likewise, during a period of well above trend growth business creation will accelerate and business bankruptcies will be very low—a boom keeps even dumbo businessmen and women alive for a time. So the birth/death model will underestimate the actual level of job creation.

Consider the estimates originally tallied for April through August of 2008 versus the final tallies (table AA). Birth-death extrapolations imagined a world of continued job gains and countered tallied jobs losses picked up in the survey. The result? Small job loss estimates and insistence by many mainstream economists that the U.S . would avoid recession. Bench mark revisions revealed a brutal recession was already firmly in place.

**TABLE AA**

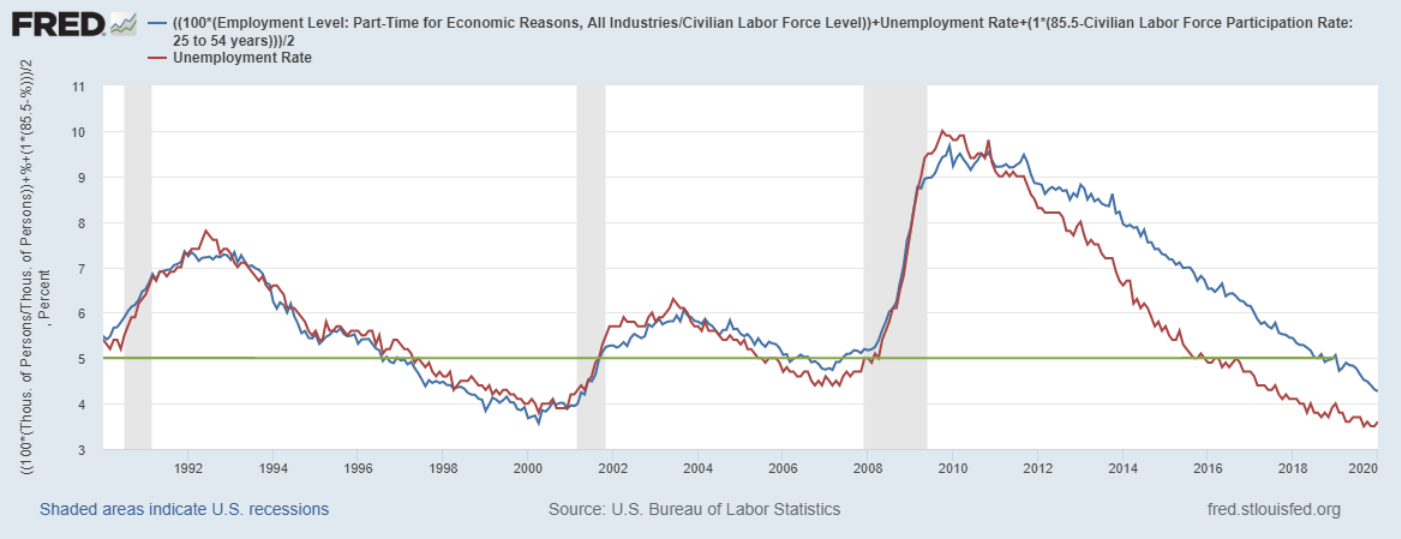
| | **Nonfarm Payrolls** | | **Changes** |
|---|---|---|---|
| | Original | Revised | difference |
| Apr-08 | -20 | -149 | -129 |
| May-08 | -49 | -231 | -182 |
| Jun-08 | -62 | -193 | -131 |
| Jul-08 | -51 | -210 | -159 |
| Aug-08 | -81 | -334 | -253 |
| | | | |
| *April-August Average* | -52.6 | -223.4 | -170.8 |

In point of fact, the initial estimate for changes in payroll figures, even in the best of times, are very rough guesses. A year ago I calculated the standard deviation of benchmark revised figures, relative to initial estimates. I used data from 1999 through March of 2009.

Jobvar=((blsrevised-blsoriginal)**2)**0.5) Jobvar = ((blsrevised-blsoriginal)20.5).Where jobvar = the monthly difference between initial and final estimates of job changes. Blsrevised = benchmark revised estimate of month-to-month private payroll changes .Blsoriginal = initial estimate of month-to-month private payroll changes

It turns out that the average monthly difference, ignoring sign over the period—the standard deviation—is a whopping 78,000. To put that in context, when BLS initially guesses that payrolls rose by 140,000, then half the time the actual change lies somewhere between 70,000 and 210,000. Moreover, you cannot rule out an actual gain of 280,000, OR NO GAIN AT ALL. Think about that when you see talking head economists on CNBC getting super excited about an initial estimate that is 30,000 above or below the consensus guess going into the number.

**EMPLOYMENT GAINS NOW HAVE LOWERED UNDEREMPLOYMENT:**




## INFLATION

Estimating the overall price level—and its rate of change—is critical to macroeconomic analysis and forecasting. The inflation rate estimates the speed with which the economy's overall price level is rising. In most instances our efforts to estimate changes in inflation reflect our desire to strip away price changes from changes in dollar values, leaving us with estimates of "real" quantities for output, income and interest rates. As we learned in the previous section, we calculate GDPR by removing the effects of inflation from GDP. Similarly, in order to calculate a wage earners increase in real purchasing power we subtract the rate of inflation from the change in his or her wage income. A lender of funds expects to receive interest payments

that more than cover the overall rise in the price level. We calculate the real interest rate by subtracting an estimate of the likely future inflation rate from the nominal interest rate being paid.

Two measures, the consumer price index and the personal consumption expenditure deflator, combine to give economists insights about the trends in overall prices.
The CPI is reported in the middle of each month. The monthly percentage change in the CPI, the core CPI and the CPI for core goods and core services are key determinants in shaping short run opinions about U.S. inflation. CPI movements give rough guidance concerning consumer purchasing power. The U.S. Federal Reserve Board assigns changes in the U.S. inflation rate coequal status with the employment picture when it meets**,** every six weeks and determines its target for short-term interest rates. The bond market reacts immediately to changes in inflation expectations. Both the stock market and the trade-weighted dollar are influenced by changes in opinions about inflation.

The Consumer Price Index:

- Analyzes the prices of a fixed basket of consumer goods and services.
- Weights are changed only with benchmark changes, every five years.
- Quality adjustments are analyzed and incorporated into price change estimates.
- Seasonally adjusted monthly inflation indices are available for many categories.
- The CPI is a Laspeyres Index.

The Personal Consumption Expenditure Deflator:

- Analyzes goods and services prices, with weights a function of expenditure levels.
- Avoids substitution bias, embedded in CPI, therefore preferred by Fed officials.
- Released after CPI, therefore less important for month-to-month assessments.

Over the past 50 years, policymakers have confronted an inflation backdrop that has run the gamut from quiescent inflation through rapid inflation and back again. Indeed, over the last few years the fall for inflation rates to very near zero, and the experience of Japan in the 1990s had some worried about deflation—a generalized fall for the overall price level.

Explosive gains in the use of information industry hardware and software have also made inflation measurement particularly challenging over the past decade.

Box 3 below investigates this challenge by comparing prices and outputs associated with calculators and computers, now versus 1974, when I graduated from JHU.

| | 1974 | 2005 |
|---|---|---|
| Calculator | $129 | $129 |
| Median family Income | $ 12,909 | $ 59,500 |
| Calc cost as | | |

| | | |
|---|---|---|
| % of income | 1% | 0.2% |

As the box reveals, one had to spend 1% of income to buy a calculator in 1974, around 5 times the outlay needed, as a percent of income in 2005. That sharp increase in purchasing power, however, is only a small part of the story. The calculator I owned in 1974, for a price of $129, multiplied, divided, added and subtracted, and it had one memory. Today's $129 calculator is thousands of times more powerful. That is why BLS attempts to "quality adjust" purchases, and it also explains why deflators for calculators and computers are sharply negative (the computer deflator for calendar year 2003 fell by 18%.) The point? We need to account for technological improvements, but quality adjustments, to allow for such progress, are bedeviling.

**Inflation Sub-categories:**

Sub-indices for both the CPI and the PCE deflator are also available.

T**he Core CPI and PCE deflator excludes food and energy prices.**

> Why exclude food and energy? Economic decision makers and financial market participants have particular interest in the interplay of the pace of economic activity, the tightness of labor and productive capacity and the pressure on prices and overall inflation. Food and energy prices, in many instances, move dramatically, independent of the overall pulse of the global economy.
> Thus food and energy prices are very volatile and subject to sector specific pressures. Does that mean we can ignore food and energy swings? No.Spikes for oil prices, in 1973,1979 and 1990 helped usher in recessions. But the surges reflected OPEC decisions in 1973 and 1979, and the Iraqi invasion of Kuwait in 1990—not economic momentum issues.

**The core CPI can also be broken down:**

**Core goods CPI:**

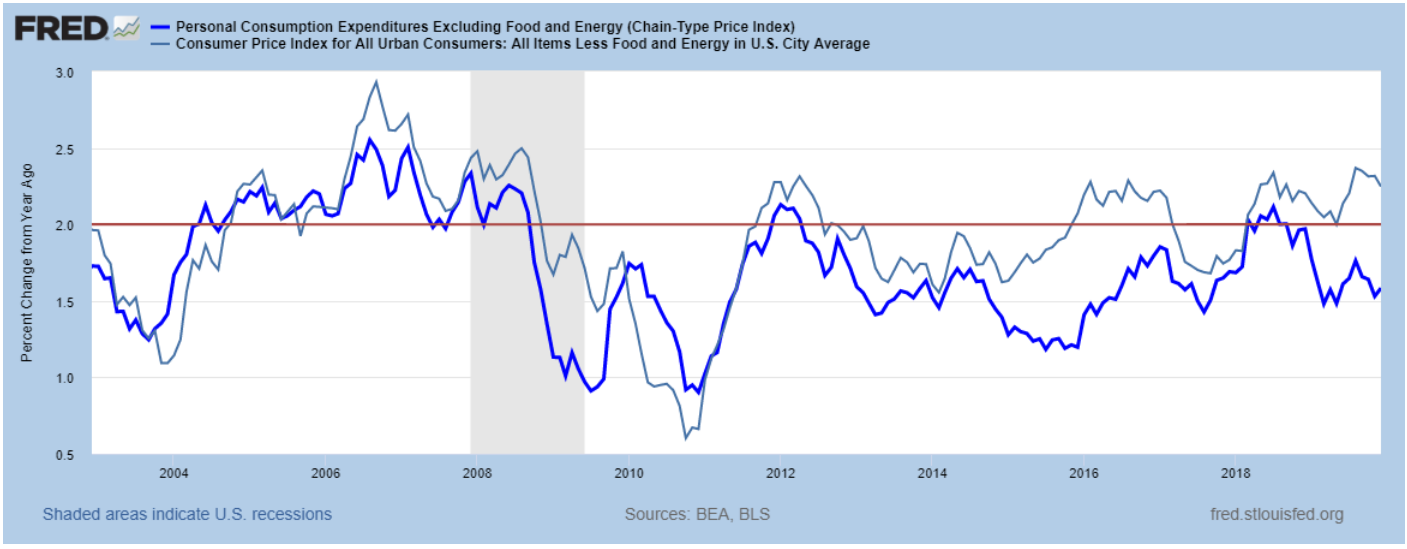
> The CPI includes goods and services prices. Good prices can be looked at excluding food and energy. Core goods prices are influenced by global labor markets, a reflection of the global nature of goods markets.

**Core Services CPI:**

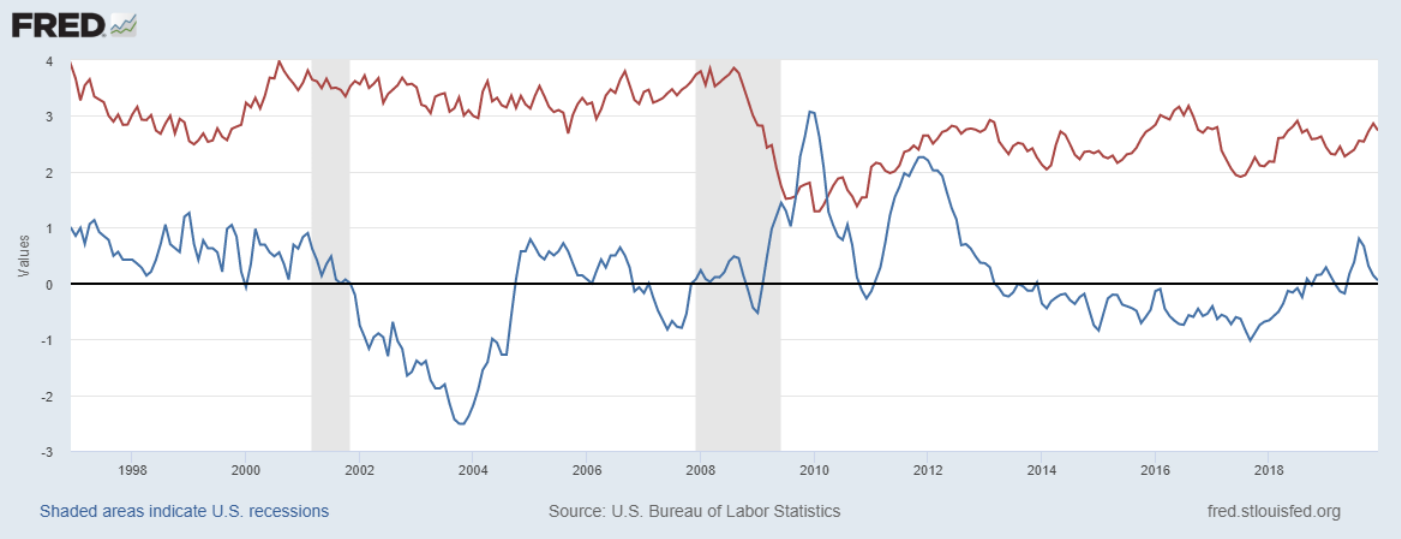
> The CPI services includes natural gas consumption, hence our need to look at CPI services, excluding energy services. The CPI also imputes the cost of homeownership, assuming people were to rent their homes to themselves. By excluding both energy and imputed rents we get a measure of outright services price pressures. Core services are services ex energy, ex imputed rents. Such services as haircuts, trips to the airport, consultations on investments and the like are for the most part captive to the domestic labor market, in contrast to core goods prices.

| Consumer Price Index | Weights* |
|---|---|
| Total | 100 |
| Core | 78.9 |
| Energy | 7.5 |
| Food | 13.6 |
| Core goods | 18.6 |
| Core services | 35.6 |
| Owners' equivalent rent | 24.7 |
| | |
| *as of 01/12/2018 | |

**Core PCE lower than core CPI:**



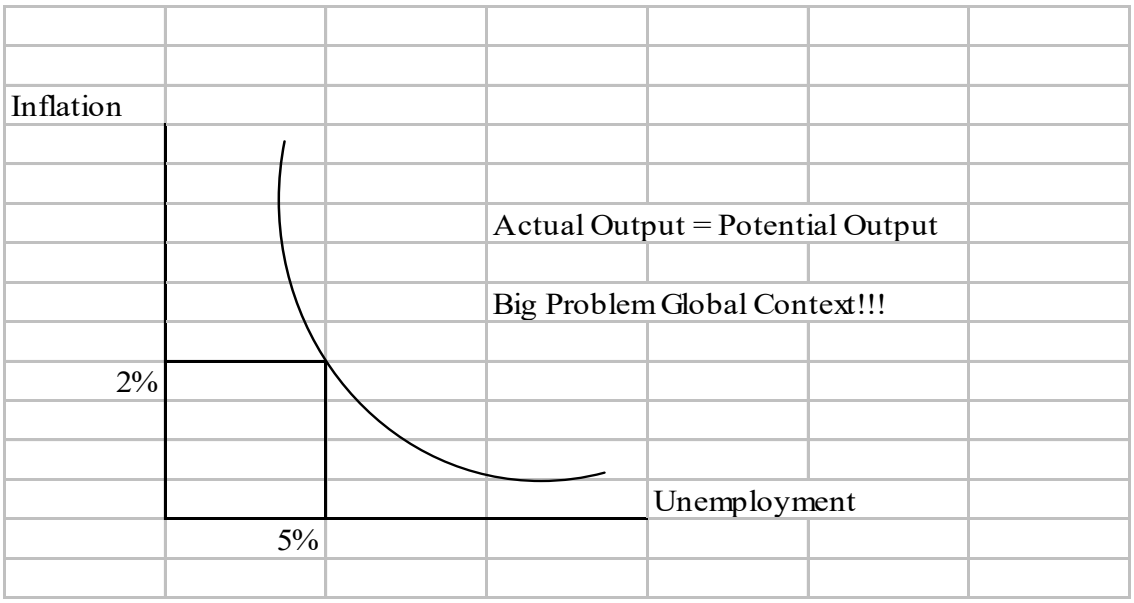
**U.S. CPI: Core Goods (blue) vs. Core Services (red)**



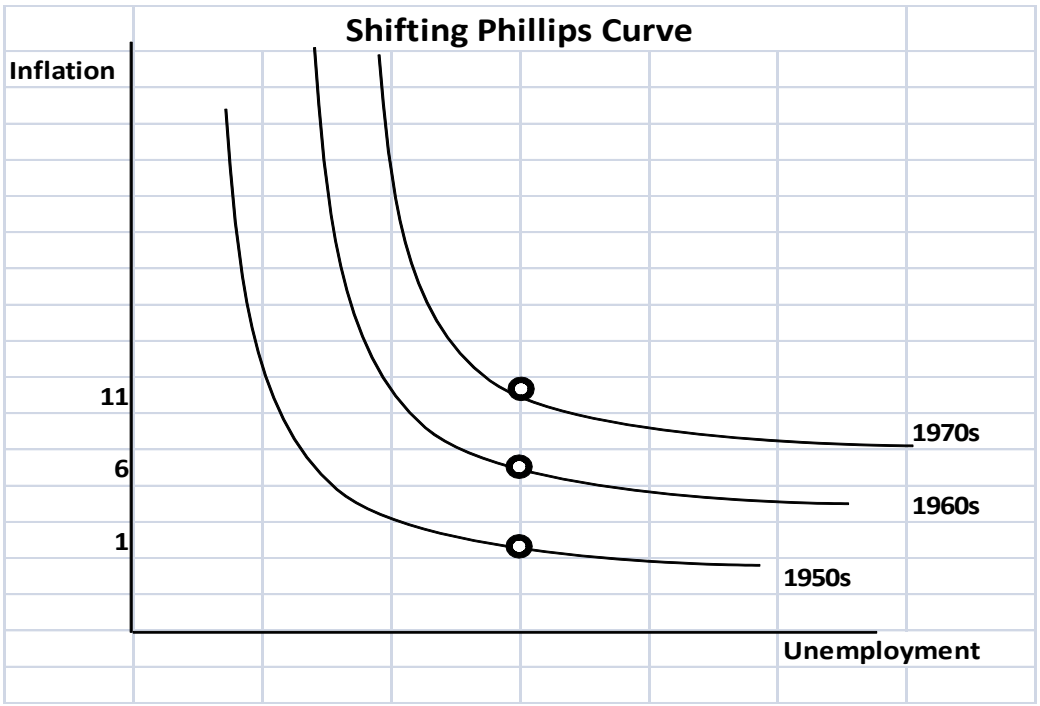

## The Phillips Curve: A Practical Application of Sticky Prices

We accept the fact that in the short run monetary policy affects output levels. If monetary policy is too easy the economy will grow above potential, for a time. But this overheated pace of expansion will generate inflationary pressures. Likewise, tight money will weigh on real growth, in the short run, again, because wages and prices are sticky and output is cut first. Over time, however, falling activity and rising joblessness will weigh on wages and prices and inflation will slow.

The Phillips Curve simply describes the amount of slack in the economy needed to lower the inflation rate.




If we believe that high unemployment will lower inflation, why not accept a higher inflation rate, in order to have a lower unemployment rate? NAIRU stands for the non-accelerating inflation rate of unemployment. We accept the notion that if unemployment is held below NAIRU, then wage and price inflation accelerates. In other words, if unemployment is below NAIRU you don't pay with a one-time increase for inflation, you pay with a climbing inflation rate. Confusion about this issue in the 1960s-1970s led to a steady move outward for the short run Phillips curve. Each cycle had a higher peak and trough for inflation. The notion that there is a long run trade-off between inflation and unemployment is now rejected. But the short run Phillips curve, for Fed Vice-Chairman Alan Blinder calls it the clean little secret of monetary policy, is alive and well.




## The Phillips Curve Equation in the New Keynesian Model

How might we think mathematically about the relationship between inflation and the level of employment in the economy? Let's start with the standard of formulation.
Where

$$\pi_{(1)} = \pi_{(0)} + \alpha * (Y_{(1)} - Y^{(*)})$$

$\pi_{(1)}$= Inflation in period 1
$\pi_{(0)}$ = inflation in period 0
α = slope
$y_{(1)}$= output in period 1
$y^*$ = equilibrium level of output

The NAIRU concept is intimately tied to the concept of potential output. The equilibrium output level occurs when all resources are used at a pace that is sustainable without generating inflation. NAIRU identifies the sustainable jobless rate. So we can rewrite the equation (1):

$$\pi_{(1)} = \pi_{(e)} + \alpha * (U^* - U_{(1)})$$

Here, it is deviation of NAIRU from level of unemployment that drives inflation.
How does a simple Phillips curve do as a forecaster of inflation during the Great Recession and mediocre recovery? Much better than a simple minded forecaster who believes that money creation can deliver INFLATION, even amid big excesses for the economy. Recall that in the USA we had quantitative easing, a surge in the Fed's balance sheet, and little change for inflation. That said, given the very high jobless rate, we have seen less disinflation/deflation than traditional models would expect. Let's analyze using a very simple model.

How does our model do forecasting the CPI?

**CPI**

| | Cpi YOY, pct. Change | jobless rate | NAIRU minus jobless rate | Phillips Curve Forecast |
|---|---|---|---|---|
| 2005 | 3.4 | 5.1 | 0.4 | |
| 2006 | 2.5 | 4.6 | 0.9 | 3.8 |
| 2007 | 4.1 | 4.6 | 0.9 | 2.9 |
| 2008 | 0.1 | 5.8 | -0.3 | 4.0 |
| 2009 | 2.7 | 9.3 | -3.8 | -1.4 |
| 2010 | 1.5 | 9.6 | -4.1 | 1.1 |
| 2011 | 3.0 | 8.9 | -3.4 | 0.1 |
| 2012 | 1.7 | 8.1 | -2.6 | 2.0 |

Very poorly. Look at the table above. In 2009, amid sky high joblessness, the model expects inflation to plunge. Instead, a consequence of a rebound for oil prices, after the second half collapse in 2008, the CPI actually accelerates.

What about if we look at the Core CPI?

**core CPI**

| | core CPI YOY, pct. Change | jobless rate | NAIRU minus jobless rate | Phillips Curve Forecast |
|---|---|---|---|---|
| 2005 | 2.2 | 5.1 | 0.4 | |
| 2006 | 2.6 | 4.6 | 0.9 | 2.6 |
| 2007 | 2.4 | 4.6 | 0.9 | 3.0 |
| 2008 | 1.8 | 5.8 | -0.3 | 2.3 |
| 2009 | 1.5 | 9.3 | -3.8 | 0.3 |
| 2010 | 0.8 | 9.6 | -4.1 | -0.1 |
| 2011 | 2.2 | 8.9 | -3.4 | -0.6 |
| 2012 | 1.9 | 8.1 | -2.6 | 1.2 |

The model does better, but it still struggles. Most tellingly, core CPI inflation is roughly the same in 2012 as it was in 2008, despite the fact that the economy suffered with a large output gap over the entire period.

What about wages, the key price likely to be determined by high joblessness?

| | | | | Phillips | cumulative |
|---|---|---|---|---|---|
| | | average | | Curve | phillips curve |
| | AHE, YOY | jobless | NAIRU minus | Forecast | forecast |
| | Percent Change | rate | jobless rate | $\alpha = 0.25$ | $\alpha = 0.25$ |
| 2005 | | 5.1 | 0.4 | | |
| 2006 | 3.8 | 4.6 | 0.9 | | |
| 2007 | 3.2 | 4.6 | 0.9 | 4.0 | |
| 2008 | 3.6 | 5.8 | -0.3 | 3.1 | |
| 2009 | 1.8 | 9.3 | -3.8 | 2.7 | 2.7 |
| 2010 | 1.7 | 9.6 | -4.1 | 0.8 | 1.6 |
| 2011 | 2.0 | 8.9 | -3.4 | 0.9 | 0.8 |
| 2012 | 2.1 | 8.1 | -2.6 | 1.4 | 0.1 |
| 2013 | 1.8 | 7.3 | -1.8 | 1.7 | -0.3 |

We see the same disconnect. Wage gains fall in 2009, and then go essentially sideways. The output gap suggests weaker advances for wage gains should have continued in each year 2008 through 2013. Consider the last column in this table. It uses the simple Phillips curve equation, and applies the predicted disinflation not to the previous year's actual wage increase, but instead to the wage increase that the equation PREDICTED for the previous year. Each year registers a slower gain, culminating in a prediction of an outright decline for 2013. Clearly high joblessness knocked wage gains down from 3% to 4% to around 2%. Nonetheless, again we see an end to disinflation, around 2% for wages.

What these simple models suggest is that PLOGS-persistent large output gaps, drive inflation toward ZERO, but not through ZERO. We will revisit this issue in lecture 5, when we talk about monetary policy.

## How did Volcker do in the 1980s?

| t | $\pi_t$ | U* | $U_t$ | $\pi_e$ | $\pi_f$ |
|---|---|---|---|---|---|
| 1978 | 9.5 | 6.5 | 6.0 | | |
| 1979 | 13.3 | 6.5 | 6.0 | 9.5 | 10.2 |
| 1980 | 12.5 | 6.5 | 7.4 | 13.3 | 12.0 |
| 1981 | 8.9 | 6.5 | 8.2 | 12.5 | 10.1 |
| 1982 | 3.8 | 6.5 | 10.7 | 8.9 | 3.0 |

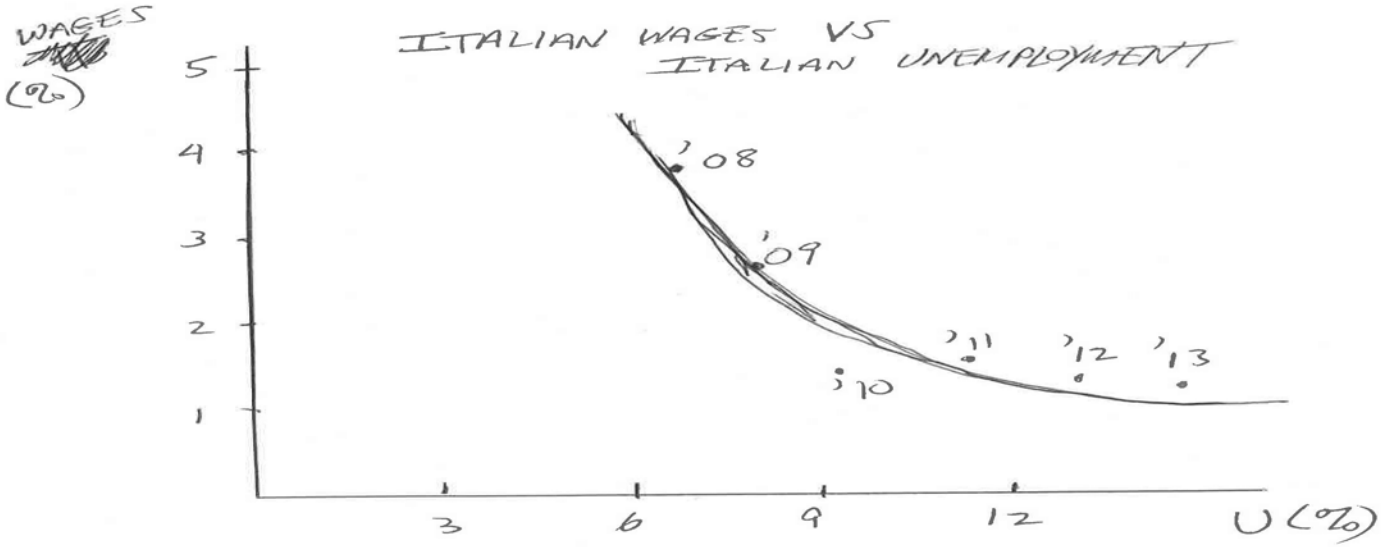
$$\pi_t = \pi_e + \alpha(U^* - U_t)$$

Set alpha = 1.4

## All U's not created equal

| | May | August |
|---|---|---|
| | 1997 | 2015 |
| Unemployment | 5.1 | 5.1 |
| U6 Unemployment | 9.2 | 10.3 |
| L.F.P.R. (25-54 yr. olds) | 83.8 | 80.7 |
| Employment/Pop. Ratio | 63.8 | 59.4 |

# It turns out that the Phillips Curve is a *CURVE.* (Wages bounce along, just above zero)



## Beveridge Curves and N.A.I.R.U.

Obviously NAIRU estimates are very important to policymakers. How much room you have to let an economy grow rapidly depends, in large part, on you estimate for NAIRU.

As of late 2012, FOMC members in general support that NAIRU is around 5.5%, a bit above the 4.8% estimate used in 2004-2008 period. Some analysts think otherwise (Daly, Hobijn et al, JEP Vol. 26, Number 3 - Summer 2012) They see signs that suggest NAIRU today is higher, a reflection of a jump in "structural" unemployment. They rely in part on Beveridge Analysis to make their assertions.

A standard Beveridge Curve plots the relationship between job openings and the unemployment rate. The idea is that when job openings are high the jobless rate will be near NAIRU. When job openings are low, unemployment will be well above NAIRU. FRB:SF assumed CBO's estimate for NAIRU, 5.2%, and collected job openings data from the BLS JOLTS report to provide us with the following chart:

Source: Bureau of Labor Statistics, Current Population Survey and Job Openings and Labor Turnover Survey, February 12, 2013.

The chart has an unsettling notion embedded in it. In December of 2012 job openings were 2.6% of the labor force. The curve tells us that in the last cycle a 2.6% job openings level was associated with a jobless rate of around 6%, not 7.8%, the December 2012 level.

The most recent analysis of the Beveridge curve DOES NOT support the notion that structural unemployment is mish higher. Why? Only “long term” unemployed have a higher Beveridge curve. It appears that despite rising “job openings” there is lingering “job hiring reticence”. In other words, you have an opening but you are slow to fill it. That suggests that as confidence returns the Beveridge curve will shift leftward.