The Global Economy

Business Cycle Indicators

Where we’re headed

- Short-term economic performance
- A series of topics
- On today’s agenda
  - Indicators
  - Big inflations

The question

- How does the US economy look to you right now?
- How can you tell?

The idea

- Lots of indicators of economic activity
- We use their past patterns to assess
  - Current economic conditions
  - Near-term future economic conditions
- If (say) an increase in housing starts has been associated with good economic performance in the past …
- What if this time is different?

Joke of the day

- Why do economists add a digit after the decimal point to their forecasts?
- To show they have a sense of humor

Bonus joke of the day

- “Nation’s Unemployment Outlook Improves Drastically After Fifth Beer,” The Onion.
Forecasting

- Tim Harford
  - Economists have allowed themselves to walk into a trap where we say we can forecast, but no serious economist thinks we can. [True, that, but what does he mean by “we”?]

- John Maynard Keynes
  - You don’t expect dentists to be able to forecast how many teeth you’ll have when you’re 80. You expect them to give good advice and fix problems.

Courses related to this topic

- Real-world analysis of economic data (ECON-GB.2347)
  - Professor Peter D’Antonio, Citi, Director and Head of US Economic Forecasting, does this for a living

- Forecasting time series data (STAT-GB.0018)
  - Professor Cliff Harvich, expert and pianist
  - Or Professor Rohit Deo, also an expert

What’s happening?

- Employment report released [late] October 22
  - Employment up 148k in September
  - Unemployment flat at 7.2%
  - October report due out Friday
  - Consensus: up 120k
  - More at Bloomberg calendar, FRED

- What do we learn from this?

Roadmap

- Indicators
- The cross-correlation function
- The business cycle scorecard

Indicators of economic activity

- Hundreds of them, more all the time
- See resource page
- Also Bloomberg and WSJ calendars
Indicators: terminology

- A variable is procyclical if it moves up and down with the economy, countercyclical if it moves in the opposite direction.
- A variable leads the economy if its ups and downs come before, lags if its movements come after, coincident if they happen at the same time.
- “The economy” = GDP growth.

Indicators: plan

- Look at monthly data (mostly yoy growth rates).
- Shift from GDP to industrial production.
- For each one:
  - Is it procyclical? Countercyclical?
  - Does it lead? Lag?
  - What does it suggest about current and future conditions?

Indicators: FRED

- Plot and download data.

Industrial production (yoy growth)

Industrial production and GDP (yoy)

Housing starts (units, thousands)
Commercial & industrial loans (yoy growth)

S&P 500 (yoy growth)

Term spread (10y – fed funds)

Indicator summary

- Think about which indicators are
  - Procyclical
  - Countercyclical
  - Leading
  - Lagging
  - Coincident
- Which ones do you like best?

Review: correlations

- Correlations: a measure of (linear) association between two variables
- Conveniently scaled between –1 and +1
- The farther from zero, the stronger the association
- Link to nontechnical guide on Course Outline
Review: correlations

The cross-correlation function

- Look at the correlation between x and y
- Think of x as the indicator
- Plus: shift y back and forth in time (to see leads and lags)
- Formally
  \[ ccf(k) = corr[x(t),y(t-k)] \]
  - If \( k < 0 \): x leads y [or y lags x]
  - If \( k > 0 \): x lags y [or y leads x]
- Why? Makes a great picture

Contemporaneous correlation

<table>
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<th>y(t)</th>
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<tbody>
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<tr>
<td>7</td>
<td>1.87</td>
<td>3.60</td>
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</tbody>
</table>

Reminder:
• \( ccf(k) = corr[x(t),y(t-k)] \)

For \( k = 0 \):
• \( ccf(0) = corr[x(t),y(t)] \)

Use data marked
• Red for x
• Blue for y

Lagging correlation

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Reminder:
• \( ccf(k) = corr[x(t),y(t-k)] \)

For \( k = +1 \):
• \( ccf(1) = corr[x(t),y(t-1)] \)
• Means: x lags y

Use data marked
• Red for x
• Blue for y
• Note lost observation

Leading correlation

<table>
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<tr>
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Reminder:
• \( ccf(k) = corr[x(t),y(t-k)] \)

For \( k = -1 \):
• \( ccf(-1) = corr[x(t),y(t+1)] \)
• Means: x leads y

Use data marked
• Red for x
• Blue for y
• Note lost observation

Cross correlation graphs

- Pictures: plot \( ccf(k) \) against \( k \)
  - \( y = \) IP growth
  - \( x = \) indicator
- Sample period: 1960 to present [why?]
- Most variables are yoy growth rates [why?]
- Does indicator lead or lag IP growth?
Does employment lead or lag?

How to tell

- Find the largest correlation
- Procyclical or countercyclical?
  - If positive, procyclical
  - If negative, countercyclical
- Leading or lagging
  - If to the left, leading
  - If to the right, lagging

Initial ("new") claims for UI (yoy growth)

Housing starts (yoy growth)

Consumer sentiment (yoy growth)

S&P 500 (yoy growth)
Yield spread

<table>
<thead>
<tr>
<th>Cross Correlation with Industrial Production</th>
<th>Yield Spread (10y - Fed Funds)</th>
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<tbody>
<tr>
<td>Leads IP</td>
<td>Leads IP</td>
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<tr>
<td>Lag IP</td>
<td>Lag IP</td>
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<td>-1.00</td>
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<tr>
<td>-0.50</td>
<td>-0.50</td>
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<td>0.50</td>
<td>0.50</td>
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<tr>
<td>1.00</td>
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</tbody>
</table>

Good indicators

- Which ones have high correlations?
- Which ones lead?
- Which ones do you like best?
- Warning: even the best indicators forecast the future imperfectly [poorly?]

Computing cross-correlations

- How do we compute them?
  - Method 1: use Excel to calculate each point [see link]
  - Method 2: use some kind of statistical software [R?]

Business cycle scorecard

- Useful summary of lots of indicators
- For each one:
  - Graph indicator over time
  - Add lines for mean, +/- one std deviation
  - Rate indicator as strong positive, positive, negative, strong negative

Business cycle scorecard: example
### Business cycle scorecard

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Strong Positive</th>
<th>Strong Negative</th>
<th>Negative</th>
<th>Positive</th>
<th>Strong Positive</th>
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<tbody>
<tr>
<td>Ind. Prod.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

• Coming up: Problem Set #3 due next week
  – Download indicators from FRED
  – Compute cross-correlation functions
  – Construct business cycle scorecard
  – Start soon!

### Scorecard: my goal

Source: Macroblog, April 2013.

What have we learned?

• Lots of things move up and down with the economy
• We can use these patterns to assess current and near-term future conditions
• Useful tools
  – Cross-correlation function
  – Business cycle scorecard
• Where can I learn more?
  – Indicators course: ECON-GB.2347, D’Antonio
  – Forecasting course: STAT-GB.0018, Deo and Hurvich

### The Global Economy

**Inflation and Monetary Policy**

### The Global Economy

**Hyperinflation**
Terminology

- The **price level** is a measure of average prices
  - We label it $P$
  - Measured in units of currency (how many dollars to buy...)
- **Inflation** is the rate of growth of the price level
  - Buying goods takes more currency
  - Or: a unit of currency buys less (same thing, of course)
- We call it **deflation** if growth rate is negative
- **Hyperinflation** is inflation > 100% per year

The idea

- Tom Sargent, interview
  - The way to start a hyperinflation is run sustained government deficits and then have the monetary authority print money to pay for it. That always works. How do you stop a hyperinflation? You stop doing it. This isn’t high economic theory.
- What is he saying? Does it make sense to you?

The idea: Argentine data

- La Nacion, via Google translate, March 25, 2012
  - [Argentina’s] Central Bank president, Mercedes Marco del Pont, said it “is totally false to say that the issue [of money] generates inflation.” She continued: “only in Argentina does the idea remain that the expansion of the money [supply] generates inflation.”
- What is she saying? Does it make sense to you?

Roadmap

- Terminology
- Hyperinflation show and tell
- Money and inflation: the quantity theory
- Money supply mechanics
- How deficits enter the picture

Hyperinflation show and tell
German currency

October 1923: 20 USD = 1 billion RM

Argentine currency

This note dates from 1980s. What’s it worth now?

Turkish currencies

Before 2008

After 2008

Brazilian currencies

REAL, Jan 1994 – present

Highest inflation rates ever

<table>
<thead>
<tr>
<th>Example</th>
<th>Highest Daily Inflation</th>
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<tbody>
<tr>
<td>Hungary, Jul 1946</td>
<td>207%</td>
</tr>
<tr>
<td>Zimbabwe, Nov 2008</td>
<td>98%</td>
</tr>
<tr>
<td>Yugoslavia, Jan 1994</td>
<td>65%</td>
</tr>
<tr>
<td>Germany, Oct 1923</td>
<td>21%</td>
</tr>
</tbody>
</table>

Inflation in Argentina (annual %)

Source: EIU database.
Inflation in Brazil (annual %)

Inflation in Russia (annual %)

Inflation in Turkey (annual %)

Inflation in Israel (annual %)

Buying lunch in Zimbabwe

**Zimbabwe timeline**

- December 2006: inflation over 1000%
- February 2007: inflation ruled illegal
- October 2008: inflation over 200 million percent!
- January 2009:
  - Transactions permitted in foreign currency
  - Soldiers and teachers to be paid in USD
- February 2009: 12 zeros knocked off
- April 2009: government abandons currency, people use USD (also South African rand – ZAR)
Israel in the 1980s

- American Rabbi visiting Israel:
  - During Israel's hyperinflation, I had a mortgage at a 9% fixed annual interest rate. As inflation increased, fixed rate mortgage payments became laughably easy to make, because salaries more or less kept pace with inflation. Finally, I received a notice canceling my mortgage, because the cost of record-keeping had become more than the monthly payment.

Iran

- Graeme Wood, “Hyperinflation vacation,” The Atlantic, April 2013:
  - The Iranian rial was hovering under 40,000 to one U.S. dollar, weaker by nearly half compared with six months earlier. Authorities tried to ban currency trading for a few weeks in October, when the inflation rate peaked.
  - Wood’s First Rule of Budget Travel: where there is runaway inflation, there are great deals for travelers with hard cash. So in January, I boarded a flight from Dubai to Kish, an Iranian holiday resort in the Persian Gulf.

Other examples

- Personal experiences with hyperinflation?

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The quantity theory of money

- The more currency (money) in circulation, the less each unit is worth

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Quantity theory: picture

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Money Growth → Inflation
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Quantity theory: words

- The more currency (money) in circulation, the less each unit is worth
Quantity theory: math

- One equation (a production function for transactions)
  \[ M \times V = P \times Y \]
  - \( M \) = stock of money in circulation (amount of currency)
  - \( V \) = velocity (how often a unit of currency is used in a year)
  - \( P \) = price level (the GDP deflator or other price index)
  - \( Y \) = real GDP

Quantity theory: math

- One equation (technology for transactions)
  \[ M \times V = P \times Y \]
  - In growth rates
    \[ \gamma M + \gamma V = \gamma P + \gamma Y \]
    - \( \gamma M \) = growth of money supply (think: currency)
    - \( \gamma V \) = growth of velocity
    - \( \gamma P \) = growth of price level (the inflation rate)
    - \( \gamma Y \) = growth of real GDP

Quantity theory

- Two hypotheses
  - \( V \) is constant (\( \gamma V = 0 \))
  - \( Y \) not affected by changes in \( M \)
    [Or: changes in \( Y \) small relative to changes in \( M \)]
- One conclusion
  - Money growth causes inflation
    \[ \gamma P = \gamma M - \gamma V \]

Quantity theory: long-run evidence

- \( \frac{M}{Y} \) and \( P \) (log scale)
- 1960 to 2010

Quantity theory: short-run evidence

- Year-on-Year Growth
- 1960 to 2010

Quantity theory: small inflations

- Lots of other things relevant in small inflations
- Link between money and prices not as tight
- More on this next week
Money supply mechanics

- How the central bank manages the money supply
  - Money = currency for our purposes
  - Supply changed by buying/selling bonds in market
- Works through balance sheets for
  - Treasury
  - Central bank
  - Private agents (households and firms)

Money supply mechanics

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<th>Liabilities</th>
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Money supply mechanics

- Where does treasury debt come from?
- How does central bank increase money supply?
- Why do households go along?

Money supply mechanics

- Where do deficits come in?
- Does there need to be a connection with money growth?
- Why so in hyperinflations?

Quantity theory: revised picture

Government Deficit \[\rightarrow\] Money Growth \[\rightarrow\] Inflation

Hyperinflation recap

- Hyperinflations – always! – stem from
  - Lack of fiscal discipline [= government deficit]
  - Accommodation by central bank [= printing money]
- How to end them: “stop doing it”
  - Balance government budget
  - Make central bank independent, prohibit it from buying debt directly from Treasury
Fiscal dominance in the US and EU

- **Fiscal dominance** means
  - Government debt and deficit are so large that the only alternative to explicit default is printing money
- **US/Fed view of the world**
  - Need aggressive monetary policy to recover from crisis
- **EU/ECB view of the world**
  - Need to resist inflation with tight monetary policy
  - US guilty of “soft fiscal dominance”

What have we learned?

- **Hyperinflation comes from**
  - Large increases in money supply
  - Triggered by government deficits
- **Solution**: Stop doing it.
- **Essential tools**
  - Quantity theory
  - Central bank balance sheet

For the ride home

- **Question 1**
  - Would Argentina be better off using USD?
  - Would the US be better off with gold?
- **Question 2**
  - Unexpected inflation hurts creditors [why? why unexpected?]
  - Does this violate property rights?