

1.3 Measurement of the Economy at the Macro Level: Business Cycles

References:
Williamson, Chs. 3.

Outline

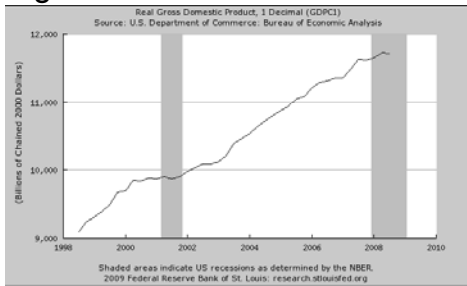
1. What are business cycles?
2. Measurement concepts.
3. The “Stylized facts” of business cycles.

NBER Definition

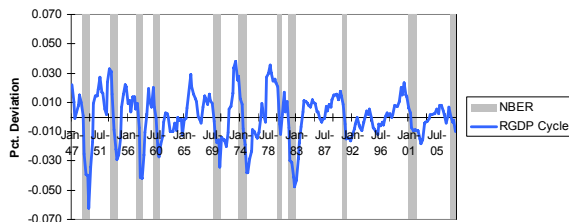
“A recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in production, employment, real [*personal disposable*] income, and other indicators. A recession begins when the economy reaches a peak of activity and ends when the economy reaches its trough. Between trough and peak, the economy is in an expansion.”

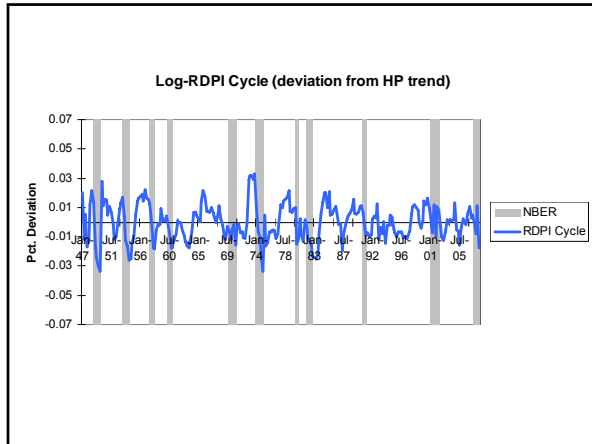
Peaks and Troughs, Booms and Recessions

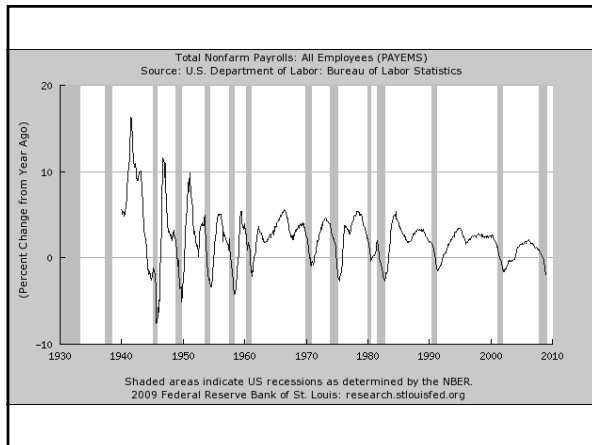
Peaks, etc: Not always obvious in a single data series!



Log-RGDP Cycle (deviation from HP trend)







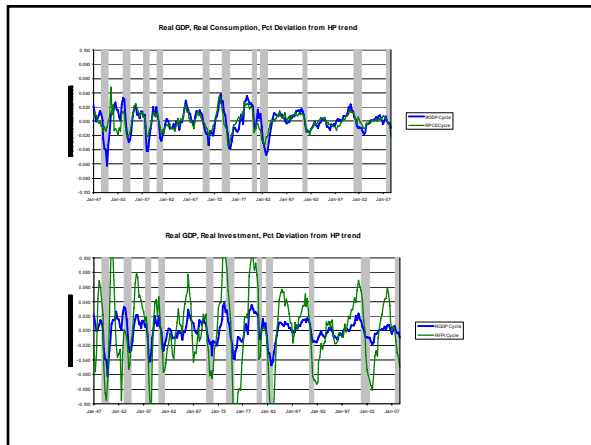
**“All business cycles are alike”:
Comovement of cyclical components**

Look at behavior of cyclical component of a time-series variable and assess:

- Volatility (relative to that of GDP)
- Correlation (with GDP)
- Leading or lagging tendency.

Volatility (relative to that of RGDP)

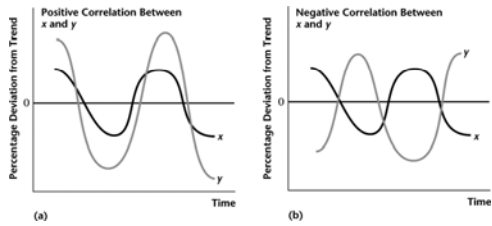
- Measured by $\sigma(X)/\sigma(Y)$
($\sigma(X)$ = standard deviation of X)
- Definition.



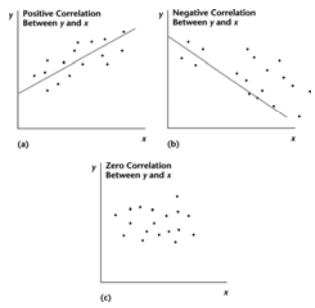
Correlation (with RGDP).

- Measures tendency to increase or decrease together.
 - $-1 \leq \sigma(X,Y) \leq 1$
 - $\sigma(X,Y) = +1$, "perfectly correlated"
 - $\sigma(X,Y) = 0$, "uncorrelated"
 - $\sigma(X,Y) = -1$, "perfect negative correlation"
- Determines whether X is
 - Pro-cyclical,
 - Acyclical, or
 - Counter-cyclical
- Definition.

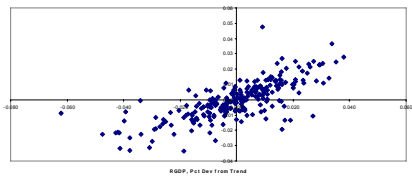
Time Series Plots of x and y



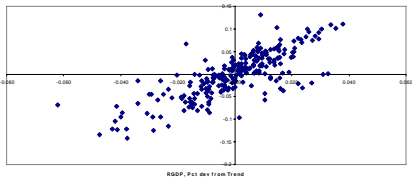
Correlations Between y and x

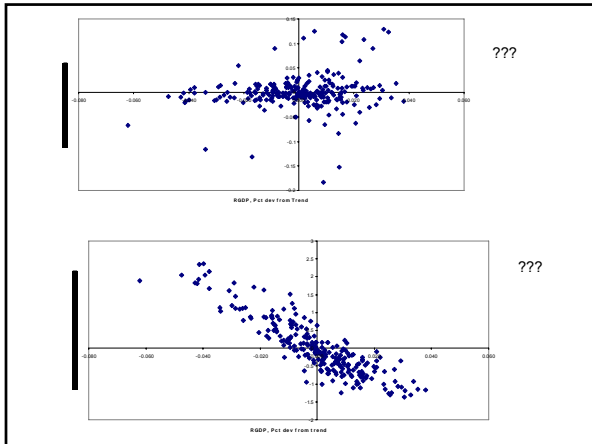


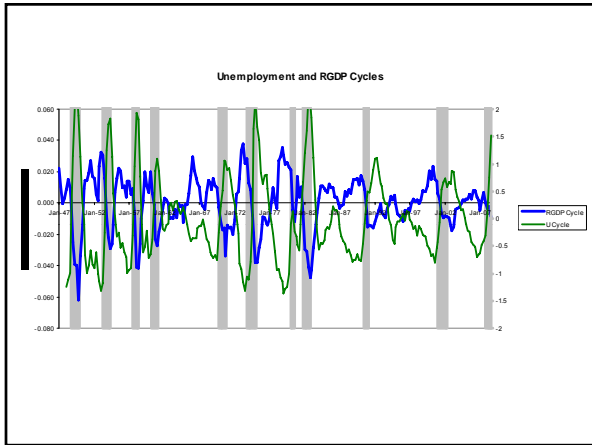
Real Consumption and RGDP Cycles

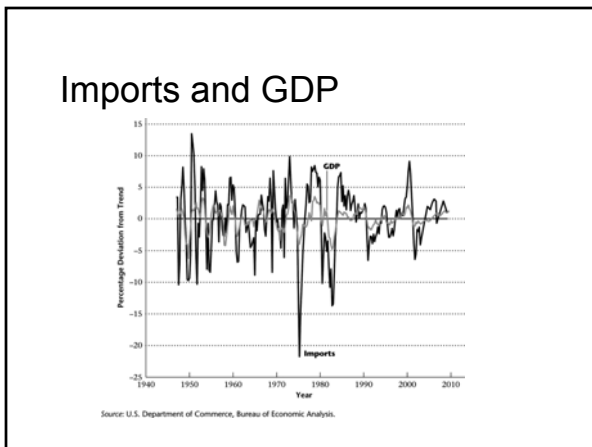


Real Investment and RGDP Cycles

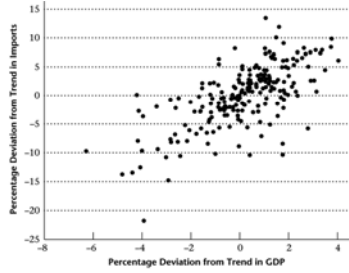






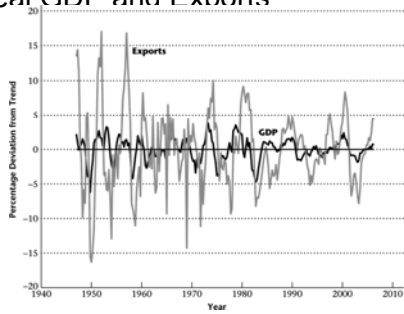


Scatter Plot of Imports and GDP

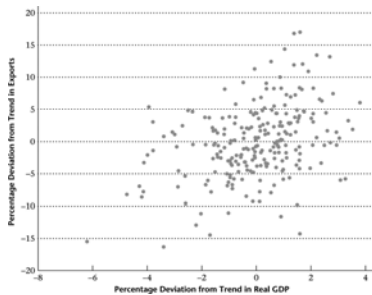


Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Percentage Deviations from Trend in Real GDP and Exports



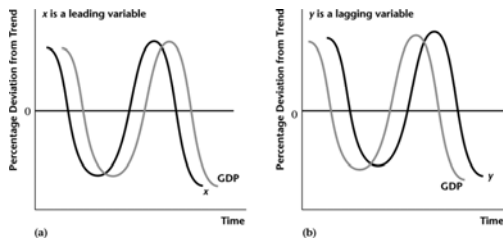
Scatter Plot of Exports vs. GDP



Leading and Lagging Variables

- Does $X(t)$ “lead” or “lag” the cycle in RGDP?
 - $X(t-1)$ more correlated with $Y(t) \Rightarrow X$ leads Y
 - $X(t+1)$ more correlated with $Y(t) \Rightarrow X$ lags Y
- Caution:
 - “Post hoc ergo propter hoc”?
 - NO!!! These relationships do NOT imply causation!!
 - Purely statistical relationships!

Leading and Lagging Variables



RGDP and the “Leading Indicators” over the cycle



Digression: Conference Board Coincident and Leading Indicators

- http://www.conference-board.org/pdf_free/economics/PresentUSEconomy.pdf
- Coincident indicators are more or less the series that define the cycle (p.4).
- Comparison of leading and coincident indexes (p.5)
- Time series of 10 leading indicators (p.9-10).

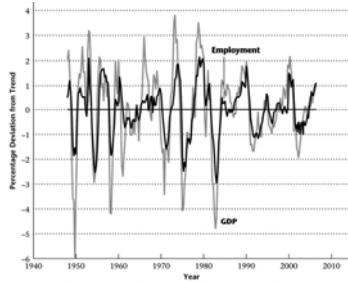
Behavior of Key Macroeconomic Variables

- Components of RGDP:
Consumption and investment.
- Labor market variables:
Employment, unemployment, real wage, average labor productivity.
- Nominal variables:
Price level and money supply.

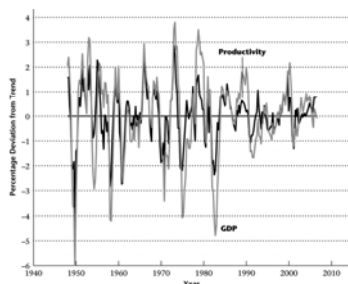
Components of RGDP: $Y = C + I + G + X - M$

[Already looked at these!]

Labor Mkt Variables: Employment



Labor Mkt Variables: Average Labor Productivity (Y/N)

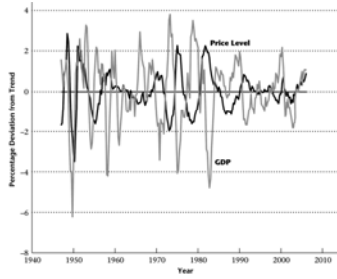


Nominal variables

- Price level.
- Money Supply.

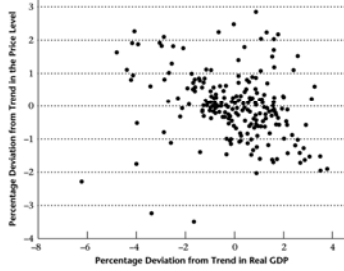
Some of the most controversial issues in Macroeconomics revolve around the cyclical behavior of these variables!

Price Level and RGDP



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Price Level and RGDP



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Money Supply RGDP.



Source: U.S. Department of Commerce, Bureau of Economic Analysis, and Board of Governors of the Federal Reserve System.

Summary of Correlation Coefficients and Volatility of Key Macro Variables

	Correlation Coefficient (with GDP)	Standard Deviation (% of S.D. of GDP)
Consumption	0.76	75.0
Investment	0.83	472.6
Price Level	-0.28	57.1
Money Supply	0.32	80.4
Employment	0.80	59.9
Average Labor Productivity	0.82	62.7

Summary of Stylized facts of Cycles

	Cyclicality	Lead/Lag	Variability Relative to GDP
Consumption	Procyclical	Coincident	Smaller
Investment	Procyclical	Coincident	Larger
Price Level	Countercyclical	Coincident	Smaller
Money Supply	Procyclical	Leading	Smaller
Employment	Procyclical	Lagging	Smaller
Real Wage	Procyclical	?	?
Average Labor Productivity	Procyclical	Coincident	Smaller

All business cycles are unique?

- We've seen the commonalities.
- Differences are also interesting (and profound and worrisome!)
- From a statement about NBER's b-cycle dating procedure:

<http://www.nber.org/cycles/recessions.html>
