

# Introduction to Business Cycle Data

Brian C. Jenkins

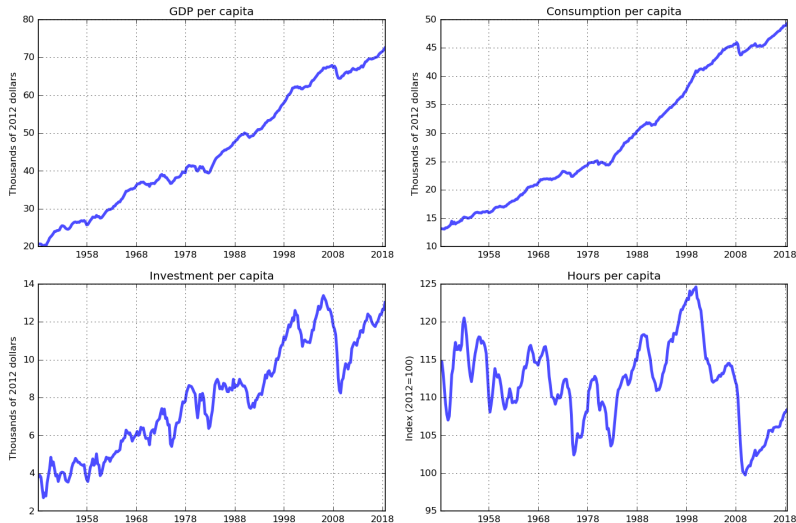
University of California, Irvine

February 4, 2019

- The *business cycle* is the fluctuation of many macroeconomic quantities that last for about 1.5 to 8 years.
- Business cycle fluctuations are costly:
  - Misallocations of capital and labor.
  - Particularly painful for workers that become unemployed and for the families of workers who become unemployed.

- We will examine two historically-competing schools of thought:
  - ① **Real Business Cycle (RBC)** theory: fluctuations in real quantities are primarily due to TFP shocks; i.e., shocks to the production function.
  - ② **New-Keynesian (NK)** theory: fluctuations are largely driven by aggregate demand and affect real quantities because of nominal rigidities (e.g., sticky prices).
- Both approaches have merits and shortcomings and elements of both are integrated into contemporary business cycle theory.

**Figure 1: GDP, consumption, investment, and hours for the US from April 1948 to July 2018.** Source: FRED.



# Trend and Cycle Components

- Suppose that the value of a time series process  $X_t$  can be decomposed into two components: a *trend* component and a *cyclical* component.

$$X_t = X_t^{trend} + X_t^{cycle} \quad (1)$$

- The trend component is the long-run path about which the series fluctuates.
- The cyclical component is the difference between the value of a time series and the trend:

$$X_t^{cycle} = X_t - X_t^{trend} \quad (2)$$

# Trend and Cycle Components

- Often it's useful to express the cyclical component of a time series as the difference between the (natural) log of the series and the log of the trend:

$$\hat{x}_t = \log(X_t) - \log(X_t^{trend}) \approx \frac{X_t - X_t^{trend}}{X_t^{trend}} \quad (3)$$

- The log-deviation from trend is approximately equal to the percent deviation of the series from trend (divided by 100).

# Trend and Cycle Components

## Example: Compounding Interest

- Suppose:

$$X_t = 220 \quad (4)$$

$$X_t^{trend} = 215 \quad (5)$$

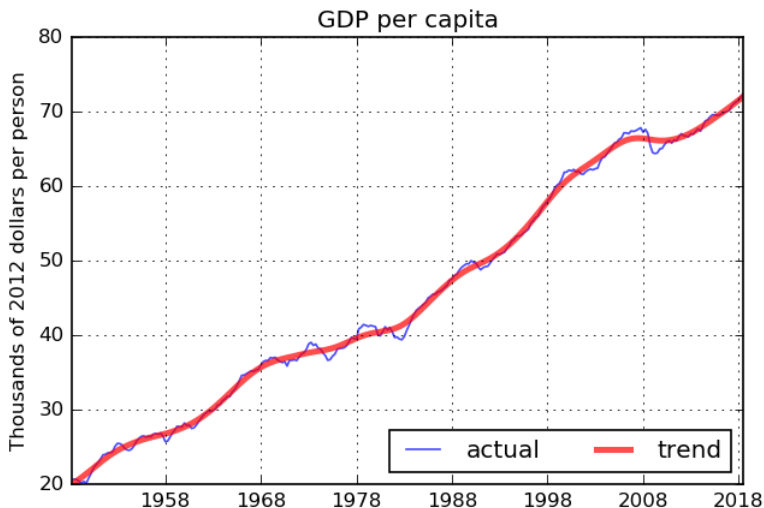
- Then:

$$\frac{X_t - X_t^{trend}}{X_t} = \frac{220 - 215}{215} = 0.0233 \quad (6)$$

and:

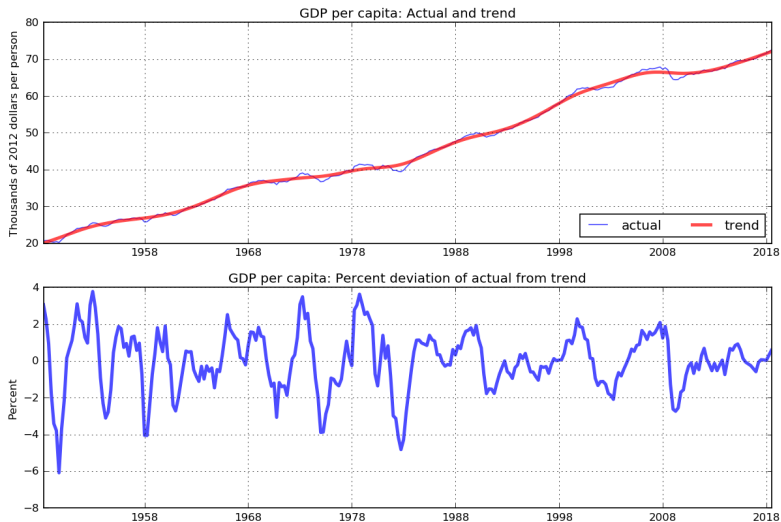
$$\log X_t - \log X_t^{trend} = \log 220 - \log 215 = 0.0230 \quad (7)$$

**Figure 2: GDP, consumption, investment, and hours per capita for the US from April 1948 to July 2018.** Source: FRED.

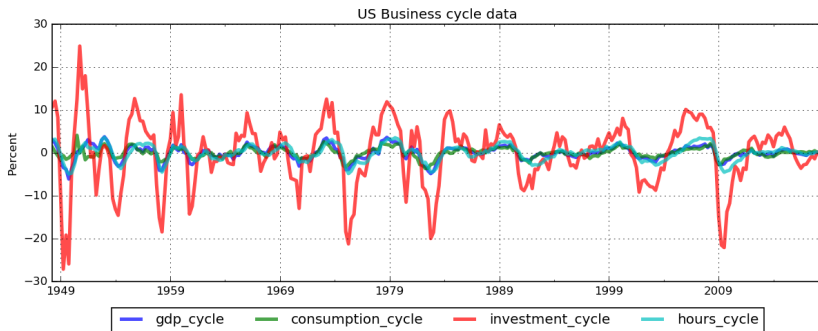




**Figure 3: US GDP per capita: actual, trend, and cycle from April 1948 to July 2018.** Source: FRED.



**Figure 4: Business cycle components of GDP, consumption, investment, and hours for the US from April 1948 to July 2018.** Source: FRED.



**Table 1: Standard deviations of real business cycle data** from April 1948 to July 2018. Units are percent deviations from trend. Source: FRED.

GDP	1.613
Consumption	1.167
Investment	7.489
Hours	1.889

**Table 2: Correlations of real business cycle data** from April 1948 to July 2018. Units are percent deviations from trend. Source: FRED.

	GDP	Consumption	Investment	Hours
GDP	1.000	0.794	0.845	0.874
Consumption	0.794	1.000	0.671	0.705
Investment	0.845	0.671	1.000	0.786
Hours	0.874	0.705	0.786	1.000