Introduction to Business Cycle Data

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- 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.

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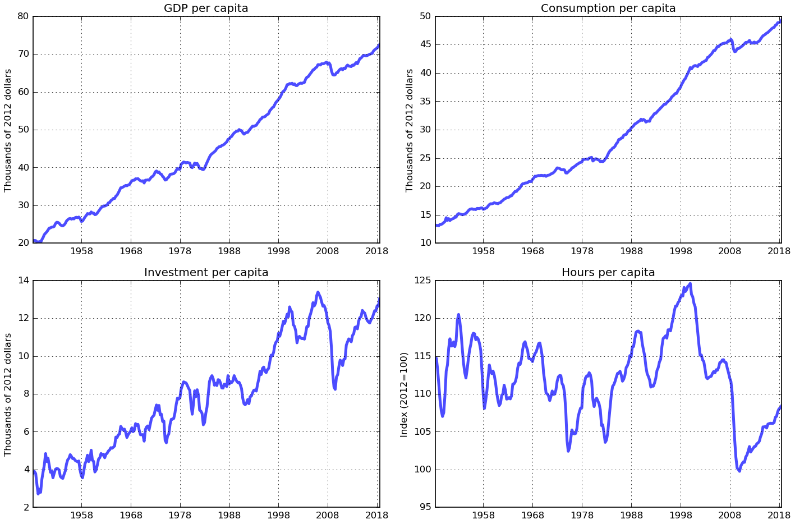
- Both approaches have merits and shortcomings and elements of both are integrated into contemporary business cycle theory.

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.

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- 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:

$$X_t^{cycle} = X_t - X_t^{trend} \tag{2}$$

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:

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

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

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Example: Compounding Interest

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

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- Suppose:

$$\begin{aligned} X_t &= 220 && (4) \\ X_t^{trend} &= 215 && (5) \end{aligned}$$

- Then:

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

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.

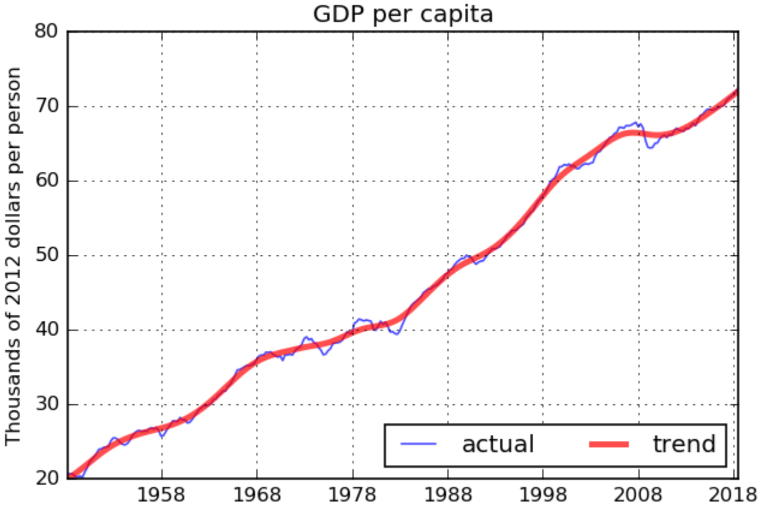

Figure 3: **US GDP per capita:** actual, trend, and cycle from April 1948 to July 2018. Source: FRED.

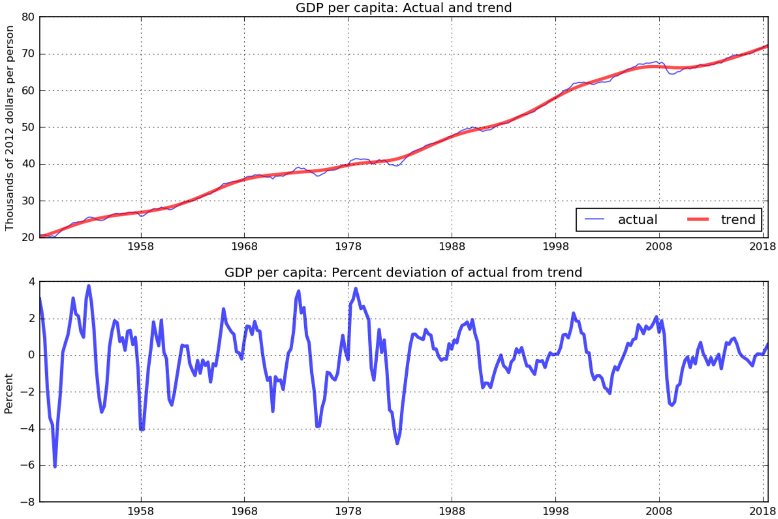

Figure 4: **Business cycle components of GDP, consumption, investment, and hours** for the US from April 1948 to July 2018. Source: FRED.

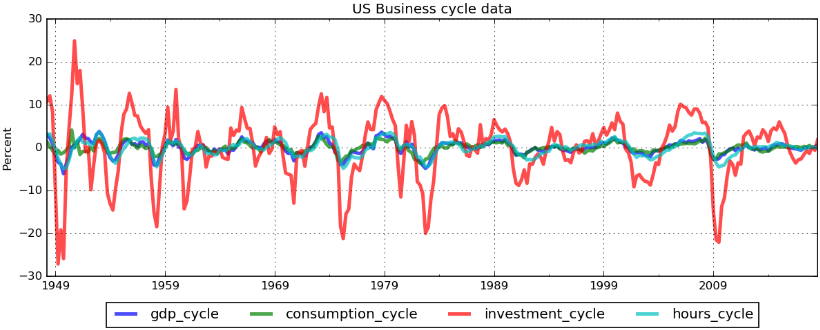

Table 1: **Standard deviations of real business cycle data** from April 1948 to July 2018. Units are percent deviations from trend. Source: FRED.

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