Business Cycles

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A bit of history (1)

- There are recurrent expansions and contractions on the aggregate economic production.
- Before the Great Depression in the 1930s the study of macro fluctuations relied on microeconomic or real causes (as opposed to nominal/monetary sources).
- After the Great Depression, Keynes and most economists stressed monetary and psychological factors as main sources of business cycles.
- Keynesian approach can be sketched through an IS-LM or AD-AS model.

A bit of history (2)

- In the 1970s macroeconometric models collapsed and the rational expectations revolution (Lucas, 1976) took off.
- Kydland and Prescott (1982) formulate the first business cycle model that involved market clearing, no monetary factors and no rationale for macroeconomic management.
- Kydland and Prescott (1982) focus on productivity/technological shocks as the driving force of business cycle.
- Although the idea that productivity shocks drive cycles has been challenged, the methodological contribution of these authors remains intact (Nobel Prize 2003).

Macroeconomics Today

- Modern macro models share same basic structure:
  - Utility maximizer households and profit maximizer firms.
  - Equilibrium economy reacts to stochastic shocks of different nature.
  - Explicit general equilibrium effects.
  - Dynamics of the economy are based on microfoundations.
- Same analytical framework for growth, business cycles and other macroeconomic phenomena.
- New Keynesians basically embed some adhoc "Keynesian" features into the Dynamic General Stochastic Equilibrium, especially price/wage rigidities.

A Proposed Reinterpretation...

- Old Keynesian models (IS-LM, AD-AS) use shortcuts and adopt empirical regularities as behavioral rules.
- Modern macroeconomics uses microfounded frameworks to analyze business cycle and growth.
- There is a continuum between microfounded vs *ad hoc* reduced form. All models lie somewhere in between.
- Modern macro workhorse: stochastic growth model as starting point to understand business cycle fluctuations.
- Originally called Real Business Cycle (fresh-water). Salt-water schools tend to call it Dynamic General Stochastic Equilibrium (DGSE) models (especially when price rigidities are incorporated).

Why Business Cycles? (1)

- Booms and recessions have been a persistent pattern of modern economies in the post Industrial Revolution era.
- Growth models say something about the long-run picture, but they don't say much about business cycles.
- Should we care about business cycles? Why?
- Compare BC uncertainty to the whole uncertainty faced by households...

Why Business Cycles? (2)

- Some reasons to worry about recessions
  - Uninsurable risks and incomplete capital markets.
  - Negative effects of fluctuations tend to be larger for poorer people.
  - Macro instability may hurt long-run growth (think of conditional β-convergence).
- In practice, government spend a great deal of resources to stabilize growth.

Decomposing Time Series (1)

- Traditionally, time series are decomposed into trend, cycle, seasonal and residual components.

$$Y_t = T_t + C_t + S_t + R_t$$

- Growth theory cares about the T_t component.
- Business cycle theory cares about the C_t component.
- Seasonal pattern is not carefully modeled in general.
- Residual is... unexplained short run variation.
- Arbitrary assumptions can be misleading, although most models implicitly or explicitly focus on explaining one element.

Decomposing Time Series (2)

- In business cycles, we basically concern about "detrended" data. We ignore short run and seasonal fluctuations.

$$Y_t = T_t + C_t$$

- Most common detrending method: Hodrick-Prescott (1980) filter. Basically the method computes

$$C_t = Y_t - T_t = Y_t - \sum_{j=-J}^{J} a_j Y_{t-j}$$

where the trend sequence T_t is computed as

$$\min_{\{T_t\}_{t=0}^{\tau}} \sum_{t=1}^{\tau} \left\{ (Y_t - T_t)^2 + \lambda[(T_{t+1} - T_t) - (T_t - T_{t-1})]^2 \right\}$$

Decomposing Time Series (3)

- The parameter λ is known as smoothing parameter:
- $\lambda = 0$ changes in slope rate are not penalized $\rightarrow T_t = Y_t$
- $\lambda = \infty$ no changes in slope $\rightarrow$ OLS on a linear trend.
- In practice, solving HP filter is quite simple. FOC is

$$0 = -2(Y_t - T_t) - 4\lambda(T_{t+1} - 2T_t + T_{t-1}) + 2\lambda(T_t - 2T_{t-1} + T_{t-2}) + 2\lambda(T_{t+2} - 2T_{t+1} + T_t)$$

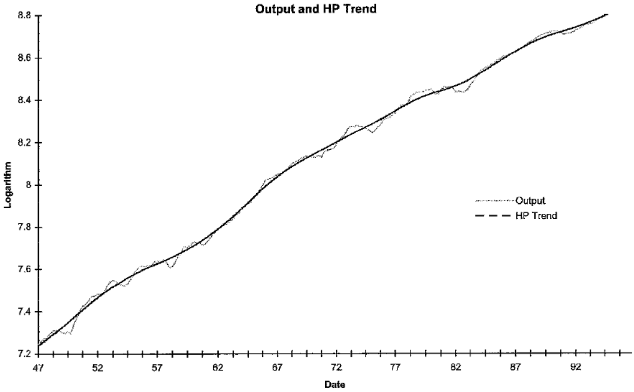
- Rearranging the we get

$$Y_t = \lambda T_{t+2} - 4\lambda T_{t+1} + (6\lambda + 1)T_t - 4\lambda T_{t-1} + \lambda T_{t-2}$$

- The sequence $\{T_t\}_{t=0}^{\tau}$ is obtained by solving a linear system of equations.

Applying HP filter to US GDP data (1)

in King and Rebelo (1999)



Applying HP filter to US GDP data (2)

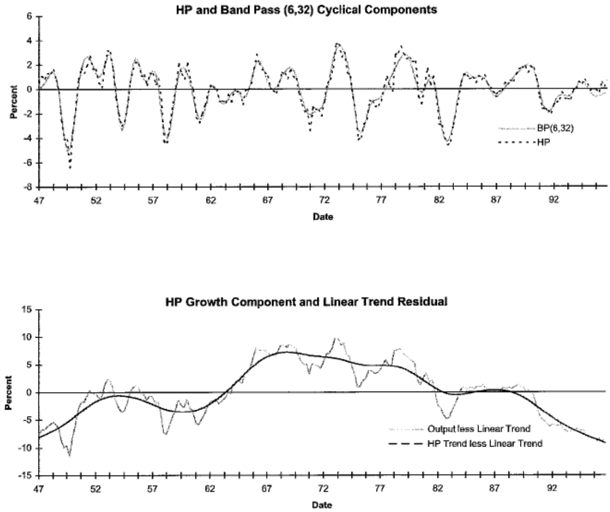
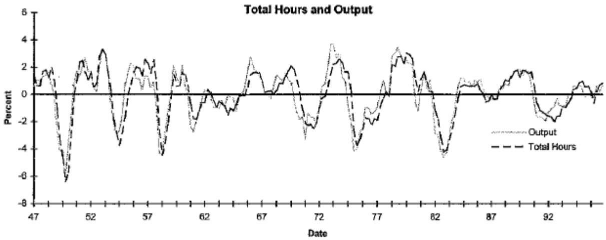
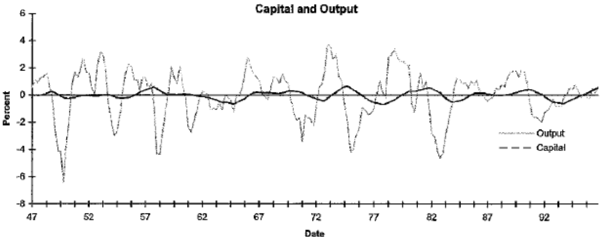


Fig. 1. Trend and business cycle in US real output. Sample period is 1947:1–1996:4.

Applying HP filter to US GDP data (3)





Applying HP filter to US GDP data (4)

Table 1
Business cycle statistics for the US Economy

	Standard deviation	Relative standard deviation	First-order autocorrelation	Contemporaneous correlation with output
Y	1.81	1.00	0.84	1.00
C	1.35	0.74	0.80	0.88
I	5.30	2.93	0.87	0.80
N	1.79	0.99	0.88	0.88
Y/N	1.02	0.56	0.74	0.55
w	0.68	0.38	0.66	0.12
r	0.30	0.16	0.60	−0.35
A	0.98	0.54	0.74	0.78

[a] All variables are in logarithms (with the exception of the real interest rate) and have been detrended with the HP filter. Data sources are described in Stock and Watson (1999), who created the real rate using VAR inflation expectations. Our notation in this table corresponds to that in the text, so that Y is per capita output, C is per capita consumption, I is per capita investment, N is per capita hours, w is the real wage (compensation per hour), r is the real interest rate, and A is total factor productivity.

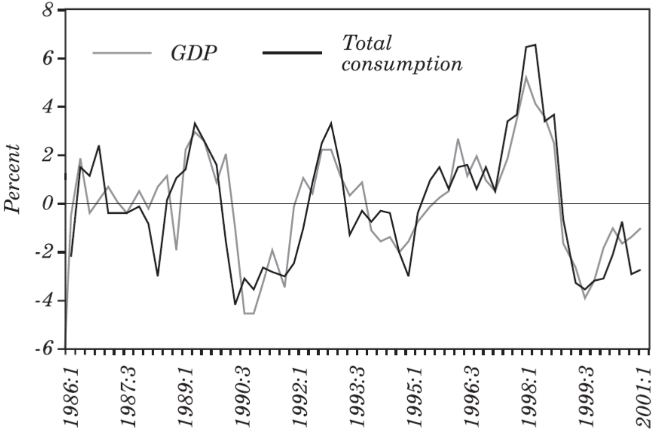
Evidence for Chile Bergoeing and Soto (2005)

Table 1. Main Indicators of the Business Cycle in Chile, 1986–2000

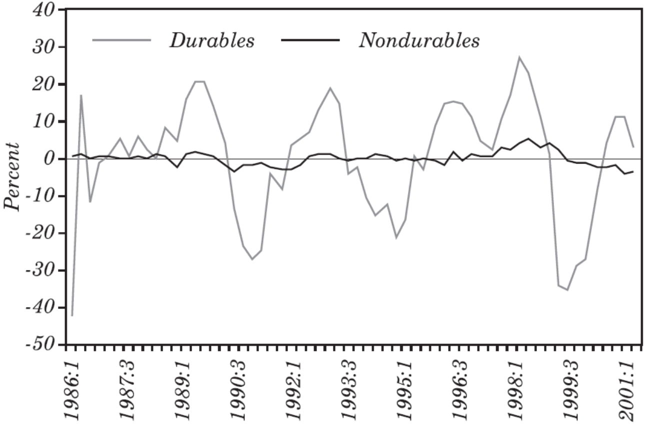
Variable	*Volatility*[a]	*Volatility relative to that of output*	*Correlation with output*	
			Contemporaneous	*Peak quarter*[b]
Output	2.20	1.00	1.00	0
Consumption, total	2.43	1.11	0.83	0
Consumption, nondurables	1.88	0.86	0.60	–1
Consumption, durables	15.94	7.25	0.80	0
Investment	7.47	3.23	0.83	0
Capital	1.32	0.60	0.41	–3
Avg. hours worked	1.07	0.74	0.21	–2
Total hours worked	1.92	0.87	0.44	–2
Employment	1.23	0.56	0.48	+2
Real wages	1.37	0.62	0.38	–1
Government consumption	1.55	4.04	–0.08	+2
Money	5.47	2.49	0.64	+1
Price level	2.12	0.96	–0.26	0
Inflation	0.93	0.42	–0.06	+3

Cyclical GDP and consumption for Chile

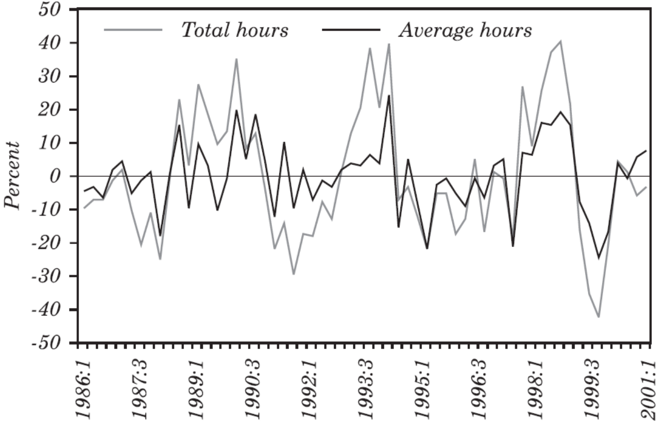
Bergoeing and Soto (2005)



Cyclical consumption components for Chile



Cyclical hours worked for Chile



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