Summary Ch 1 Empirical facts in International Economics

Business cycles facts are characterized by decomposing the time series $y_t = y_t^c + y_t^s$ (cycle + trend/secular component) (Methods: HP filter, log-linear detrending, log-quadratic, time differences, Band Pass filter)

Log-linear: $y_t = \ln Y_t$ (Y_t: economic time series), then let $y_t = a + bt + \epsilon_t$, cycle: $y_t^c = \epsilon_t$, trend: $y_t^s = a + bt$; a, b, c can be estimated via OLS (e.g., King, Plosser, Rebello, JME 1988)

Log-quadratic: $y_t = a + bt + ct^2 + \epsilon_t$, cycle: $y_t^c = \epsilon_t$, trend: $y_t^s = a + bt + ct^2$, a, b, c can be estimated via OLS (e.g., Mendoza 1991)

Business Cycles Facts with Annual Data

Source: WDI (1960-2011); data included for countries that have at least 30 consecutive observations in log of GDP (y), real consumption (c), government consumption (g), investment (I), exports (x), imports (m). Sample: 120 countries, 94 countries for current account. All variables are real and per-capita.

Note on consumption: typically studies remove durables from definition of consumption. Reason: such expenditure resembles investment in household physical capital better.
Like investment it is far more volatile than consumption in non-durables and services.

Results: Non durable and services consumption is less volatile than output ($\sigma_c < \sigma_y$)
Durables consumption is more volatile than output ($\sigma_{c,durables} > \sigma_y$)

σ_c/σ_y	log-linear detrending	Quadratic detrending	HP Filter
Total	1.02	1.01	0.86
Non durables	0.87	0.84	0.64
Durables	2.47	2.53	2.95

Note on trade balance and current account:
Trade balance and current account take on negative values and log(.) cannot be used. Instead normalize by trend of GDP or consider the variables as ratio of GDP $tb_t = \frac{X_t - M_t}{\exp(y_t^s)}$, $ca_t = \frac{CA_t}{\exp(y_t^s)}$

Ten Business Cycles Facts:

Fact 1: [High Global Volatility] The cross-country average standard deviation of output is about twice as large as its U.S. counterpart.
Fact 2: [Excess Consumption Volatility] On average across countries, private consumption including durables is more volatile than output.
Fact 3: [Global Ranking of Volatilities] The ranking of cross-country average standard deviations from top to bottom is imports, investment, exports, government spending, consumption, and output.
Fact 4: [Procyclicality of the Components of Aggregate Demand] On average across countries, consumption, investment, exports, and imports are positively correlated with output.
Fact 5: [Countercyclicality of the Trade Balance and the Current Account] On average across countries, the trade balance, trade-balance-to-output ratio, current account, and current-account-to-output ratio are negatively correlated with output.
Fact 6: [Acyclicality of the Share of Government Consumption in GDP] On average across countries, the share of government consumption in output is roughly uncorrelated with output.
Fact 7: [Persistence] The components of aggregate supply (output and imports) and aggregate demand (consumption, government spending, investment, and exports) are all positively serially correlated.
Fact 8: [Excess Volatility of Poor and Emerging Countries] Business cycles in emerging or poor countries are about twice as volatile as business cycles in rich countries.
Fact 9: [Excess Consumption Volatility in Poor and Emerging Countries] The relative consumption volatility is higher in poor and emerging countries than in rich countries.
Fact 10: [The Countercyclicality of Government Spending Increases with Income] The share of government consumption is countercyclical in rich countries, but acyclical in emerging and poor countries.

$\sigma_y^{ROW} > \sigma_y^{US}$

w/ durables $\sigma_c > \sigma_y$

Global Ranking:
$\sigma_m > \sigma_i > \sigma_x > \sigma_y > \sigma_c > \sigma_y$

C, M, I, X are procyclical

TB, CA are countercyclical

G/Y is acyclical

Serial Correlation in all components of Agg. Supply and Agg. demand (y, im; and c, g, i, x).

RoW vs. US

US1: $\sigma_y^{RoW} > \sigma_y^{US}$
US4: g/y is countercyclical
US5: US is less open than RoW ($\frac{X+M}{Y}$ 240% in RoW vs 99% in US)

Countries Comparison by Income

Classification by per-capita GDP:

< $3000	Poor	(40, 1/3)
$3000 - $25000	Emerging	(58, 1/2)
> $25000	Rich	(22, 1/6)

Fact 2: $\sigma_y^{EME}, \sigma_y^{Poor} > \sigma_y^{Rich}$

Excess Volatility:	8.7%	6.1%	3.3%

Fact 9: $\frac{\sigma_c^{Poor}}{\sigma_y} > \frac{\sigma_c^{EME}}{\sigma_y} > \frac{\sigma_c^{Rich}}{\sigma_y}$ Poor & EMEs smooth consumption by less

Fact 10: Countercyclicality of Gov. Spending increases w/ income
Corr(g/y, y): Poor: 0.08, EME: -0.08, Rich: -0.39
also the government consumption is countercyclical in rich countries, but acyclical in EMEs & Poor countries

Quarterly Data

Not many long series $n^{annual} = 120$, $n^{quarterly} = 28$
Sample Period: 1980Q1 - 2012Q4
Facts 5, 8, 9, 10 remain to hold.

Note on HP filter:

Given y_t, pick y_t^c, y_t^s to solve: $\min_{\{y_t^c, y_t^s\}_{t=1}^T} \left\{ \sum_{t=1}^T (y_t^c)^2 + \lambda \sum_{t=2}^{T-1} [(y_{t+1}^s - y_t^s) - (y_t^s - y_{t-1}^s)]^2 \right\}$ s.t. $y_t^s + y_t^c = y_t$

as $\lambda \to \infty$ Δy^s become costly $\Rightarrow$ y^s converges to linear trend
as $\lambda \to 0$ The cycle disappears ($y^c = 0$, $y^s = y_t$)

In matrix form: $\min_{y^s} (Y - Y^s)'(Y - Y^s) + \lambda (Y^{s\prime} B' B Y^s)$ $B = \begin{bmatrix} 1 & -2 & 1 & 0 & \cdots \\ 0 & 1 & -2 & 1 & 0 \cdots \\ \vdots & & & & \\ 0 & \cdots & 0 & 1 & -2 & 1 \end{bmatrix}$

FOC: $-(Y - Y^s) + \lambda B' B Y^s = 0 \Rightarrow Y^s = (\mathbb{I} + \lambda B' B)^{-1} Y$ ($\Rightarrow$ HP is a linear filter)