

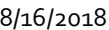
# INTERMEDIATE MACROECONOMICS

Kittichai Saelee

EE312

Faculty of Economics

Thammasat University



- 2

# LOGISTIC INFORMATION

- **Instructor:** Dr. Kittichai Saelee
- **Lecture venue:** Room 302; 11 am – 1.00 pm. (2 hours)
- **Contact:** kittichai\_lee[at]econ.tu.ac.th
- **Office hours:** Room#516, Fri between 2.30 pm and 4 pm.
  - Book your appointment in my Google calendar:  
<https://goo.gl/fgydUR>
  - Students are required to switch to use official email provided by BE program.
  - To acquire an account, please check  
<http://www.checkmail.econ.tu.ac.th/>

# LOGISTIC INFORMATION

- Evaluations:

- Homework: 10%
- Quiz: 20% (Drop the lowest one out.)
- Midterm: 40% **(Oct 3, 2018, 12.00 - 14.00)**
- Final exam: 40% **(Dec, 4, 2018, 09.00 – 12.00)**

\* No make-up exam will be given; please manage schedule ahead of time.

\* Grading is based on curve/distribution.

- Class materials will be posted on the BE moodle.  
(passcode: **7423**)

# LOGISTIC INFORMATION

- Class starts at 11.05 am. Please be here on time!
- No cellphone, no social media, no FB live.
- This course is *VERY* hard. Be prepared!



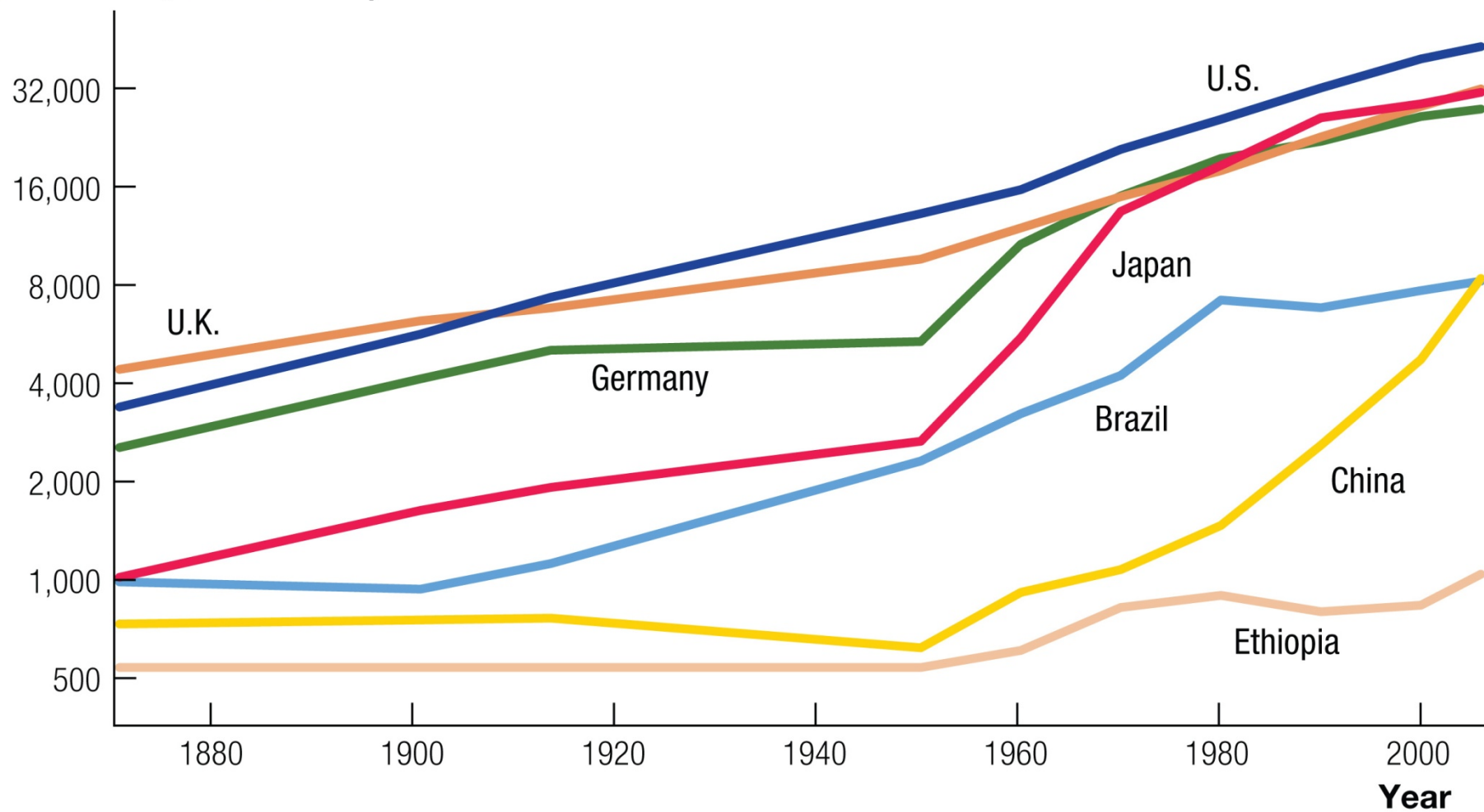
- Logistic information
- What do we study in this course?
- Data and measuring business cycles
  - Measuring economic activities
  - Measuring business cycles

# WHAT WE STUDY IN THIS COURSE

- Similar to what you studied in EE212, in terms of common questions.
- Understanding in greater details (**with more extensions**) of the two big issues in macroeconomics:
  - Long-term growth
  - Business cycles fluctuations



**Per capita GDP**  
(ratio scale, 2005 dollars)

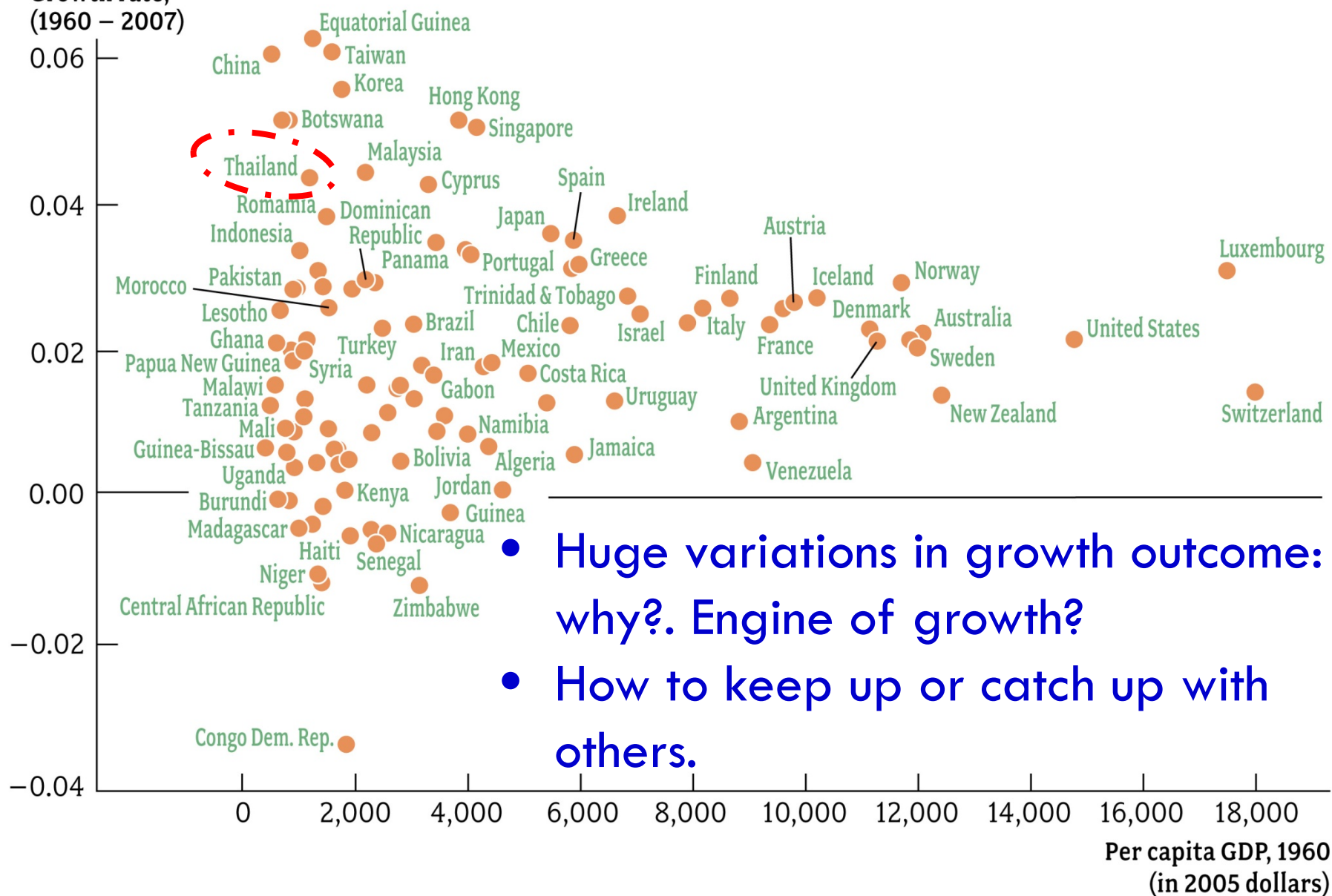


**FIGURE 3.6** Per Capita GDP in Seven Countries, 1870–2006



## Decimal points

Growth rate,  
(1960 – 2007)



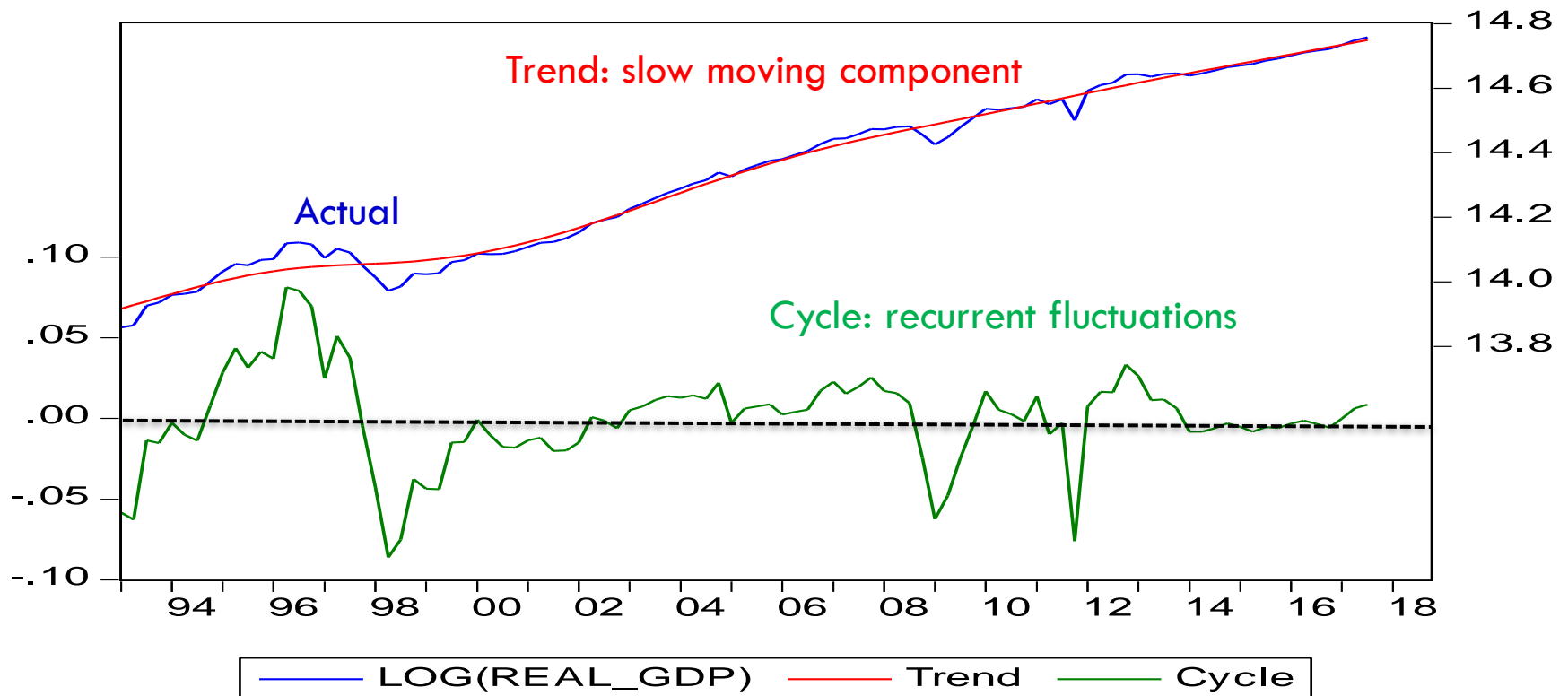
**FIGURE 5.9** Growth Rates around the World, 1960–2007

# SHORT-RUN OR MEDIUM-RUN BUSINESS CYCLES AND FLUCTUATIONS

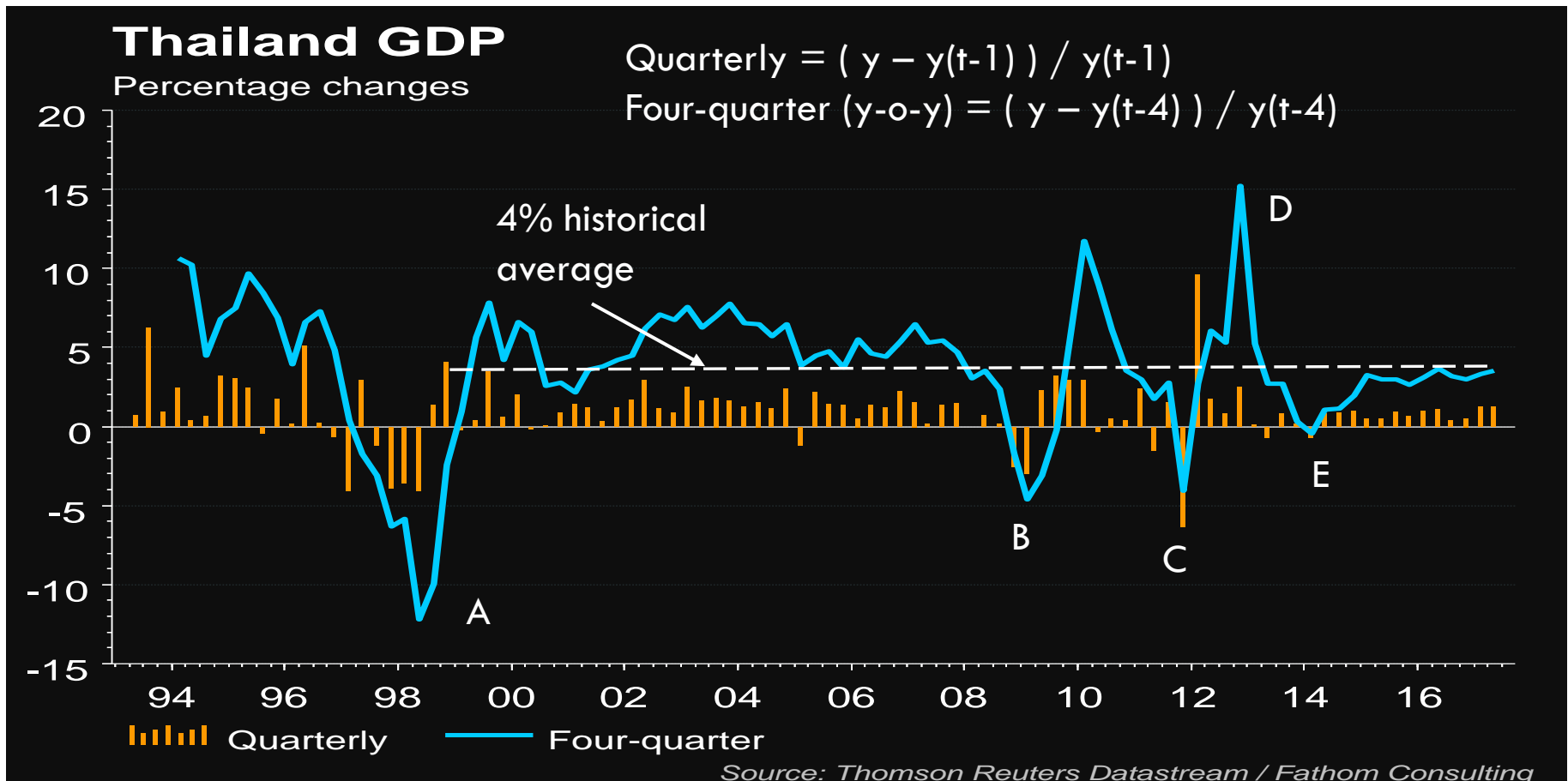
- Normally, we observe that country's real GDP grows over time, as the series have exhibited **upward trending pattern**.
- However, actual series are not growing at a constant rate.
  - From time to time, we observe a deviation of the actual series from its counterpart (long-term) trend.
- This phenomena is typically referred to **"business cycles fluctuations"**.

# THAILAND BUSINESS CYCLES

Hodrick-Prescott Filter (lambda=1600)



# GROWTH VARIATIONS



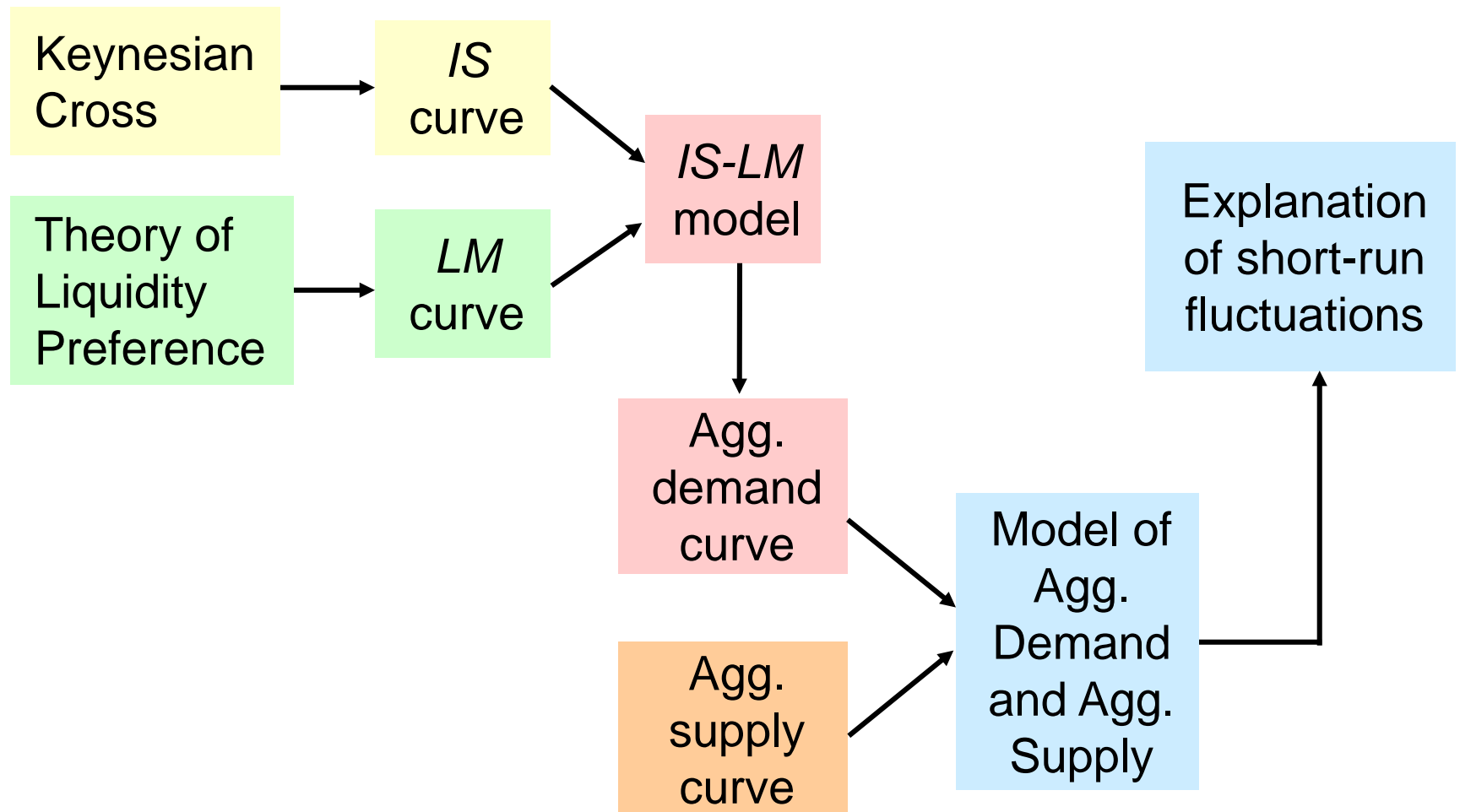
# WRAP UP: QUESTIONS IN MACROECONOMICS

	Growth	Business cycles
Positive	<ul style="list-style-type: none"><li>• What causes the disparity in the level of income per capita across countries?</li><li>• Why do some countries grow, on its average basis, faster than other countries?</li></ul>	<ul style="list-style-type: none"><li>• Why do countries experience recurrent fluctuations in level of GDP and growth of GDP?</li><li>• What are the mechanisms behind the fluctuations? Pattern of fluctuations across different variables?</li><li>• Why do the recessions occur?</li></ul>
Normative	<ul style="list-style-type: none"><li>• What can we do to improve our country?</li><li>• How to catch up the level of income per capita that other wealthy countries have been experiencing.</li></ul>	<ul style="list-style-type: none"><li>• What do need to do to maintain our economy to remain stabilized around its long-term path?</li><li>• Should or shouldn't we intervene the system by any government policies?</li></ul>

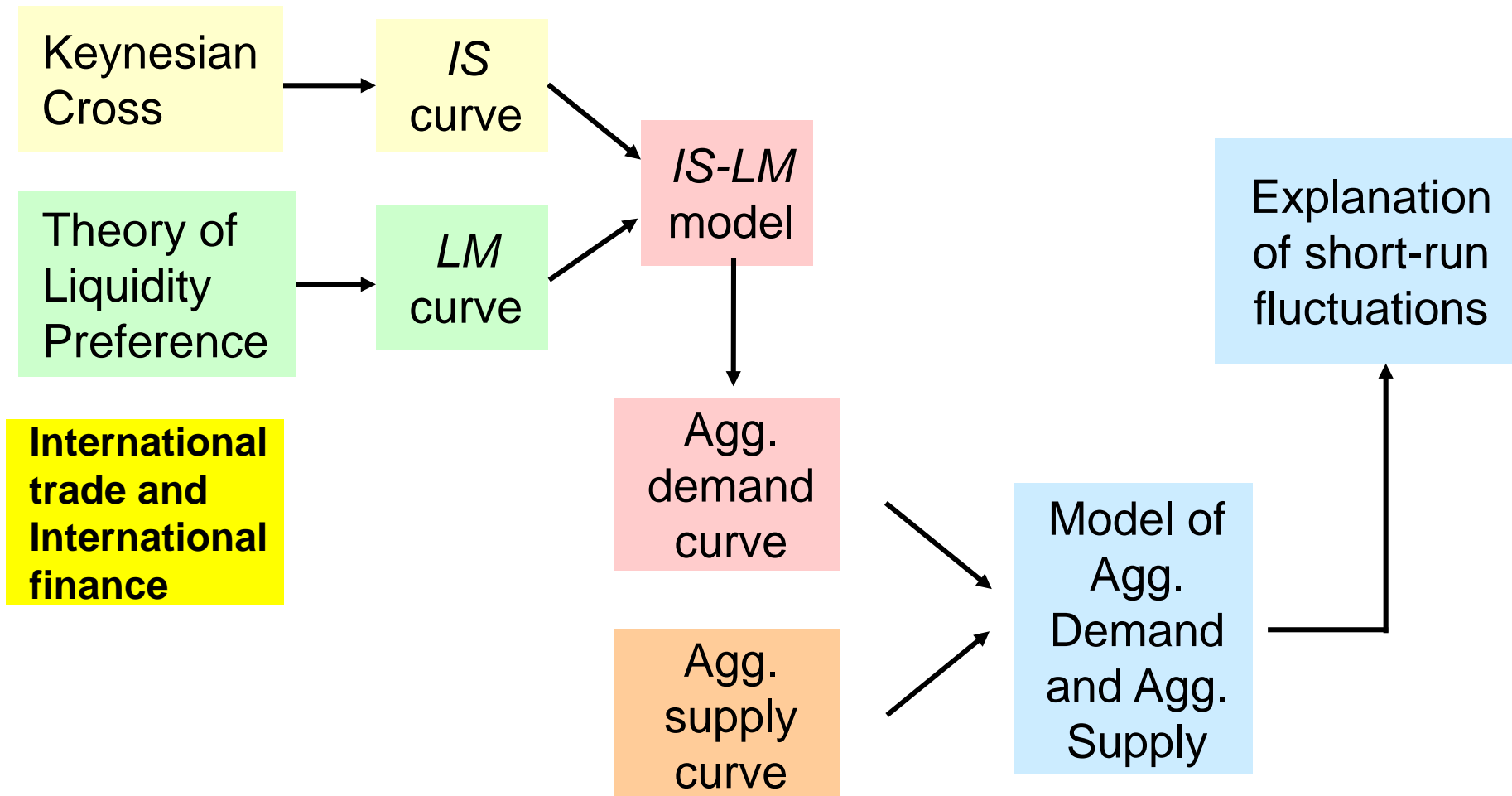
# HOW DO I (WE) ORGANIZE THE TEACHING IN THIS COURSE?

- By time horizon! Short → Medium → Long
- Short-run business cycles
  - how does the deviation take place at the beginning?
  - Look into propagating mechanism of shock.
- Medium-run business cycles
  - After a deviation, how does the economy adjust and revert itself to the long-term trend.
- Long-run growth process

# SHORT-RUN FLUCTUATIONS IN EE212: THE KEYNESIAN SYSTEM



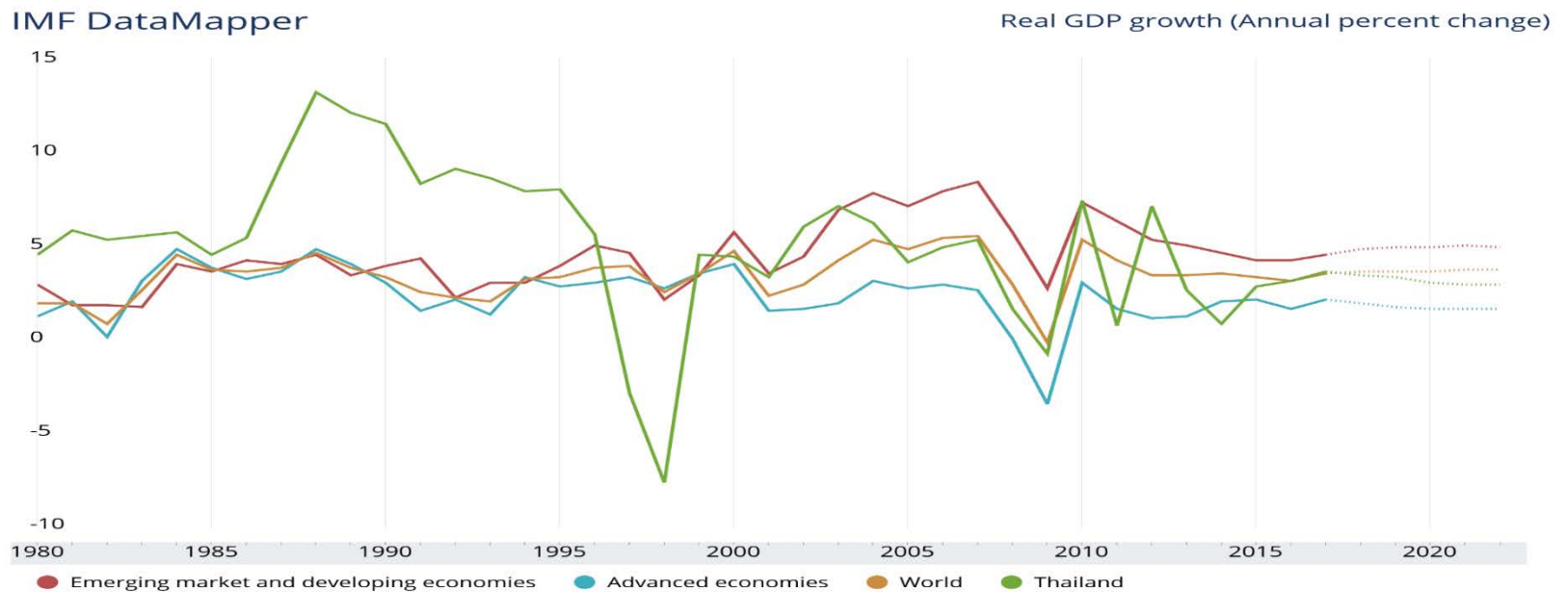
# WHAT'S NEW IN EE<sub>312</sub> THEN?: *EXTENSIONS OF KEYNESIAN SYSTEM*





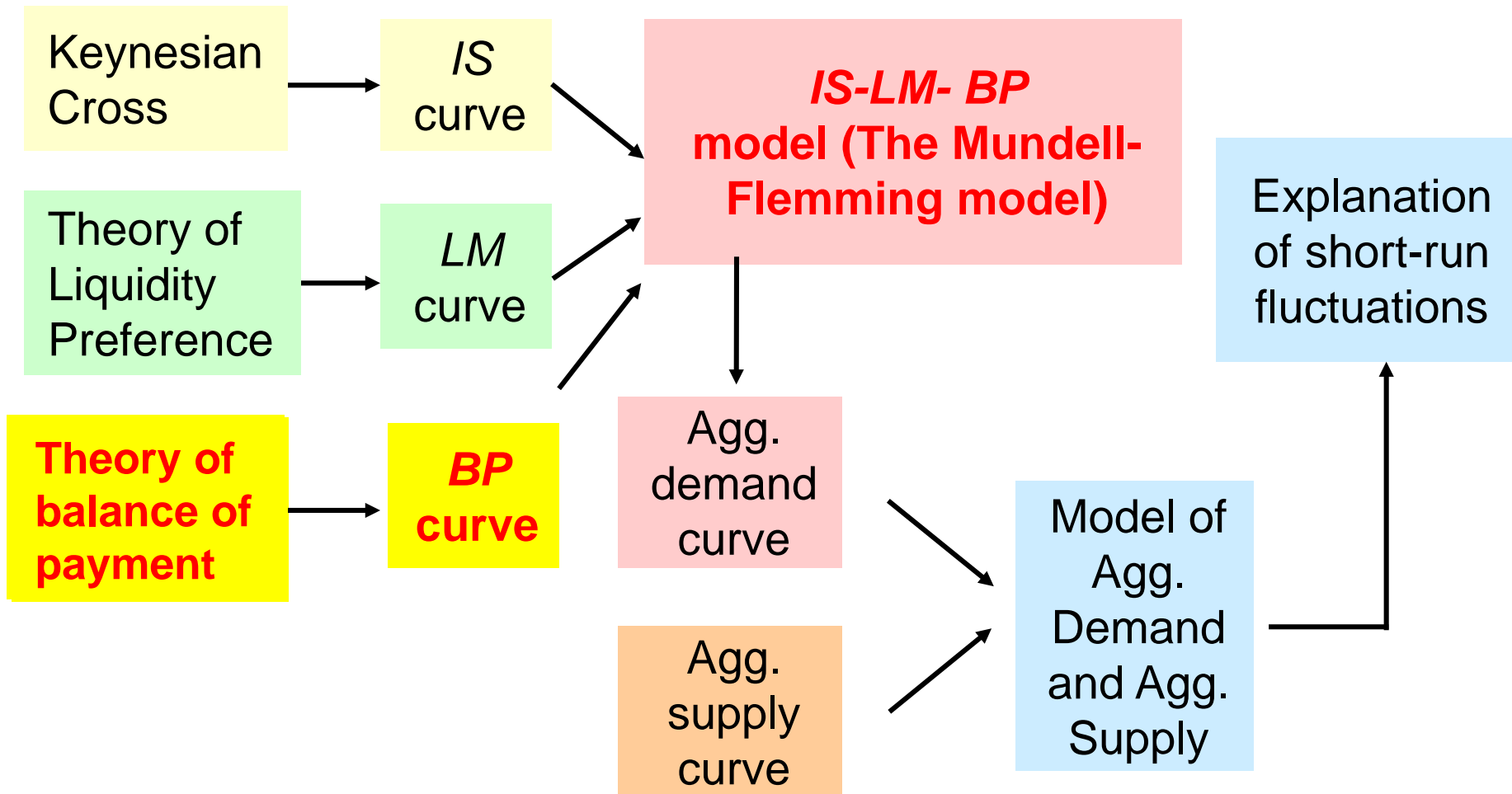
# WHAT'S NEW: INTERNATIONAL DIMENSION

- Focus more on **international dimensions**; knowing how to explain the connection between global and Thai macroeconomy. Why?

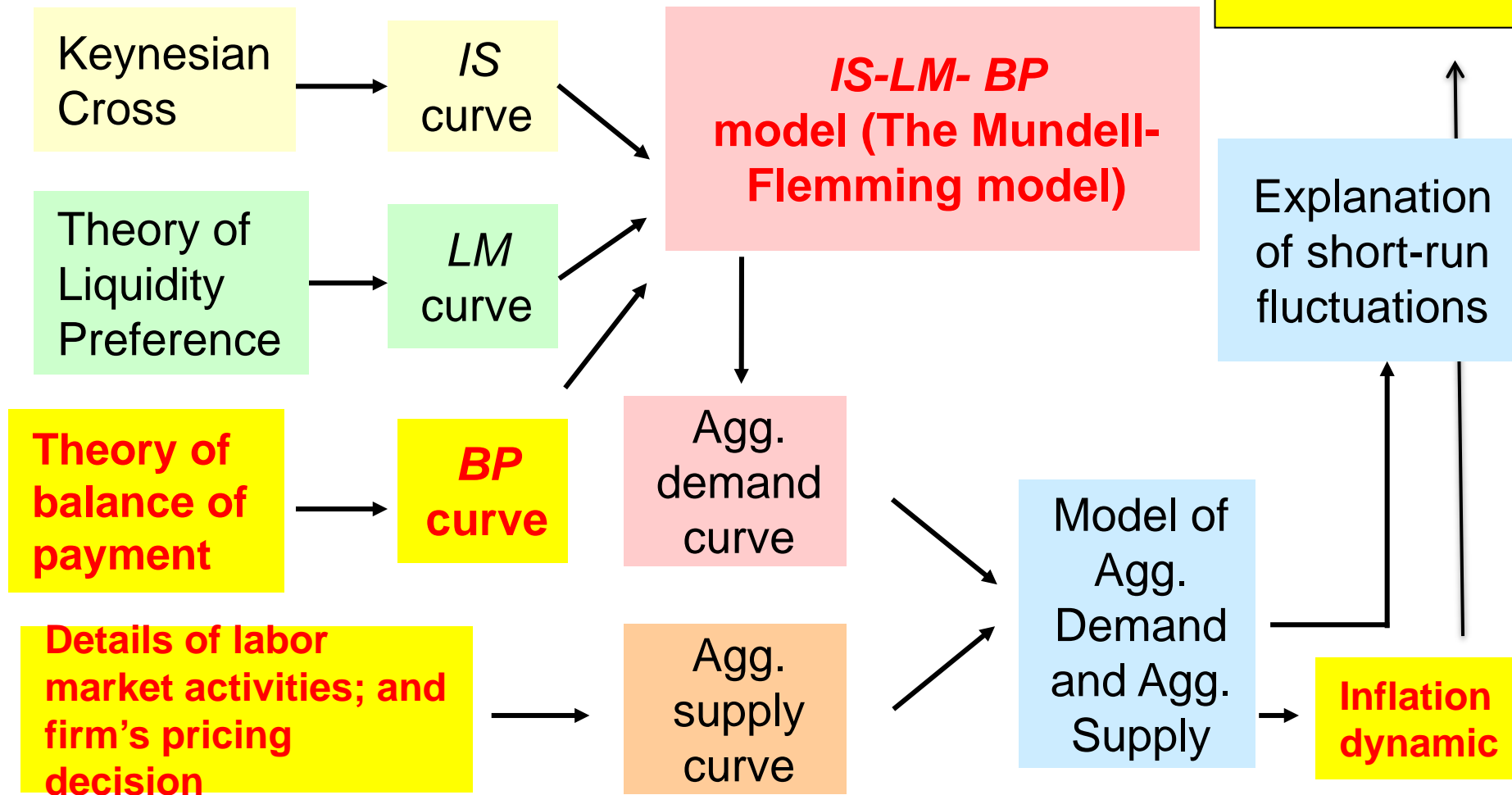


©IMF, 2017, Source: World Economic Outlook (October 2017)

# WHAT'S NEW IN EE<sub>3</sub>12 THEN?: *EXTENSIONS OF KEYNESIAN SYSTEM*



# WHAT'S NEW IN EE<sub>312</sub> THEN?: *EXTENSIONS OF KEYNESIAN SYSTEM*



# APPROACH

- We present two different approaches for the business cycles studies
  - Non micro-foundataion approach (traditional)
  - Micro-foundataion approach (modern)

# MICRO-FOUNDATION APPROACH

- Historically, Keynesian Macroeconomics emerged itself as a specific field in economic around 1930s; **The Great depression.**
- Opponents (Classical economists) to the approach argued that the framework is not correct.
- However, people didn't care because Keynesian models did a very good job in terms of explaining data, forecasting, and provide policy recommendations; **economy was stable.**

# MICRO-FOUNDATION APPROACH

- Opponents' voices were recognized around 1970s' as the traditional model failed to explain what happened during **the first oil shocks**.
- This led to the extensive use of micro-foundation approach as the framework for macroeconomics studies; **paradigm shifted since then**.

## TRADITIONAL V.S. MICRO-FOUNDATION

- The idea is simple: macroeconomics is the aggregation of individuals behavior; bottom-up approach.
- Having a proper understanding how micro-level unit makes decision should allow for better predictions; models fit the data better.

## TRADITIONAL V.S. MICRO-FOUNDATION

- Flexible than traditional Keynesian framework because we can **add more ingredients** into the analysis.
- Provide more structurally coherent interpretation on data; **lot of tools in statistics** have been well developed for taking the micro-foundation models to **test with data**.



# READING MATERIALS

- Lot of work!... Spend your time wisely in this semester.
- Check your syllabus.
- - Froyen: Chapter 1 – Chapter 15 (Midterm)
- - Williamson: Chapter 1 – Chapter 11 (Final)
- Don't complain!!! This course is 4 units of credit.
- Textbook can be purchased at the bookstore.
- Check BE moodle.

# AGENDA

- Logistic information
- What do we study in this course?
- **Data and measuring business cycles**
  - Measuring economic activities
  - Measuring business cycles



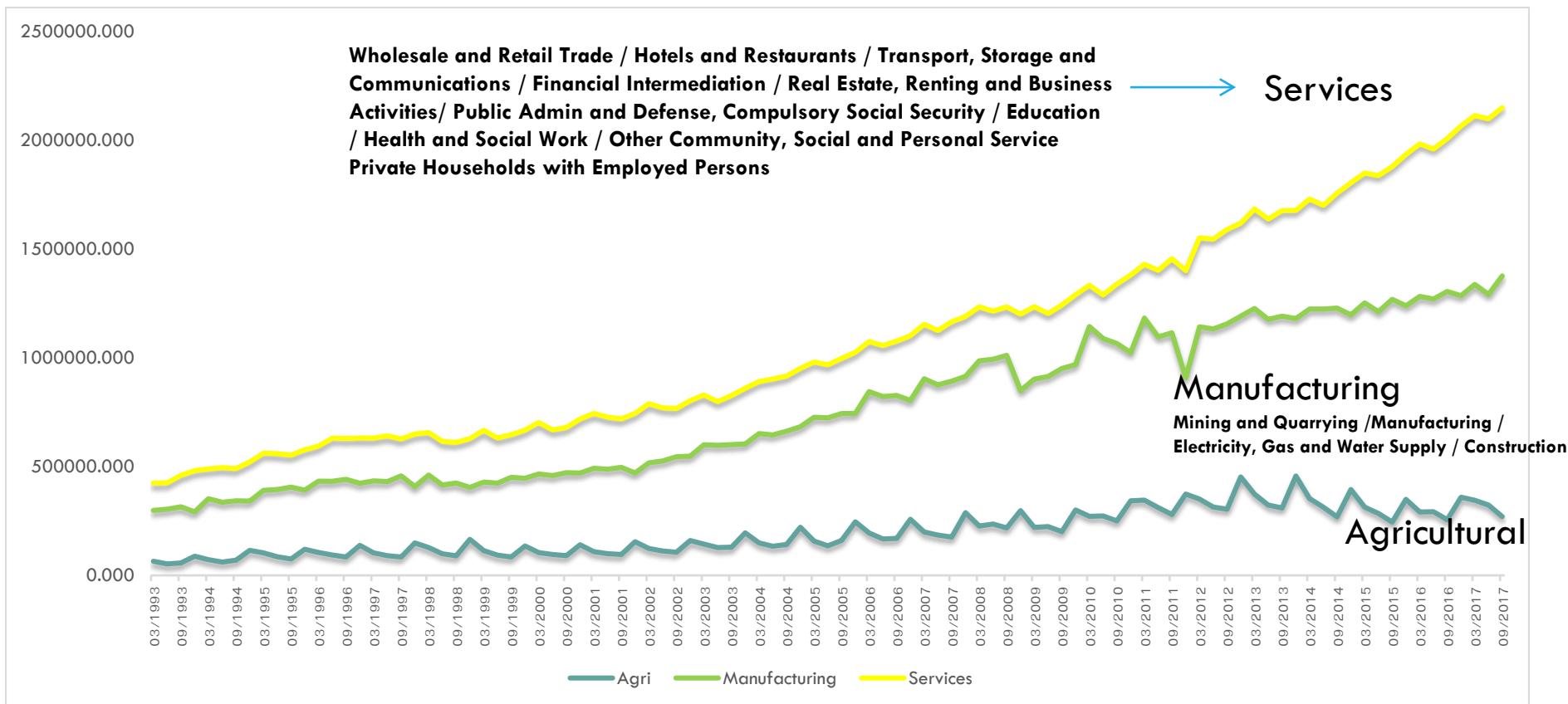
# MEASURE ECONOMIC (*AGGREGATE*) ACTIVITIES?

- **Policy-making decision**; Information and data needed.
- Need to know if we are “slack (weak)” or “tight (strong)”
- Good indicators for the economic condition?
- Commonly used are **GDP (aggregate output), inflation (cost of living) and unemployment rate (labor market outcomes.)**

# MEASURING GDP

- In Thailand, the statistical agency that is responsible for measuring and producing data for these aggregate activities is **NESDB (สภาพัฒน์ฯ)**.
- Starting from 1993, NESDB has made available the data in **quarterly** basis.
- Reporting statistic has some lagged periods of the announcement for 1.5 months.
- Approach for the calculation: Income, Production (value-added), Expenditure.

# DEEPER LOOK INTO THAI DATA: PRODUCTION-BASED *NOMINAL* GDP



# Sectoral share to market-value GDP (Nominal GDP)

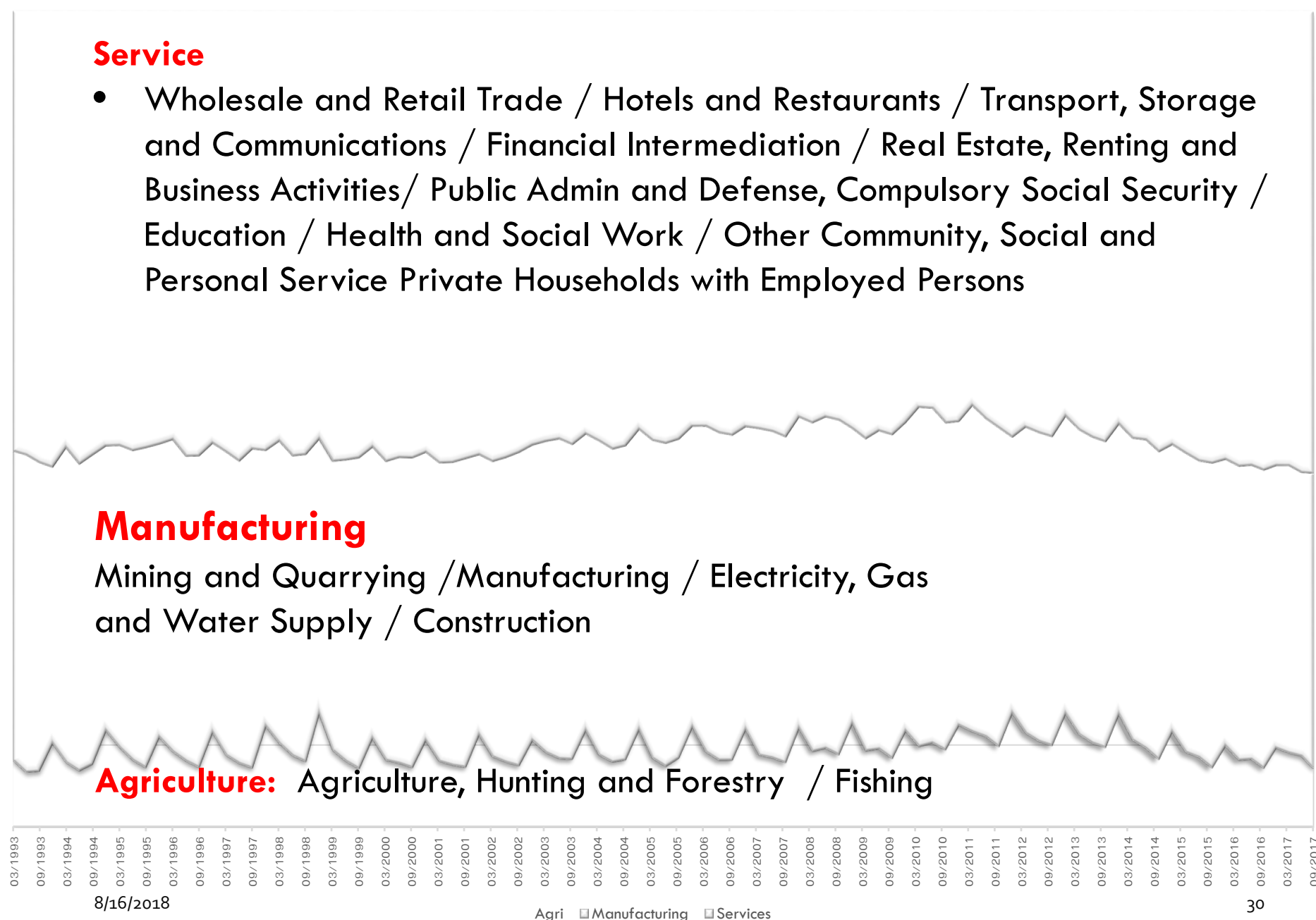
## Service

- Wholesale and Retail Trade / Hotels and Restaurants / Transport, Storage and Communications / Financial Intermediation / Real Estate, Renting and Business Activities / Public Admin and Defense, Compulsory Social Security / Education / Health and Social Work / Other Community, Social and Personal Service Private Households with Employed Persons

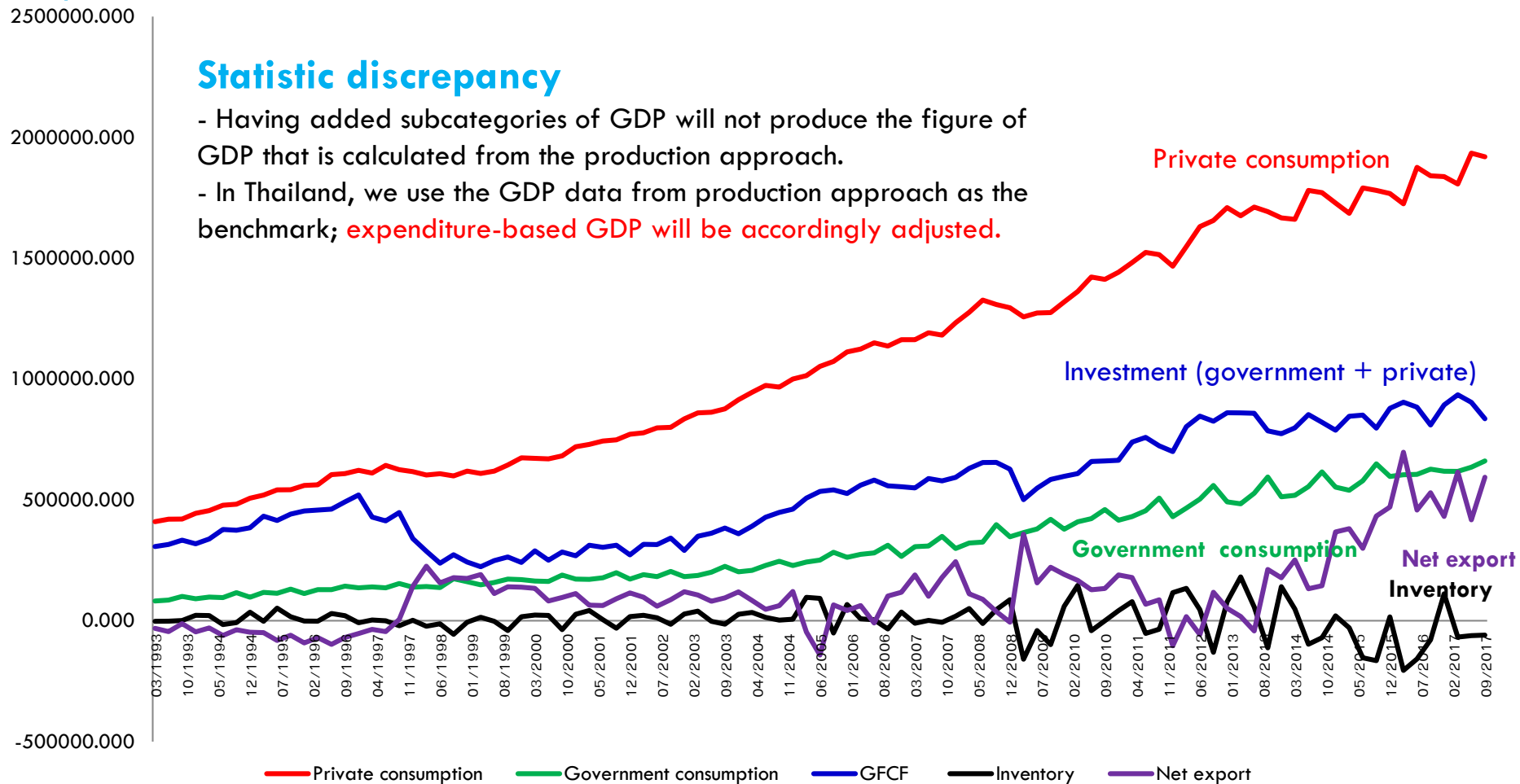
## Manufacturing

Mining and Quarrying / Manufacturing / Electricity, Gas and Water Supply / Construction

**Agriculture:** Agriculture, Hunting and Forestry / Fishing



# EXPENDITURE-BASED GDP: ITS NOMINAL COMPONENT



# REAL VS NOMINAL MEASUREMENT

- We can not aggregate units of production; we then aggregate the value of products.
- Problematic of the measurement using nominal value?
- Real-based measurement: eliminate the price effect (extract the volume effect or real quantity)
- Methods: Fixed base year and Chain-volume-measure (CVM)



# REAL GDP: FIXED BASE YEAR

- Real GDP is obtained by **using base-year prices** in calculation.
  - For example, assume the base year = 1988

$$rGDP^{2016} = \sum_i (P_i^{1988} * Q_i^{2016})$$

$$rGDP^{2015} = \sum_i (P_i^{1988} * Q_i^{2015})$$

$$g^{2016} = \left[ \frac{rGDP^{2016}}{rGDP^{2015}} - 1 \right] * 100\%$$

# REAL GDP: FIXED BASE YEAR

- If the base year changes, GDP figures also change --- the NESDB has used four base years (1956 1962 1972 1988).

Problem?

- Main problem: **fixed base years do not reflect economic changes over time.**

- Changes in the composition of output and relative prices. (USB in 1998 / USB in 2016)

- Improved quality of existing products.

- New goods come to markets; old goods die out.



# CHAIN-WEIGHTED REAL GDP

- Updating fixed-base year revises not only historical series of real GDP, but also the entire historical path of growth rate.
- Generate series of real GDP using the most accurate growth estimation.

# CHAIN-WEIGHTED REAL GDP

- The geometric mean of the real GDP growth rates between the two-year period.
  - Calculate the real GDP growth using year-1 prices.
  - Calculate the real GDP growth using year-2 prices.
  - Compute their geometric mean to get the annual chain-weighted growth rate from Year 1 to Year 2.
  - Do the same for any pair of the successive two-year set.

$RGDP_P^Q$   Base-year price

Using 2011 as the base year

$$RGDP_{2011}^{2011} = 130; \quad RGDP_{2011}^{2012} = 135$$

$$g_{2011}^{2012} = \left[ \frac{RGDP_{2011}^{2012}}{RGDP_{2011}^{2011}} - 1 \right] \times 100 = \left[ \frac{135}{130} - 1 \right] \times 100 = 3.8\%$$

Using 2012 as the base year

$$RGDP_{2012}^{2011} = 133; \quad RGDP_{2012}^{2012} = 139$$

$$g_{2012}^{2012} = \left[ \frac{RGDP_{2012}^{2012}}{RGDP_{2012}^{2011}} - 1 \right] \times 100 = \left[ \frac{139}{133} - 1 \right] \times 100 = 4.5\%$$

$$g_c^{2012} = \sqrt{g_{2011}^{2012} \times g_{2012}^{2012}} = \sqrt{3.8 \times 4.5} = 4.1\%$$

# CHAIN-VOLUME-MEASURE GDP

- **Step 1:** calculate **Direct Index (DI)**.
  - GDP for Year 2 using prices in Year 1.
  - GDP for Year 1 using prices in Year 1.
- Direct Index for Year 2 is the annual growth rate of Year 2 using Year 1 prices.
  - Do the same for Year 3, Year 4, ....
- Each year has its own DI based on the previous year's prices.
  - *Rolling-over base year*: 2001 → 2000 and 2002 → 2001

$$GDP_{t-1}^t = \sum_i (P^{t-1} * Q^t)$$

$$GDP_{t-1}^{t-1} = \sum_i (P^{t-1} * Q^{t-1})$$

$$DI^t = \frac{GDP_{t-1}^t}{GDP_{t-1}^{t-1}} = \frac{\sum_i (P^{t-1} * Q^t)}{\sum_i (P^{t-1} * Q^{t-1})}$$

$$DI^{2016} = \frac{GDP_{2015}^{2016}}{GDP_{2015}^{2015}} = \frac{\sum_i (P^{2015} * Q^{2016})}{\sum_i (P^{2015} * Q^{2015})}$$

$$DI^{2015} = \frac{\sum (P^{2014} * Q^{2015})}{\sum (P^{2014} * Q^{2014})}$$

$$DI^{2014} = \frac{\sum (P^{2013} * Q^{2014})}{\sum (P^{2013} * Q^{2013})}$$

$$DI^{2013} = \frac{\sum (P^{2012} * Q^{2013})}{\sum (P^{2012} * Q^{2012})}$$

$$DI^{2012} = \frac{\sum (P^{2011} * Q^{2012})}{\sum (P^{2011} * Q^{2011})}$$



# CHAIN-VOLUME-MEASURE GDP

- **Step 2:** create the **Chain Index (CI)**.
- Link the series of DI's into CI for each year.
- CI = cumulative growth rate from 2013.

$$C_{2013}^{2016} = CI^{2016} = DI^{2016} * DI^{2015} * DI^{2014} * DI^{2013}$$

$$C_{2013}^{2015} = CI^{2015} = DI^{2015} * DI^{2014} * DI^{2013}$$

$$C_{2013}^{2014} = CI^{2014} = DI^{2014} * DI^{2013}$$

$$C_{2013}^{2013} = CI^{2013} = DI^{2013}$$

# CHAIN-VOLUME-MEASURE GDP

- **Step 3:** calculate chain-volume-measure GDP value using CI and the base-year value.
  - Use the value of nominal GDP 2013 as reference.

$$cvmGDP_{2013}^{2014} = GDP^{2013} * CI^{2014}$$

$$cvmGDP_{2013}^{2015} = GDP^{2013} * CI^{2015}$$

$$cvmGDP_{2013}^{2016} = GDP^{2013} * CI^{2016}$$

# NOTES ON CVM GDP

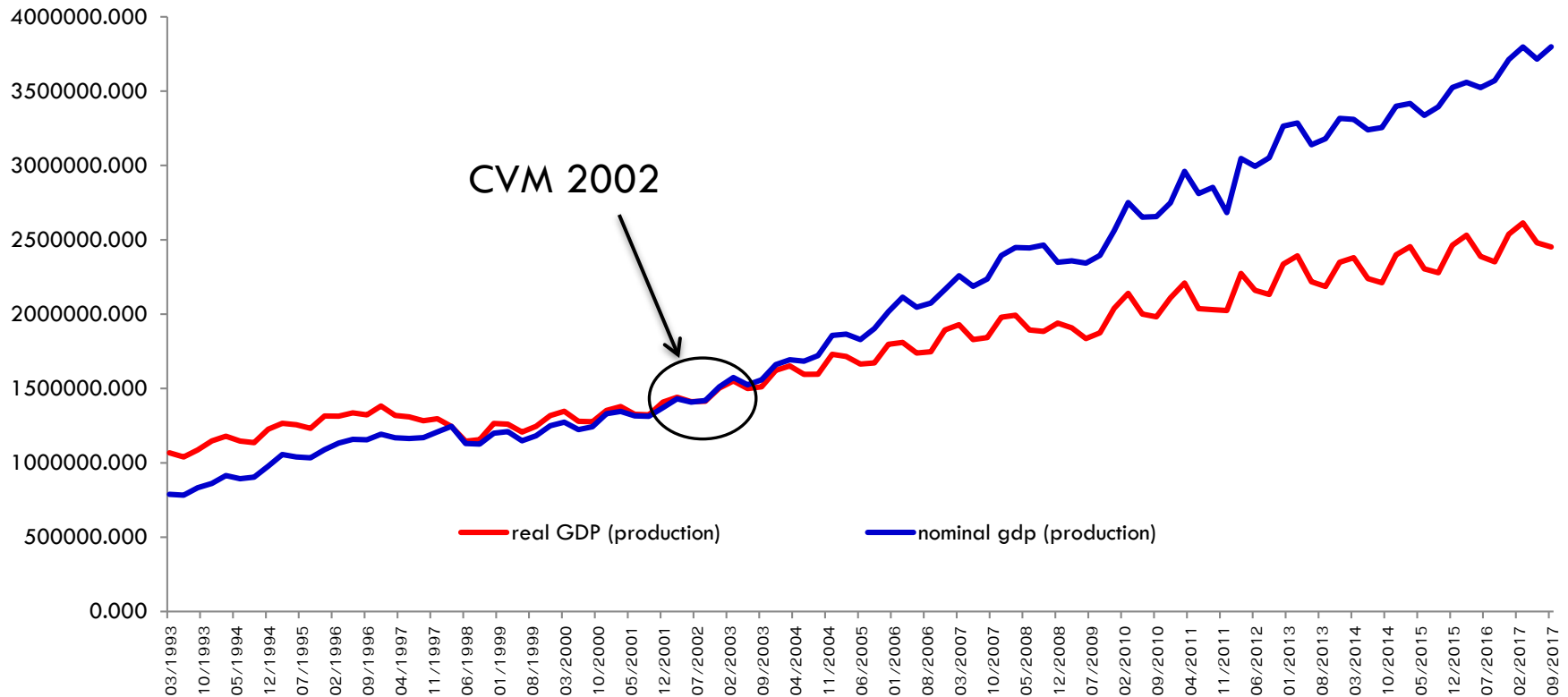
- The calculated growth rates are closer to reality.
  - Growth rates from DI, CI and CVM are identical.
- CVM series are *non-additive*.
  - For the base year, GDP subcategories sum up to total GDP.
  - For other years, subcategories do not sum up.

$$RGDP \neq RGDP\_SERVICE + RGDP\_MANU + RGDP\_AGRI$$

$$RGDP \neq RC + RI + RG + RX - RM$$

- In terms of accounting, this is technically adjusted by “*residual terms*”.

# REAL V.S. NOMINAL GDP MEASUREMENT



# IMPLICIT GDP PRICE DEFLATOR

- The ratio of the nominal GDP to the real GDP of a given year.
- The most **comprehensive** *price index*.
  - includes prices of **all final goods and services**.

$$\text{Implicit GDP price deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} * 100$$

# COST OF LIVING AND CONSUMER PRICE INDEX

- Prices change all the time; policymaker wishes to know how difficult households have faced.
- **Cost of living index (COL):** how much expenditure would a typical household need to ensure **the same standard of living** as in the base year?

# COST OF LIVING AND CONSUMER PRICE INDEX

- Consumer price index is constructed to serve for this purpose.
- **Consumer Price index:** current-period expenditure required by a typical household so that he/she can acquire the same fixed basket of consumption goods as in the base year.

# CONSUMER PRICE INDEX: CONCEPTUAL METHOD

- The consumer price index (CPI) uses the current-year prices and **the base-year quantities of the goods**.
  - Base year = 2007;  $CPI_{2007} = 100$

$$CPI^{2012} = \frac{\sum (Q^{2007} * P^{2012})}{\sum (Q^{2007} * P^{2007})} * 100$$

$$CPI \text{ Inflation} = \left[ \frac{CPI^{2012}}{CPI^{2011}} - 1 \right] * 100\%$$



# PROBLEMS WITH PRICE INDICES

- Changes in the quality of the goods over time.
- Emergence of new goods.
- Changes in the relative prices over time.
  - Assuming no change in consumers' choice despite changes in relative prices.
  - The items with rising prices will be over-weighted; **substitution biased**.

# BIASED MEASUREMENT OF CPI INDEX

- The last problem leads to an over-estimation of COL.
- COL: **same standard of living?**
  - Same bundle
  - Same level of happiness.
- Following the latter, you can just substitute expensive items with cheaper ones.
  - Lower expenditure required then!

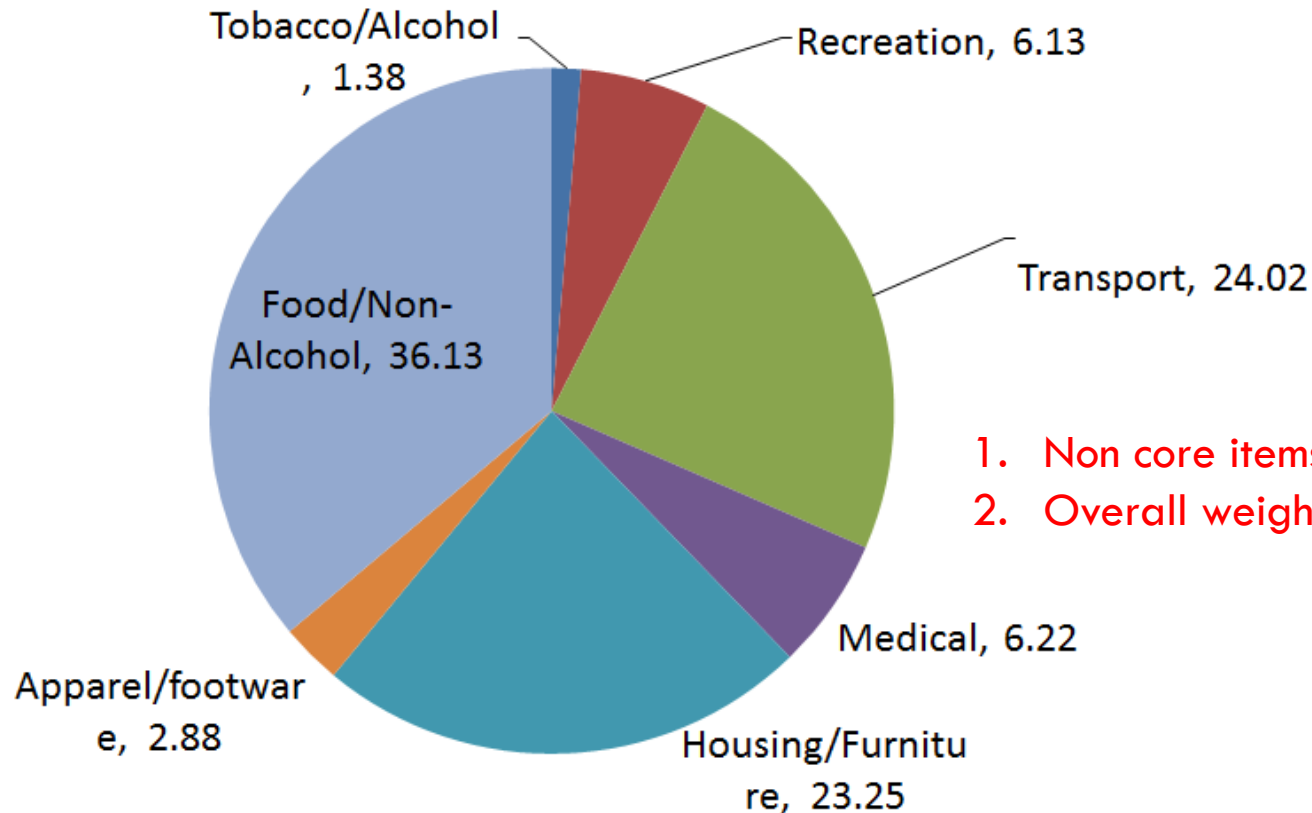
# BIASED MEASUREMENT OF PRICE INDEX

- In the US, CPI inflation was found to be **approximately 1% over-estimate the true COL index.** (See Boskin 1996)
- Miscalculation matters a lot public policy.
  - Social security payment is typically tied to inflation.
  - Upward biased calculation of COL generated in CPI inflation hence results in over-budgeting.

# THAILAND'S INFLATION FIGURES

- The series are calculated monthly by the **Bureau of Trade and Economic Indices**, Internal Trade Department Ministry of Commerce (สำนักดัชนีเศรษฐกิจการค้า กรมการค้าภายใน)
- Data is collected, based on the survey.
  - **Headline (General) CPI:** prices of 7 groups (373 items) of goods and services.
  - **Core CPI:** prices of 266 items, excluding fresh food and energy group (107 items).

# WEIGHT IN THE CALCULATION OF CPI

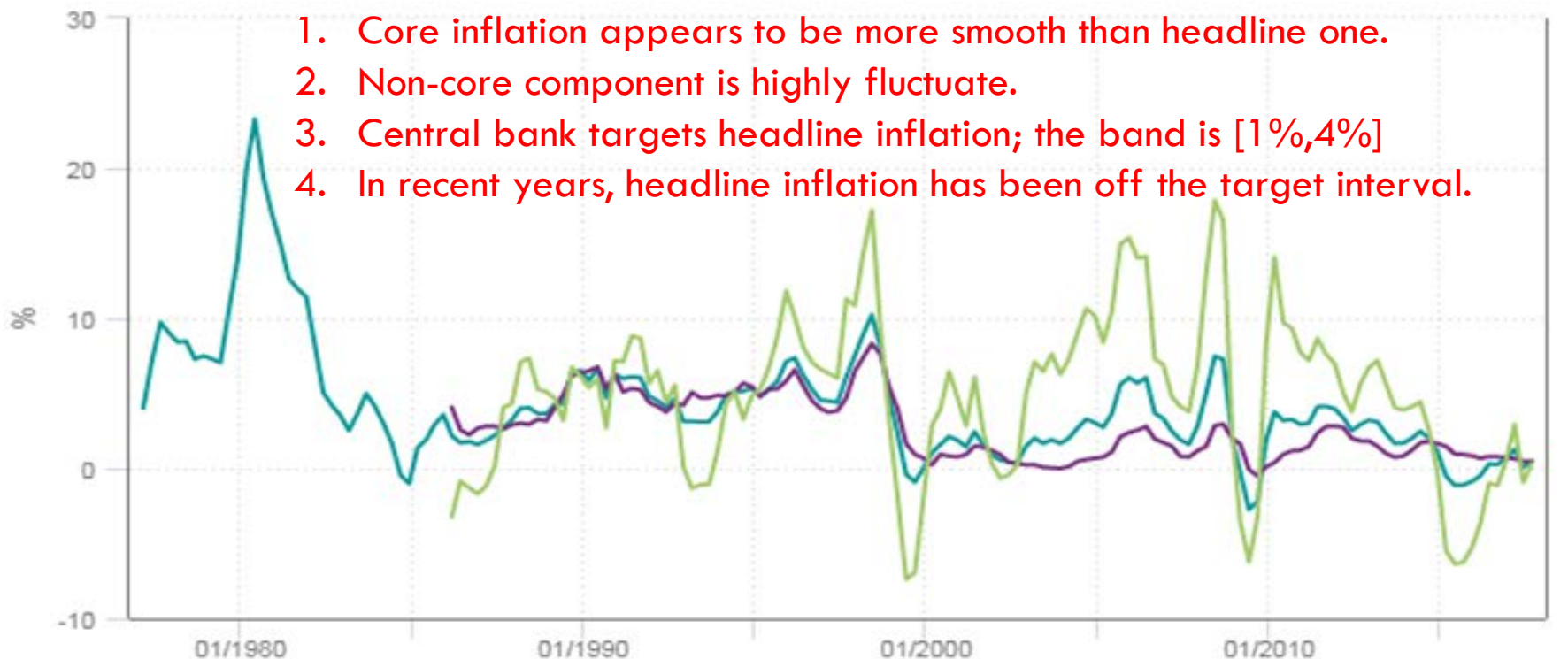


1. Non core items count for 27.40%
2. Overall weights for the whole kingdom.

# HEADLINE AND CORE INFLATION

## inflation measures

1. Core inflation appears to be more smooth than headline one.
2. Non-core component is highly fluctuate.
3. Central bank targets headline inflation; the band is [1%,4%]
4. In recent years, headline inflation has been off the target interval.



— Consumer Price Index; AGGREGATE(Quarterly; March, June, September, December; Avg; No) > %CHANGE(Over Year)  
— Core Consumer Price Index; AGGREGATE(Quarterly; March, June, September, December; Avg; No) > %CHANGE(Over Year)  
— Non Core CPI: Raw Food and Energy; AGGREGATE(Quarterly; March, June, September, December; Avg; No) > %CHANGE(O

Source: CEIC Data

# LABOR MARKET MEASUREMENT

- **Real GDP** provides us several key information on how strong economy is performing.
- **CPI Inflation** measures the rise of cost of living, and hence reflects welfare.
- Another counterpart measurement for the slackness/tightness economics activities is the labor market indicators such as **unemployment rate**.

# HOW DO WE MEASURE LABOR MARKET ACTIVITIES

- Labor market indicators are reported by **survey**.
- **Working-age population**: 15 years above, not incapacitate to work.
  - labor force plus + not in labor force.
- **Labor force** = the employed + unemployment.
- **Unemployment** = those who look for the job, but not currently being employed
- **Unemployment rate** = the unemployed/labor force.



# HOW DO WE MEASURE LABOR MARKET ACTIVITIES

- **Labor-force participation rate** = total labor force / working-age population
- **Discouraged workers:** those who wish to work but have stopped searching for jobs and thus are dropped out of the labor force.

# THAILAND'S LABOR FORCE FIGURES

- Two sources: NESDB (and also NSO.)
- Labor force: persons with the age of 15-59.
- **Underemployment:** work less than 35 hours and available for more.

	2017/Q1
1.Population	67,555.03
1.1 Below 15 years	11,726.48
1.2 Above 15 years	55,828.55
2. Labor force (2.1 + 2.2 + 2.3) 3/	38,216.14
2.1 Employed	37,443.2
Underemployed	335.65
2.1.1.Agri	11,002.54
2.1.2.Manu	8,837.86
2.1.3 Service	14,689.65
2.2 Unemployment	463.38
2.3.seasonal unemployed	309.56
3.Not in the labor force with 15 years of age above	17,612.41
3.1 housework	5,169.94
3.2 study	4,444.33
3.3 Young / old / in capacitate to work	6,196.75
3.4 others	1,801.4
Labor force participation rate (2 divided by 1.2)	68.45%
unemployment rate (2.2 divided by 2)	1.21%

# AGENDA

- Logistic information
- What do we study in this course?
- **Data and measuring business cycles**
  - Measuring economic activities
  - Measuring business cycles



## TIME SERIES DATA: SOME TECHNICAL JARGONS

- Most aggregate variables are **time series**; data value can be observed at each point of time.
- Having referred to time-series data, one common approach is to characterize behavior of the data is to think about the **decomposition**.

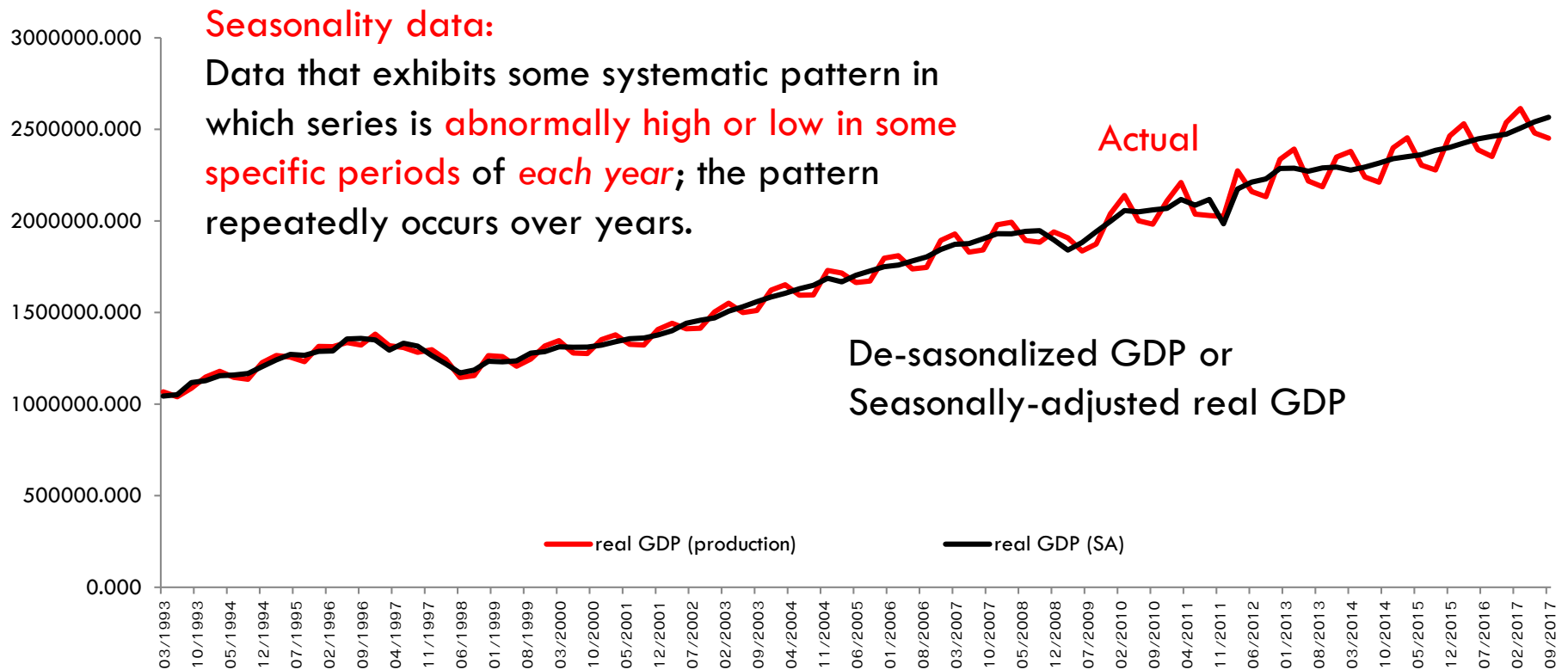
$$X = T + C + S$$

$X$  = actual  $T$  = trend;  $C$ =Cycle;  $S$  = Seasonal

For example:

GDP = Trend GDP + Cycle GDP + Seasonal part

# ACTUAL REAL GDP HAS CONTAINED SOME SEASONAL EFFECTS.



# SEASONALLY-ADJUSTED REAL GDP HAS SLOWLY MOVED AND GROWN OVER TIME.



## Detrending and Cyclical Fluctuations: measurement?

Output is equal to the **long-run trend** plus de-trended component. The latter is called the cyclical part, i.e. short-run fluctuations:

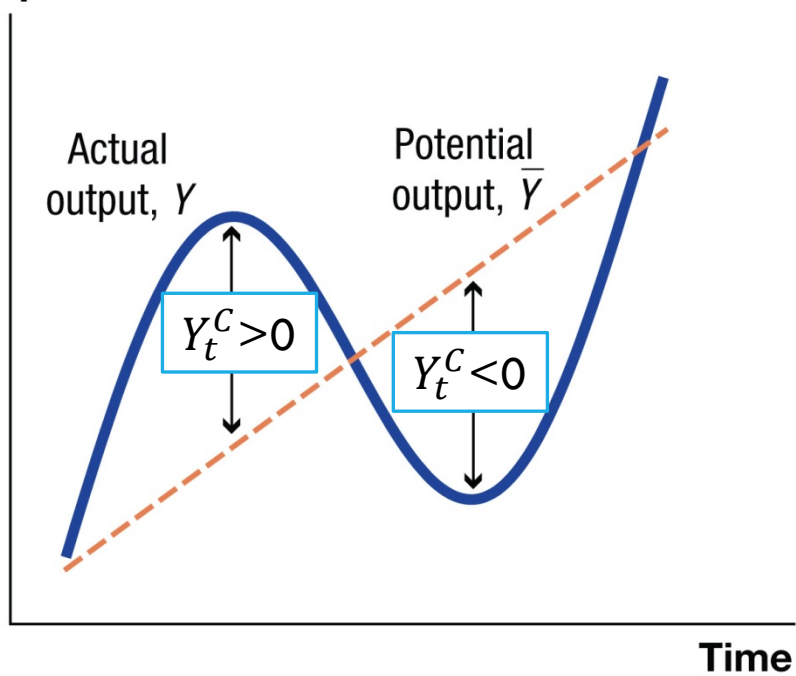
$$Y_t = \bar{Y}_t + Y_t^C$$

- The long-run trend is potential output.
- Cyclical measurement is usually made in percentage (**why? Normalization!**): the short-run fluctuations are the percentage change of deviations from potential GDP.

$$\widetilde{Y}_t^C = \frac{Y_t - \bar{Y}_t}{Y_t}$$

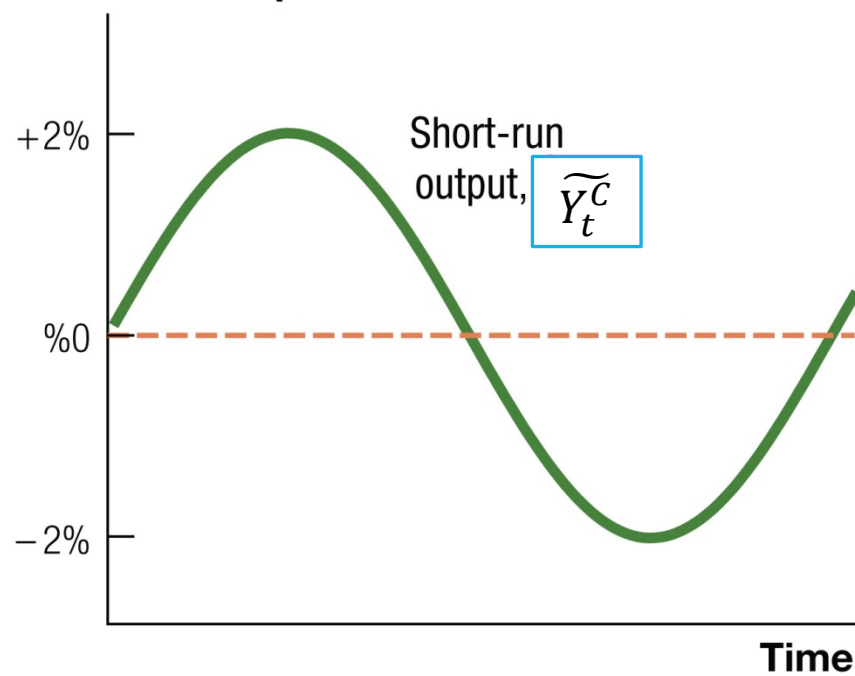


Output



(a)

Short-run output



(b)

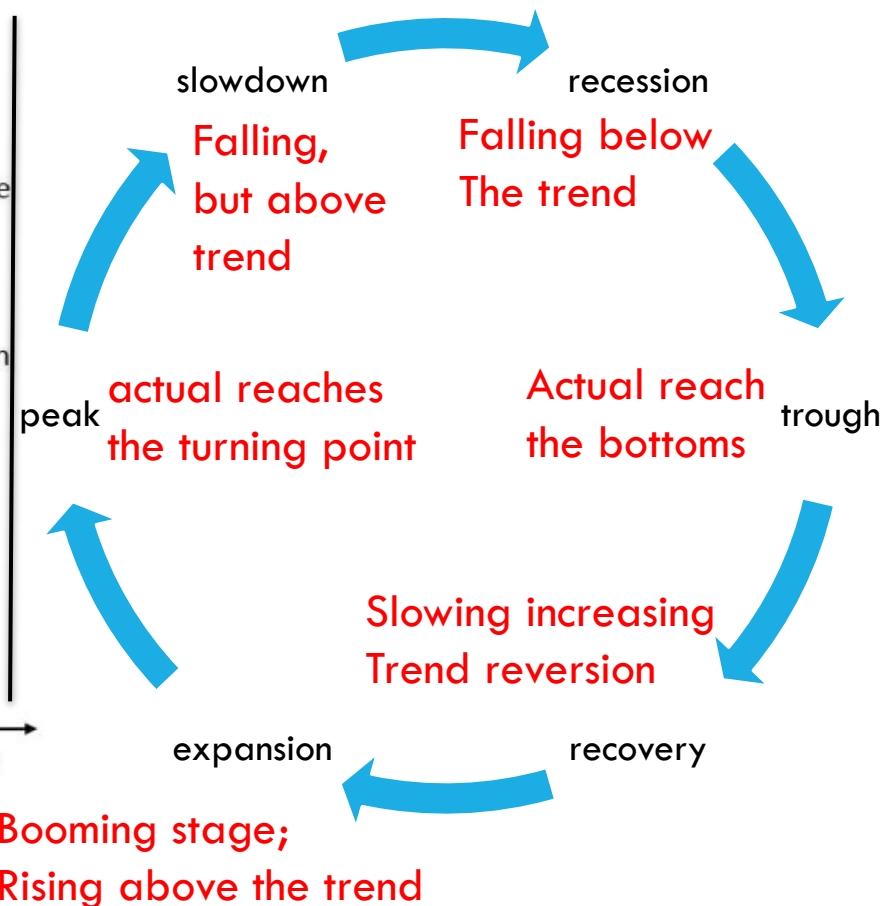
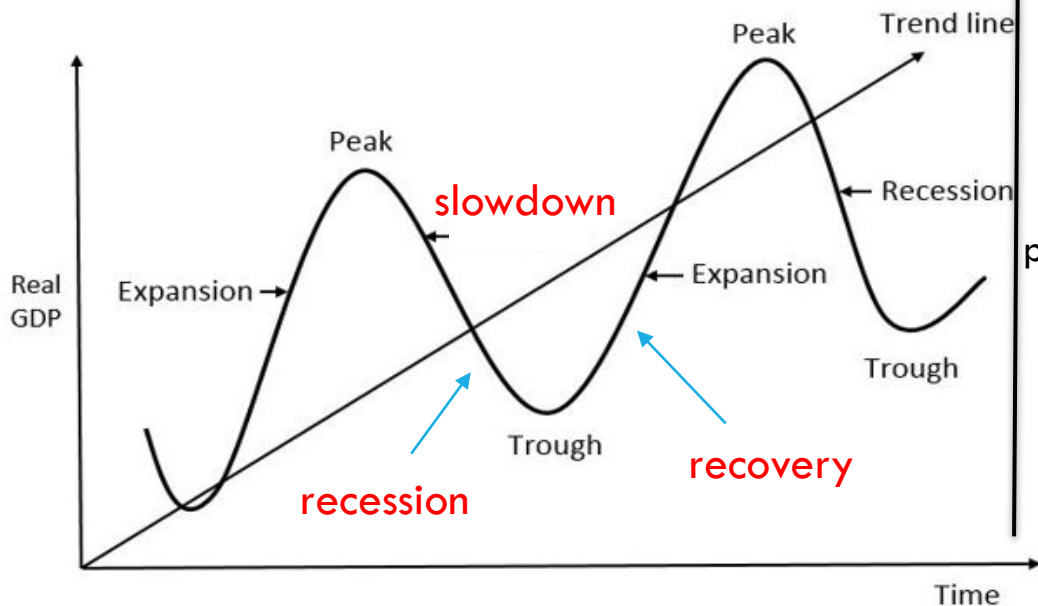


# PHASE OF MOVEMENT AROUND TREND: CYCLICAL FLUCTUATIONS

Recurrent fluctuations of economics variables that have repeatedly occurred.

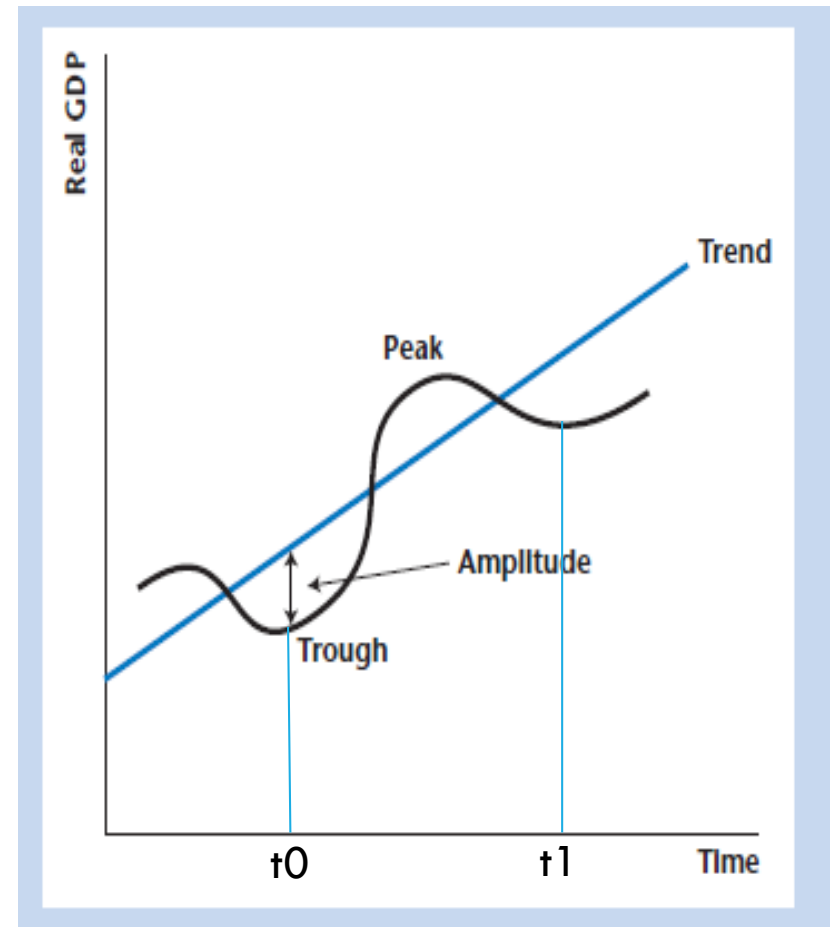
Phase of movements around the trend

Graph 1



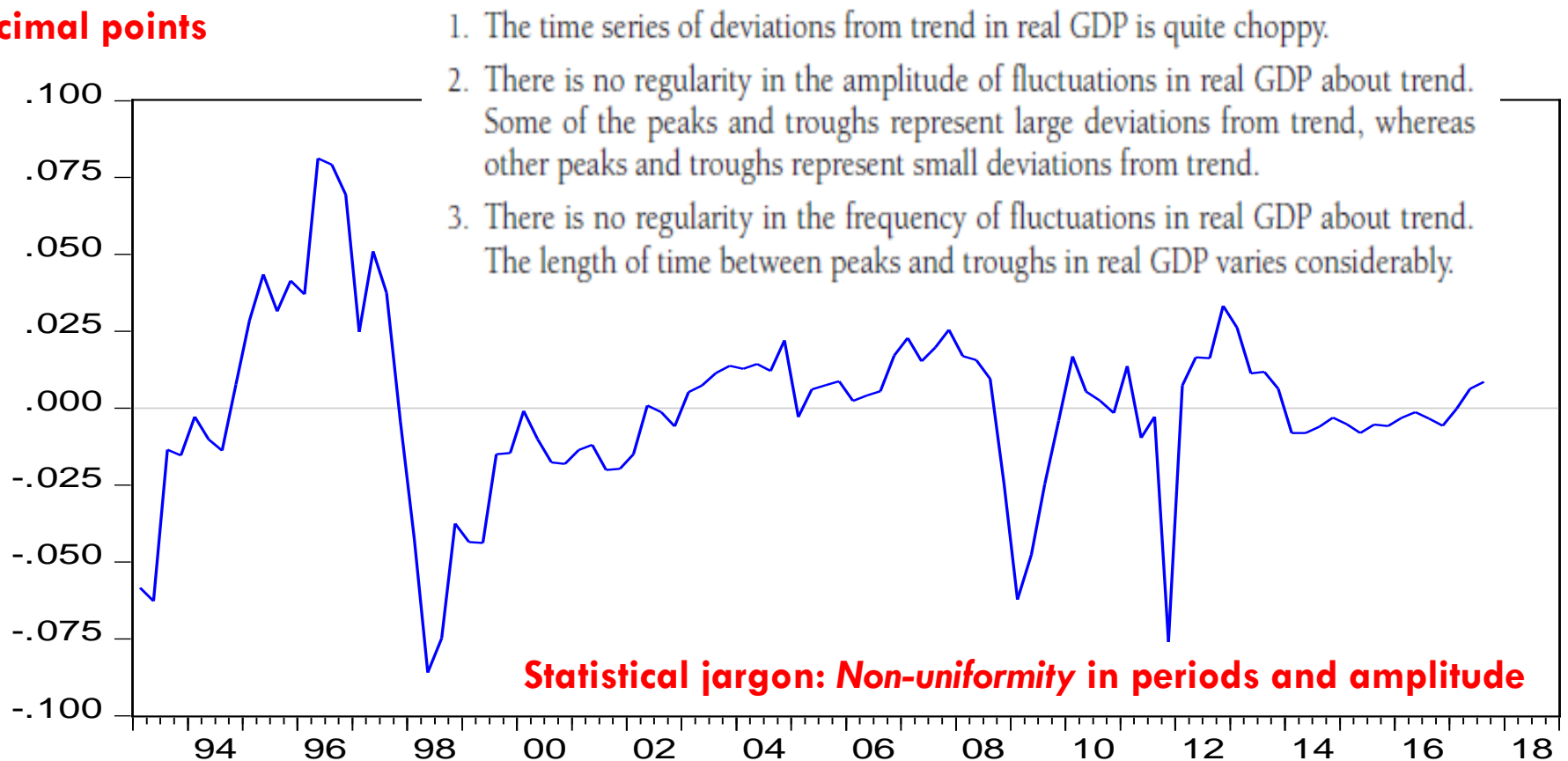
# HOW DO WE CHARACTERIZE/SUMMARIZE PATTERN OF BUSINESS CYCLES?

1. **Amplitude of the cycle:** Trough-to-Peak or trough-to-trend
  2. **Periods of cycle:** periods (in quarter) for having one complete cycle: trough to trough
- Ideally, you would hope that information for the two things can be determined.
  - **Unfortunately, no. Randomness!**



# HOW DO WE CHARACTERIZE/SUMMARIZE PATTERN OF BUSINESS CYCLES?

## Decimal points



# HOW DO WE CHARACTERIZE/SUMMARIZE PATTERN OF BUSINESS CYCLES: STATISTICAL APPROACH

- Because cycles are random, economists then apply some statistical methods to describe/characterize the pattern of business cycles.

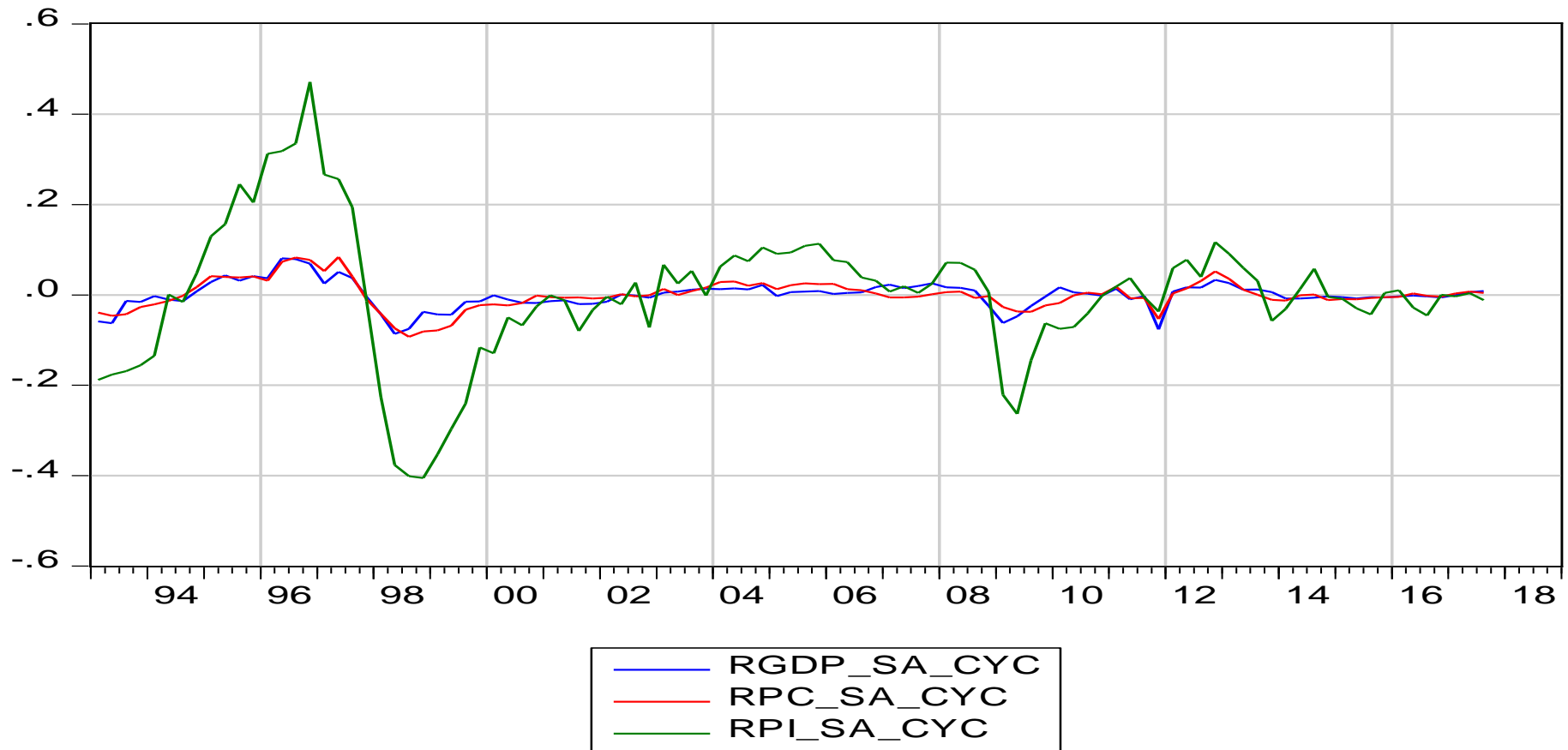
## 3. How volatile is the cycle?

- Volatility can be measured by using the **standard deviation** concept.

## 4. Comovement of cyclical variables

- How does the cycle of variable A relate to cycle of variable B?

# HOW DO WE CHARACTERIZE/SUMMARIZE PATTERN OF BUSINESS CYCLES: STATISTICAL APPROACH



# HOW DO WE CHARACTERIZE/SUMMARIZE PATTERN OF BUSINESS CYCLES: STATISTICAL APPROACH

Variable	GDP	RPC	RPI
S.D.	0.028 (2.8%)	0.032 (3.2%)	0.148 (14.8%)

- Comovement:
- $\text{Corr}(\text{GDP}, \text{RPC}) = 0.88$
- $\text{Corr}(\text{GDP}, \text{RPI}) = 0.85$
- $\text{Corr}(\text{RPC}, \text{RPI}) = 0.93$

Conventionally, we call X as a **procyclical variable** if  $\text{corr}(\text{GDP}, x) > 0$ .  
**Counter-cyclical** if  $\text{corr}(\text{GDP}, x) < 0$ .

# BUSINESS CYCLES: GDP AND INFLATION

