INTERMEDIATE MACROECONOMICS

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AGENDA

- Measuring economics activities
- Business cycle measurement

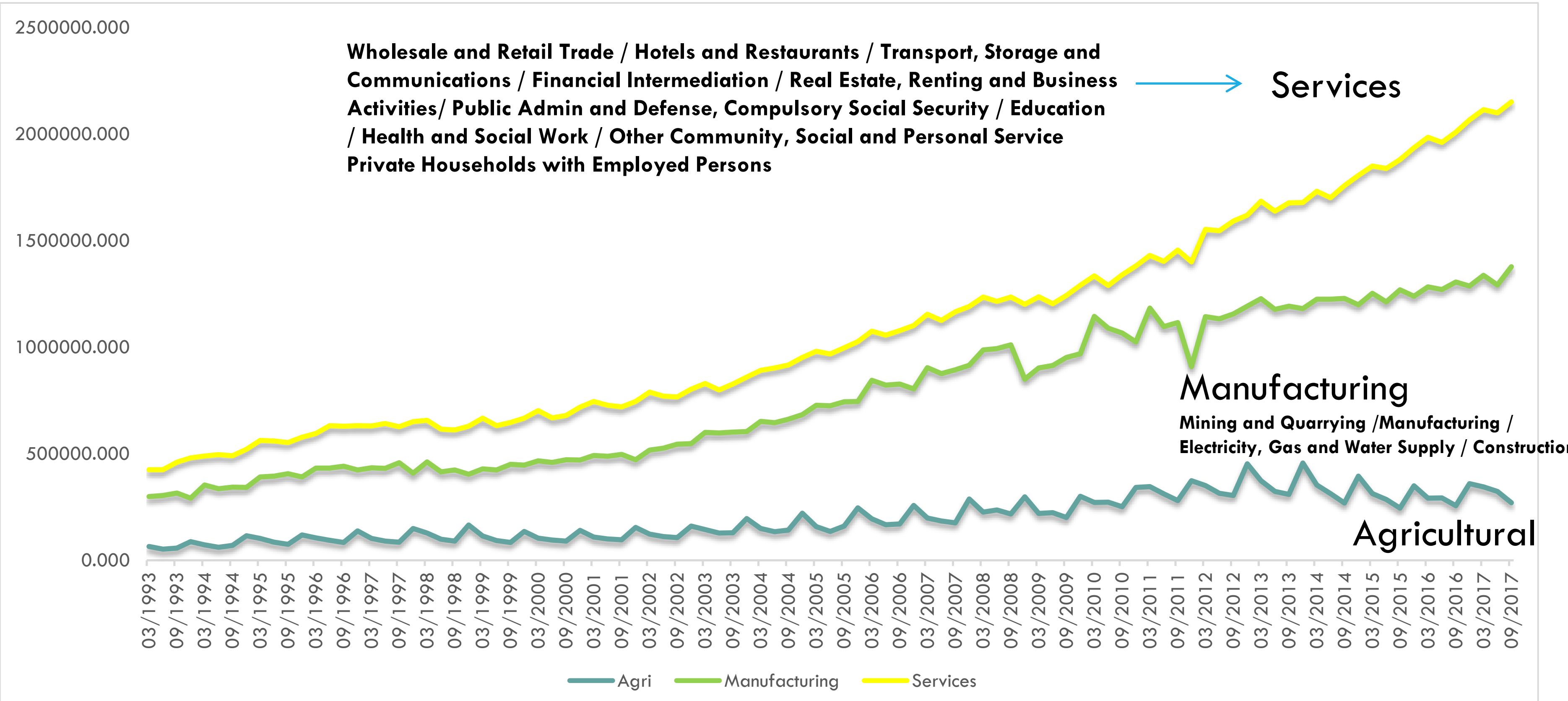
MEASURE ECONOMIC (*AGGREGATE)* ACTIVITIES?

- Macroeconomics is the science that has been developed for the purpose of policy-making decision.
- Policy-making decision requires information; data is so important for making judgment on the desirability of alternative policies.
- Normally, we need to know if aggregate activities are slack (too weak) or tight (too strong). Indicators for these measurements?
- This is usually referred to measuring GDP, inflation and labor market outcomes.

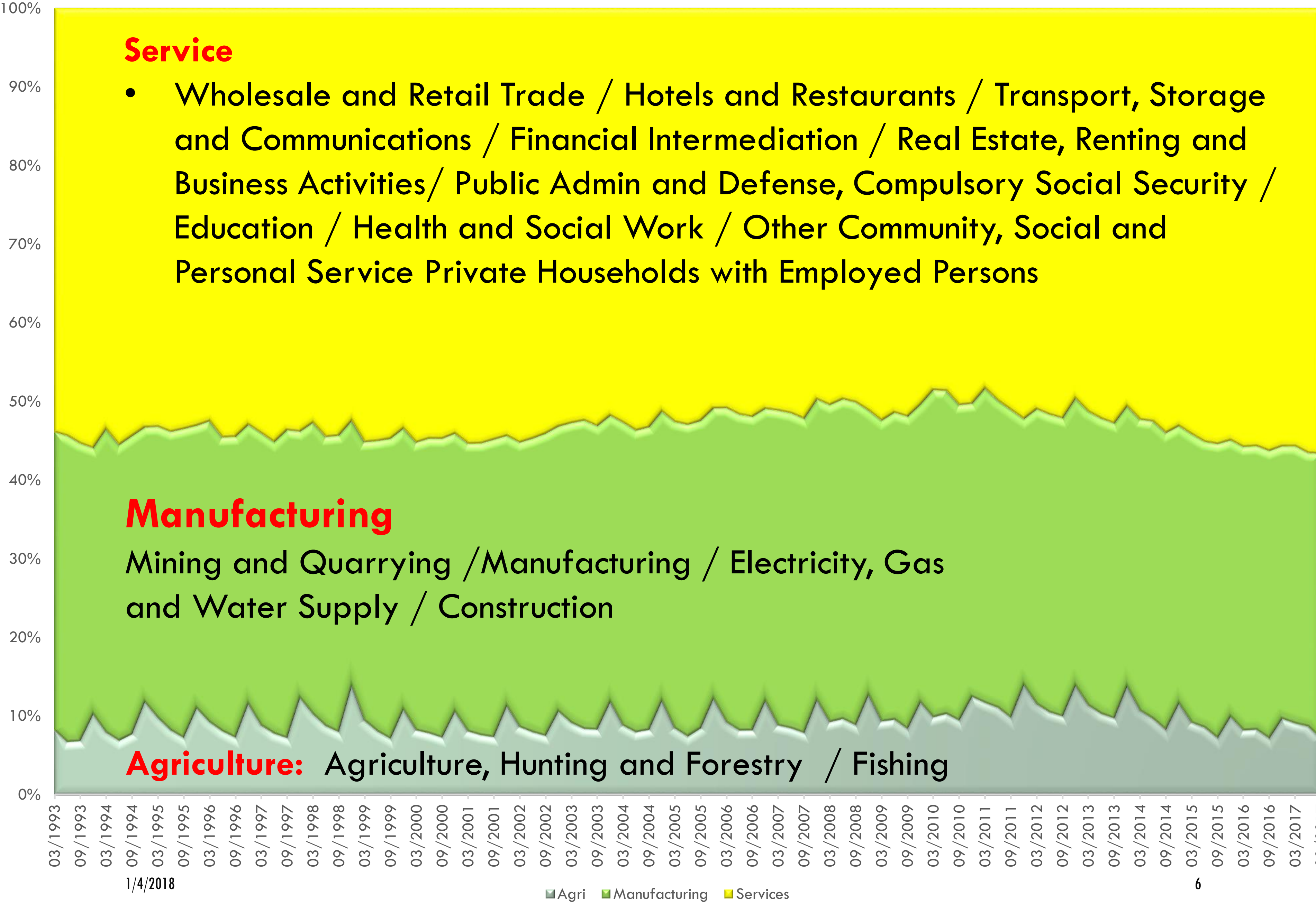
MEASURING GDP

- 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



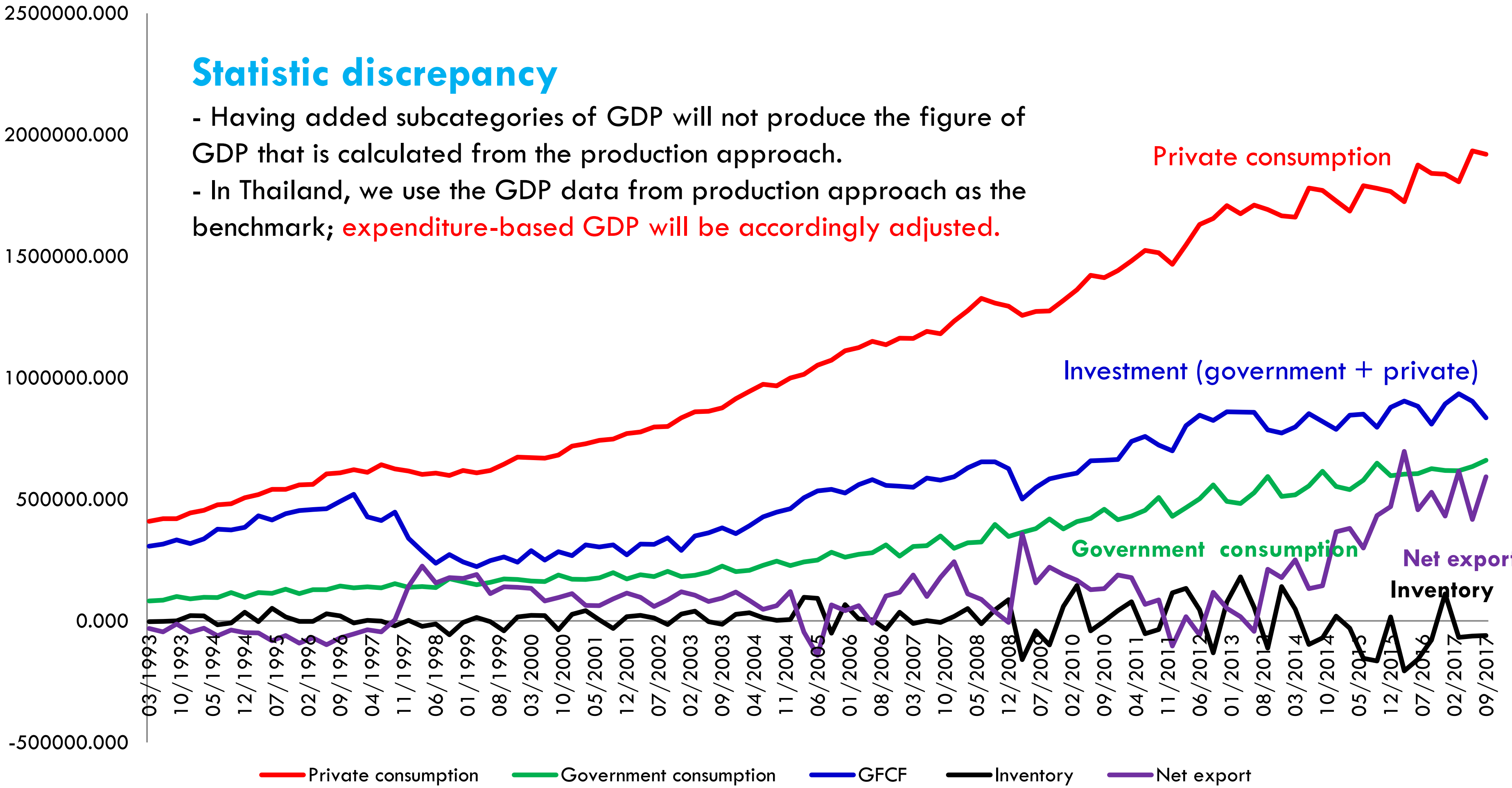
Sectoral share to market-value GDP (Nominal GDP)



EXPENDITURE-BASED GDP: ITS NOMINAL COMPONENT

Statistic discrepancy

- Having added subcategories of GDP will not produce the figure of GDP that is calculated from the production approach.
- In Thailand, we use the GDP data from production approach as the benchmark; expenditure-based GDP will be accordingly adjusted.



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
- 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).

- Fixed base years do not reflect economic changes over time.
  - Changes in the composition of output and relative prices. (USB in 2008 / USB in 2016)
  - Improved quality of existing products
  - New goods come to markets; old goods die out.

- These problems mostly occurs in high-tech sectors

https://www.economist.com/news/briefing/21697845-gross-domestic-product-gdp-increasingly-poor-measure-prosperity-it-not-even

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.

$RGDP_P^Q \longrightarrow$ 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

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

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

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

$$DI^{2016} = \frac{GDP_{2015}^{2016}}{GDP_{2015}^{2015}} = \frac{\sum_{i} \left(P^{2015} * Q^{2016}\right)}{\sum_{i} \left(P^{2015} * Q^{2015}\right)}$$

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

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CHAIN-VOLUME-MEASURE GDP

Step 2: create the **Chain Index (CI).**

Link the series of DI's into CI for each year.

CI for each year is the geometric mean of growth rates from the base year (2013).

- CI = cumulative growth rate from 2013.

$$C_{2013}^{2016} = D^{2016} * D^{2015} * D^{2014} * D^{2003}$$

$$C_{2013}^{2015} = D^{2015} * D^{2014} * D^{2013}$$

$$C_{2013}^{2014} = D^{2014} * D^{2013}$$

$$C_{2013}^{2013} = D^{2013}$$

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.

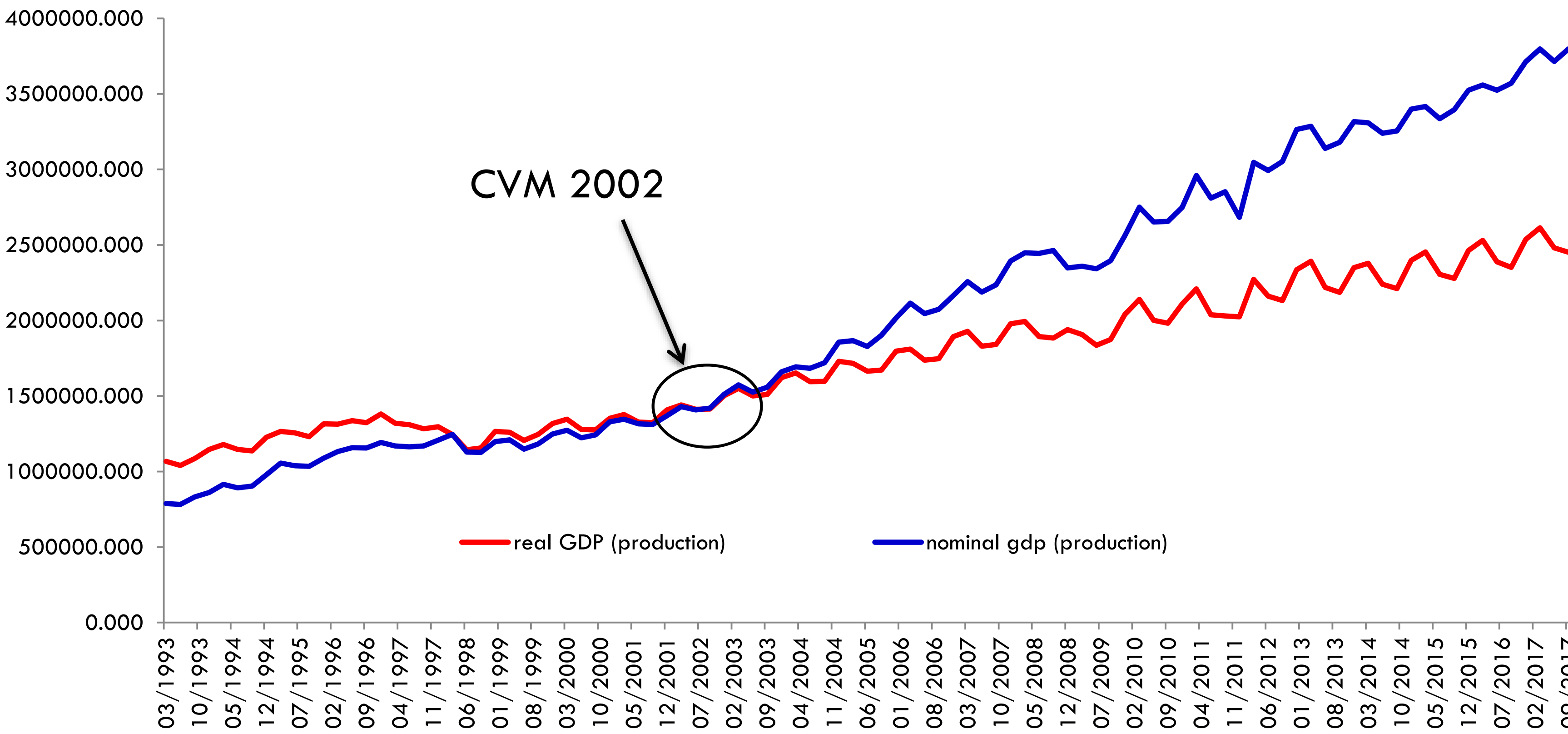
- CVM series are ***non-additive***.
  - For the base year, GDP subcategories sum up to total GDP.
  - For other years, subcategories do not sum up.

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

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

- 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.

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

PRICE INDEX AND INFLATION

- **Price index** is a weighted average of the prices of a basket of the goods and services produced over a period of time.
  - How much money would it be needed if one needs to secure a fixed consumption bundle?
- This is constructed for measuring cost of living (CPI: consumer price index) or cost of production (PPI: Producer price index)
  - CPI measures COL and hence welfare changes.
- **Inflation** is the rate of change in the price index.

CONSUMER PRICE INDEX

The consumer price index (CPI) uses the current-year prices and the base-year quantities of the goods.

- Base year = 2007; $CPI_{2007} = 100$

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

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

CALCULATION OF INFLATION

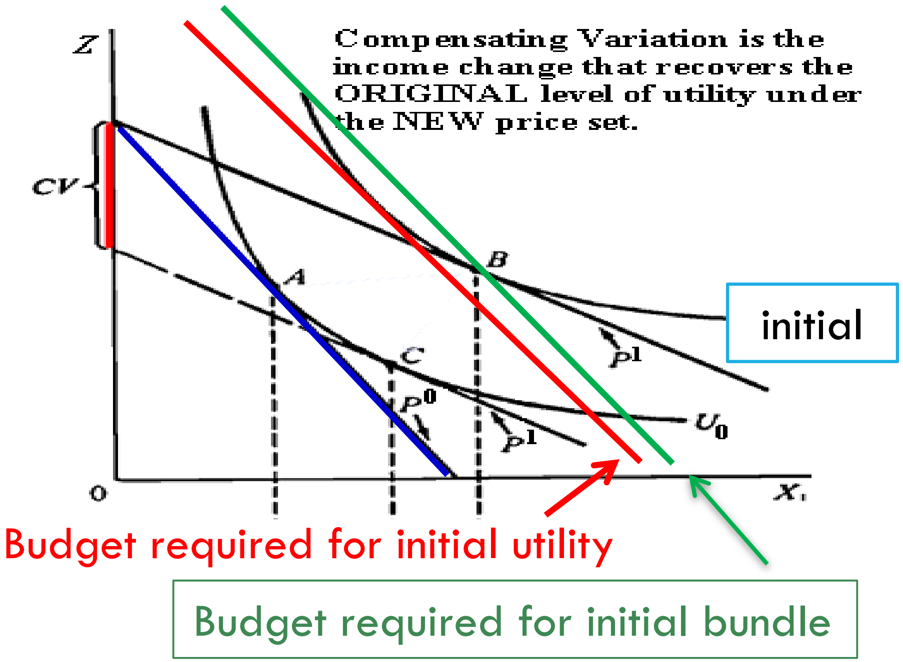
Inflation can be calculated by using either the implicit GDP price deflator or CPI.

$$\text{GDP deflator inflation}^{2012} = \left[\frac{Deflator^{2012}}{Deflator^{2011}} - 1 \right] \times 100\%$$

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

PROBLEMS WITH PRICE INDICES

- 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.



- Changes in the quality of the goods over time.

- Emergence of new goods.

BIASED MEASUREMENT OF PRICE INDEX

- In the US, CPI inflation had been found to be approximately 1% over-estimate using the Laspeyres's method (See Boskin 1996)
  - Putting this simple, 1% reporting CPI inflation = Cost of living the same.

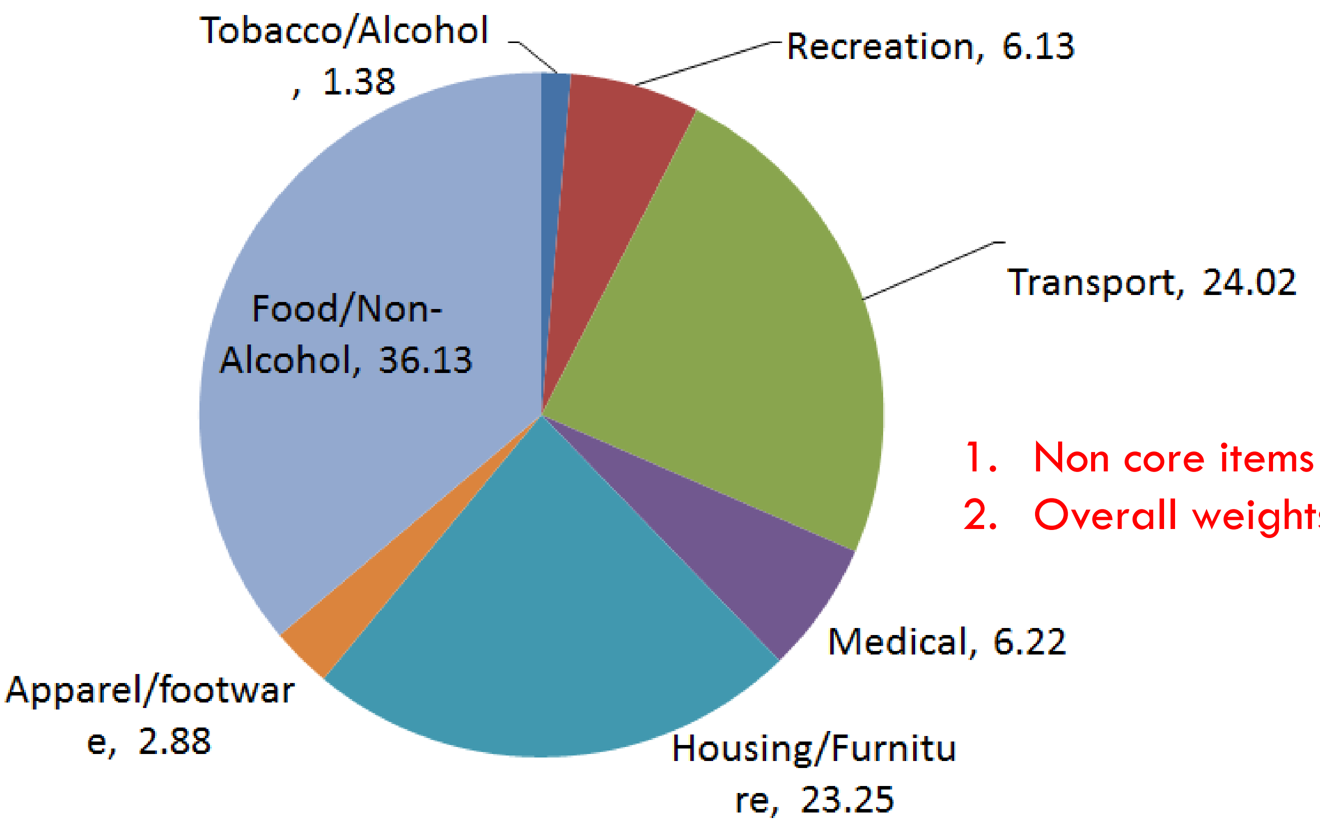
- Miscalculation matters a lot public policy.
  - In many countries, social security payment (retirement income) is tied to the CPI inflation; the goal is to maintain the same standard of living.
  - Upward biased calculation in inflation hence results in higher budget than that would have been necessary if the calculation had been made correct.

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).

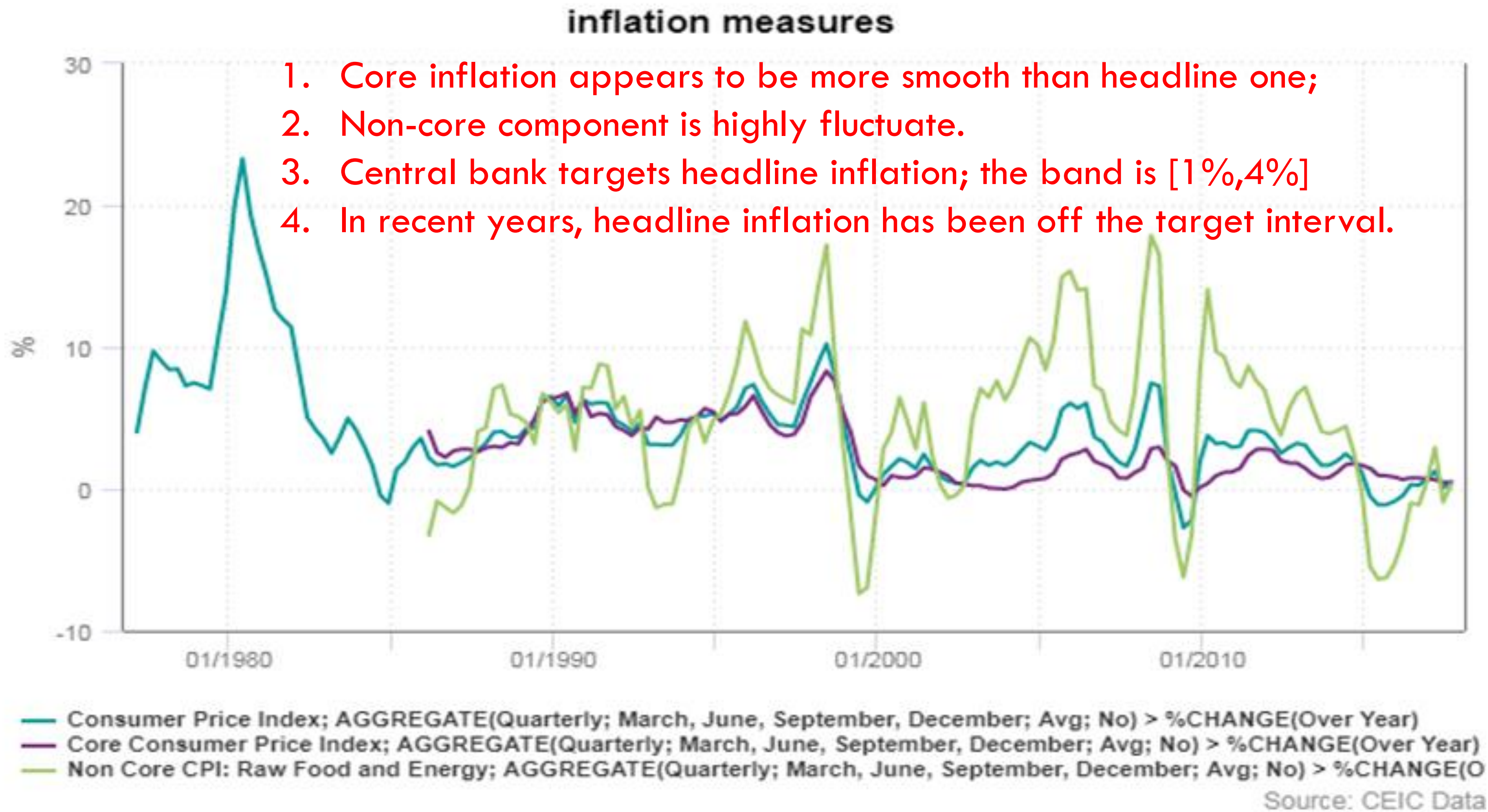
WEIGHT IN THE CALCULATION OF CPI



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

HEADLINE AND CORE INFLATION

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.



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:** 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.
- **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

- Measuring economics activities
- Business cycles measurement

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.**

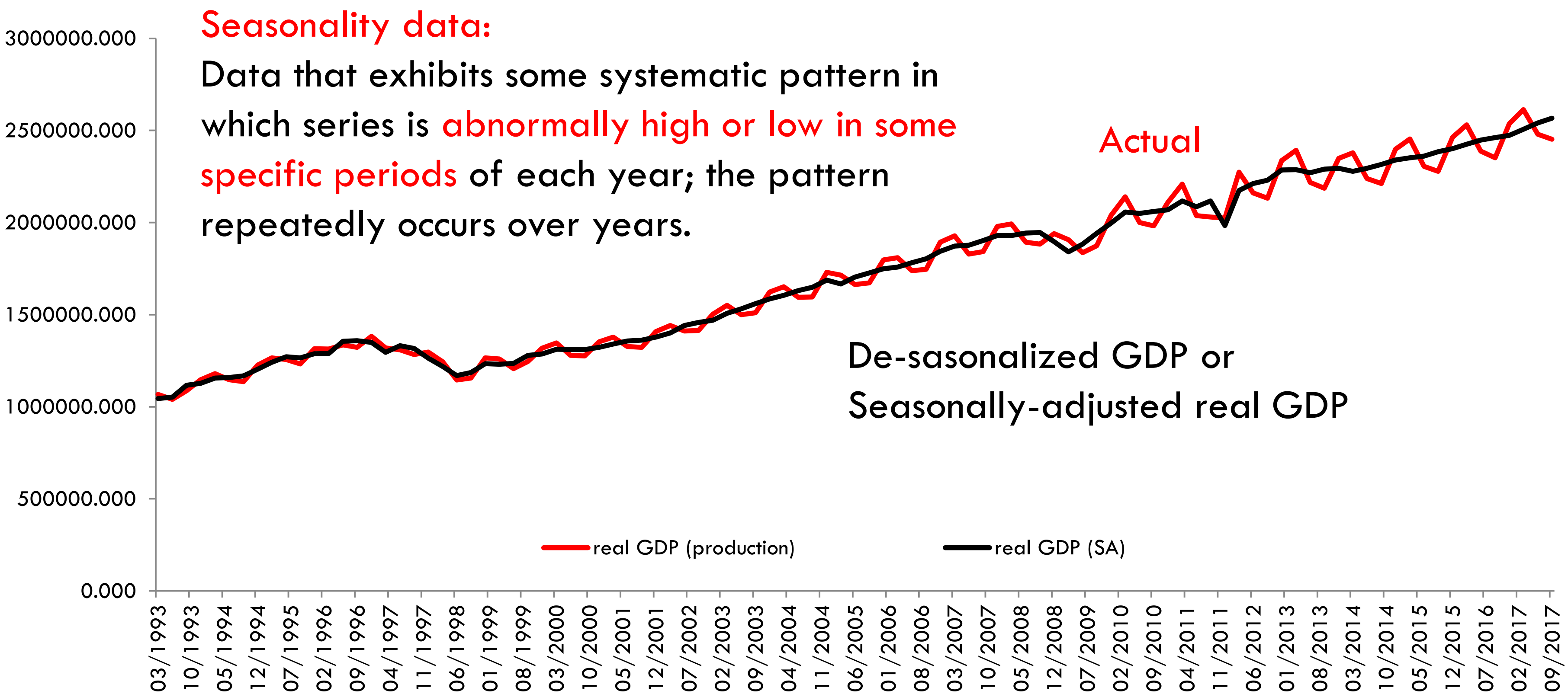
$$X = T + C + S$$

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.

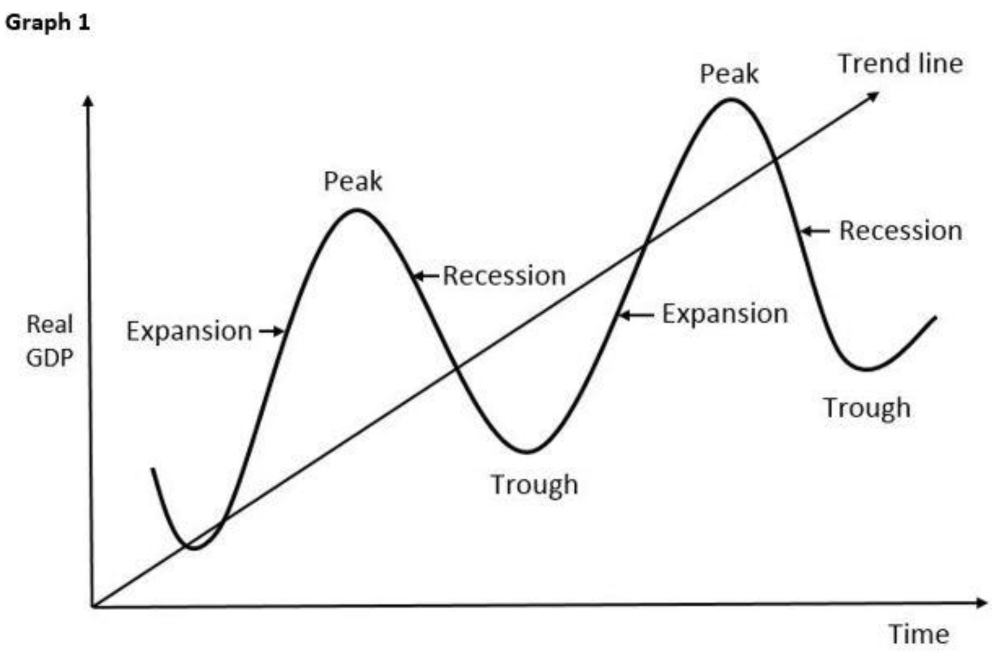
Trend:

- The series has slowly moved and grown over time. The slow-moving part of the series is called “trend”.
- In economics, this trend is given by long-term factors, i.e. potential growth of the economy.

PHASE OF MOVEMENT AROUND TREND: CYCLICAL FLUCTUATIONS

Recurrent fluctuations of economics variables that have repeatedly occurred.

Phase of movements around the trend: Expansion, peak, recession, trough



1. Expansion: actual rising above trend
2. Peak: actual reaches the turning point
3. Recession: actual starts to decrease/decelerate
4. Trough: actual bottom outs.

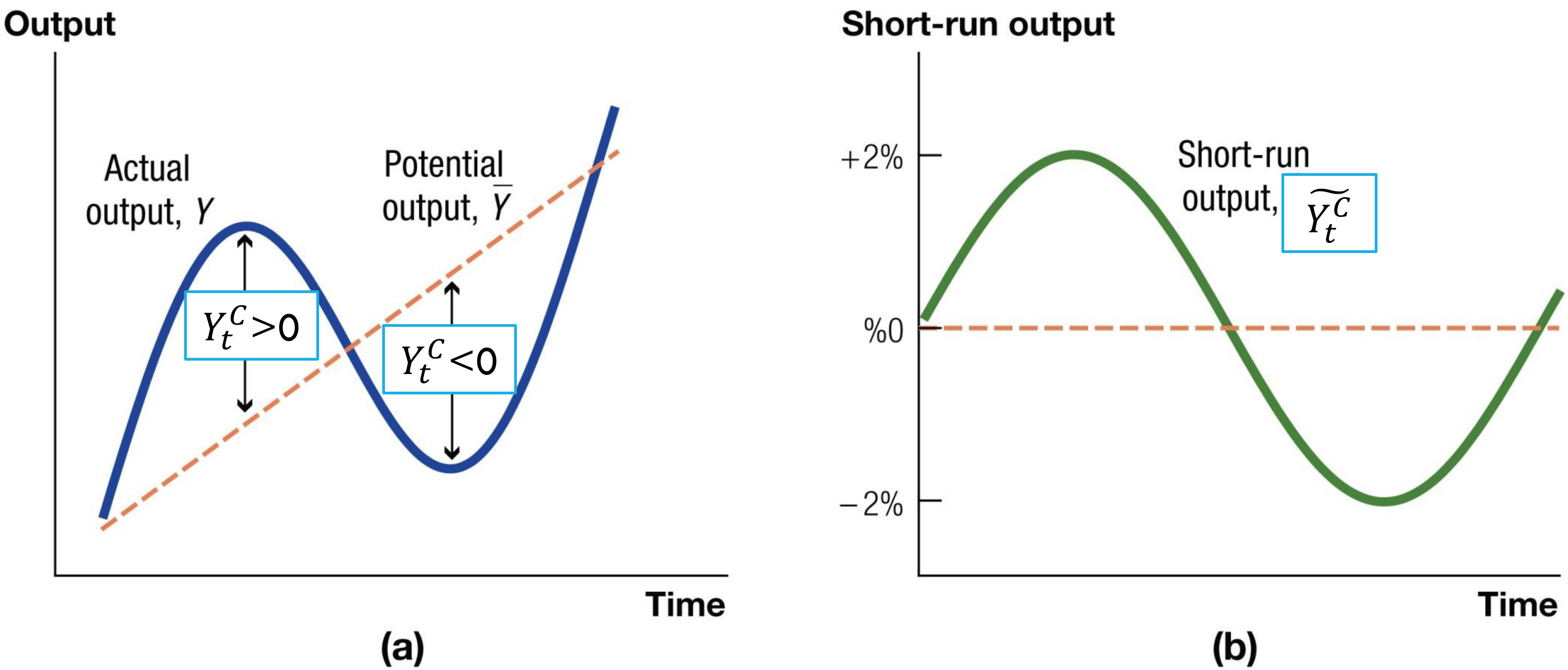
De-trending and Cyclical Fluctuations

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

$$Y_t = \overline{Y_t} + Y_t^C$$

- 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.

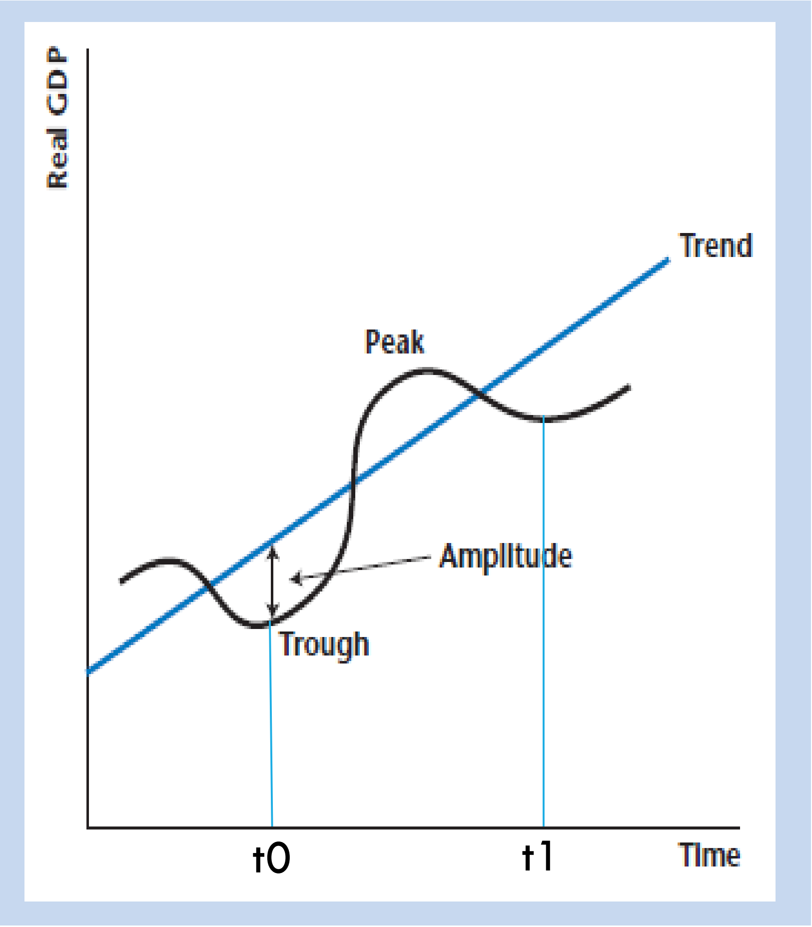
$$\widetilde{Y_t^C} = \frac{Y_t - \overline{Y_t}}{Y_t}$$


Output
Actual output, Y
Potential output, $\overline{Y}$
$Y_t^C > 0$
$Y_t^C < 0$
Time
(a)
Short-run output
+2%
%0
−2%
Short-run output, $\widetilde{Y_t^C}$
Time
(b)

HOW DO WE CHARACTERIZE/SUMMARIZE PATTERN OF BUSINESS CYCLES?

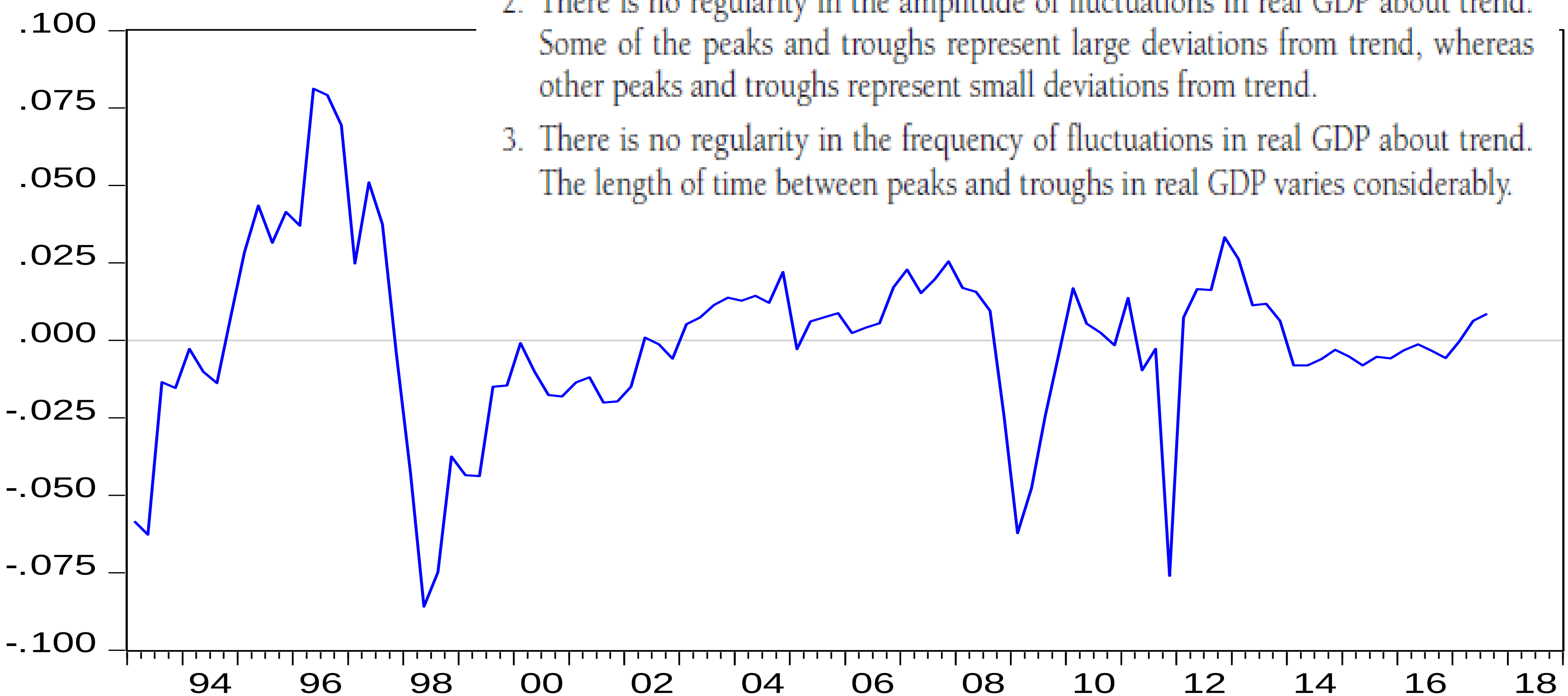
1. Amplitude of the cycle: Trough to Peak / trough to trend

2. Periods of cycle: periods (in quarter) for having one complete cycle: trough to trough



HOW DO WE CHARACTERIZE/SUMMARIZE PATTERN OF BUSINESS CYCLES?

1. The time series of deviations from trend in real GDP is quite choppy.
2. There is no regularity in the amplitude of fluctuations in real GDP about trend. Some of the peaks and troughs represent large deviations from trend, whereas other peaks and troughs represent small deviations from trend.
3. There is no regularity in the frequency of fluctuations in real GDP about trend. The length of time between peaks and troughs in real GDP varies considerably.



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.

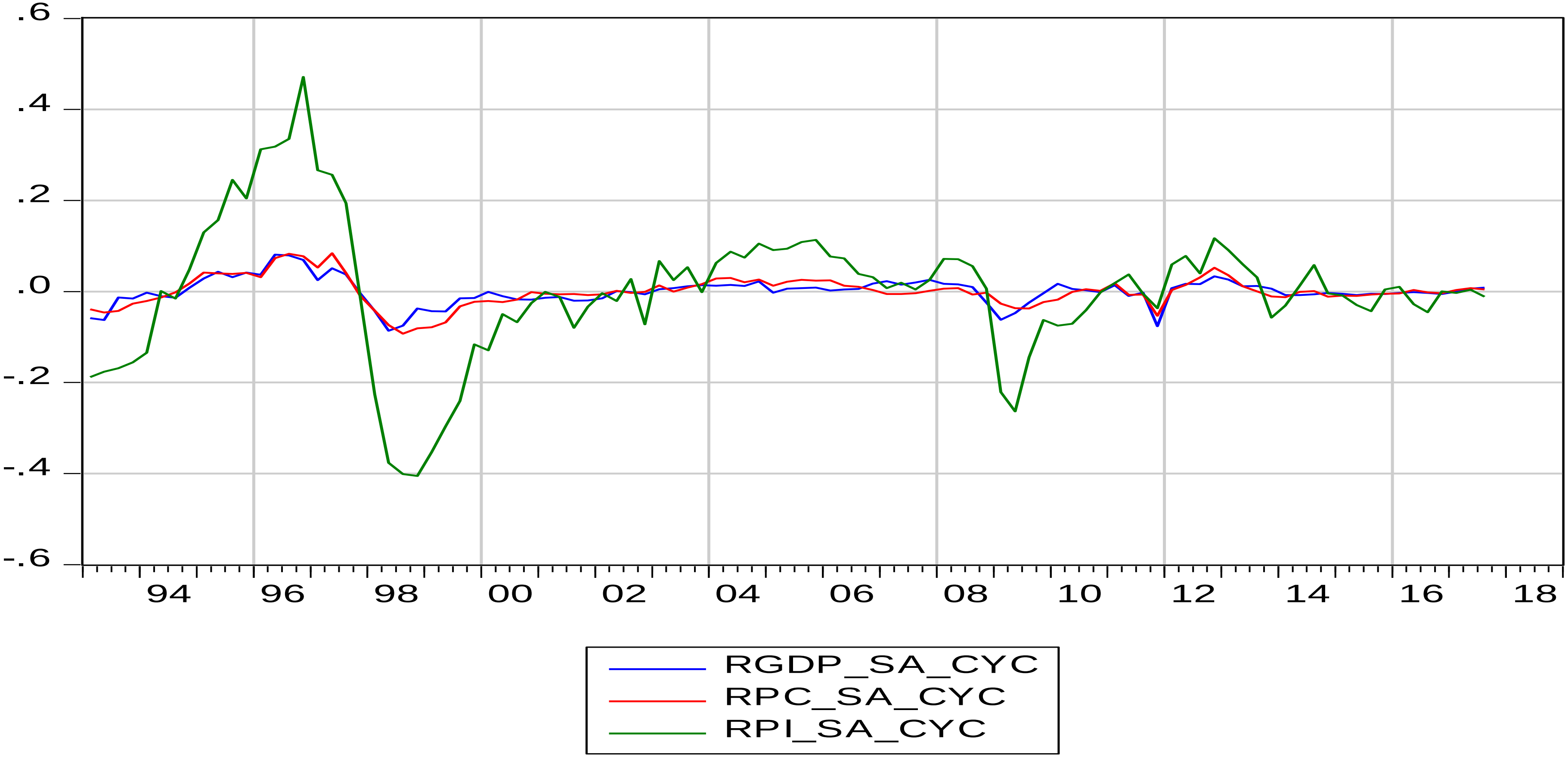
3. How volatile is the cycle?

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

4. Comovement of cyclical variables

- How does cycle of A relate to cycle of 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:

Corr(GDP,RPC) = 0.88

Corr(GDP,RPI) = 0.85

Corr(RPC, RPI) = 0.93

Conventionally, we call X as a procyclical variable if corr(GDP,x) > 0.
Counter-cyclical if corr(GDP,x) < 0.

BUSINESS CYCLES: GDP AND INFLATION