



AGENDA

- **What is a Business Cycle?**
- **Measurements of business cycle**
- **Business Cycle Analysis: A Preview**
- **Appendix: Important macroeconomic data and indicators**



WHAT IS A BUSINESS CYCLE?

Fed boosts rates for first time in 4 years

Central bank raises benchmark borrowing level to 1.25 percent



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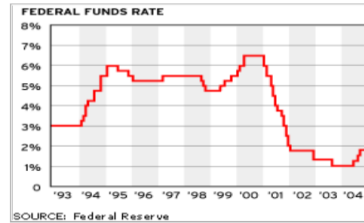
By Martin Wolk
Executive business editor

msnbc.com
Updated 6/30/2004 4:41:39 PM ET

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The Federal Reserve raised key short-term interest rates Wednesday for the first time in more than four years, launching a risky campaign to suppress inflation without stamping out economic growth.

Concluding a two-day meeting, Fed Chairman Alan Greenspan and fellow central bank policy-makers boosted the benchmark federal funds rate a quarter-point to 1.25 percent, citing recent evidence the economy "is



15 years
ago! In June
2005

A year after, and
then with in 2 years
afterwards



Q4, 2006 - U.S. housing market slows after two years of rising official interest rates. Delinquency rates on U.S. subprime mortgages rise, leading to wave of bankruptcies at subprime lenders. Interest rate premia on Collateralised Debt Obligations, repackaged bonds and loans which included subprime mortgage debt, jump sharply in December 2006 and January 2007. REUTERS/Brian Snyder

Fed cuts rates to record low - Reuters

<https://www.reuters.com> › article › us-usa-fed-preview › fed-cuts-rates-to-r... ▼

Dec 15, 2008 - In addition to the **rate cut**, the **Fed** said it was prepared to expand a plan ... many forecast the economy will shrink through the first half of 2009.

Fed Cuts Key Rate to a Record Low - The New York Times

<https://www.nytimes.com> › 2008/12/17 › business › economy › 17fed

Dec 16, 2008 - The **Federal Reserve** entered a new era on Tuesday, lowering its benchmark interest **rate** virtually to zero and declaring that it would now fight the recession by pumping out vast amounts of money to businesses and consumers through an expanding array of new lending programs.

The Great Recession

December 2007–June 2009

Lasting from December 2007 to June 2009, this economic downturn was the longest since World War II.



Store closing signs at a furniture store in 2009 (Photo: Associated Press; Photographer: Paul Sakuma)

Nearly a decade of the Great Recession, FED raised the rate in DEC 2015

Fed raises rates for first time in 9 years - Reuters

<https://www.reuters.com> › [article](#) › [us-usa-economy-instant](#) › [fed-raises-rat...](#) ▼

Dec 16, 2015 - (Reuters) - The **Federal** Reserve hiked **interest rates** for the **first time in nearly a decade** on Wednesday, signaling faith that the U.S. economy ...

Finally! Fed raises interest rates - Business - CNN.com

<https://money.cnn.com> › [economy](#) › [federal-reserve-interest-rate-hike](#) ▼

Dec 16, 2015 - America's **first interest rate** hike in **nearly a decade** is here. The **Federal**

Fed Cuts Interest Rates for First Time Since 2008 Crisis - The ...

<https://www.nytimes.com> › [economy](#) › [federal-reserve-interest-rate-cut](#)

Jul 31, 2019 - The **Fed**, which dropped its target **rate** to a range of 2 percent to 2.25 percent, stopped short of signaling the beginning of an aggressive **rate-cutting** campaign. By the end of the day, the S&P 500 was down 1.1 percent, the benchmark index's worst decline since May 31.

China's October industrial profits post biggest fall since 2011 ...

<https://www.scmp.com> › [Economy](#) › [China Economy](#) ▼

Nov 27, 2019 - Profits at China's industrial firms continued to slide in October, posting their steepest fall since 2011 as producer prices remained weak and **trade** tensions with the US weighed on the world's second largest economy. ... in September, according to the National Bureau of Statistics ...

Missing: [plummet](#) | Must include: [plummet](#)

Trade War: China's Slowdown Gets Even More Worrying ...

<https://marketrealist.com> › [Sectors](#) › [Consumer](#) ▼

Sep 10, 2019 - The US-China **trade** war has taken a toll on the Chinese economy. In August, China's ... A negative PPI suggests China's **growth** is slowing down. Furthermore, the ... Auto sales continue to **plummet**. China's passenger car ...

Trade war risks grinding global trade growth to a halt | Atradius

<https://group.atradius.com> › [publications](#) › [economic-research](#) › [trade-war-...](#) ▼

Jun 11, 2019 - World **trade growth** stagnated in Q1 amid the escalating **trade** war. While we ... 2. Bilateral **trade** flows between the US and China **plummet**.

Global markets take fright as Trump ramps up US-China trade ...

<https://www.theguardian.com> › [business](#) › [aug](#) › [global-markets-take-fright...](#) ▼

Aug 2, 2019 - In a **development** likely to have severe ramifications for global **growth**, ... **trade** volumes **plummet** and major companies pause investments.

Global trade may drop 17% in full trade war: WTO, Economy ...

Bangkok Post

THAILAND

WORLD

BUSINESS

OPINION

AUTO

LIFE

The vicious economic cycle has begun



CHARTCHAI PARASUK
COLUMNIST

PUBLISHED : 5 DEC 2019 AT 04:01
NEWSPAPER SECTION: [NEWS](#)

280



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Do not be surprised to see the government constantly coming out with economic good news such as its claims there are more factories opening than closing and more jobs being created. Or that the government is confident the bottom has been reached and a brighter economic outlook is set for next year. It is their job to create hope, while it is also my job to give readers the real economic picture. These pieces of information are accurate but, unfortunately, their stories do not go along with the real numbers. And remember, numbers never lie.

Registration of new factories could exceed closures. But the fact is factories are producing less and less. According to the Bank of Thailand's manufacturing production index, factories in Thailand produced 1.2%, 2.5%, and 4.3% less in the first, second, and third quarters respectively.

NOW, it's all coming back again!

Business cycles in macroeconomics

- Economists have long been interested in understanding the business cycle phenomena
 - What drive the cycle?
 - Pattern / forecastability?
 - Can we find tame/fix the cycle?
- Has become an important topic of discussion since the world war II
 - **Example:** US NBER business cycle committees
 - In Thailand, NESBD has been responsible for reporting statistic and projecting business cycle activities in Thailand



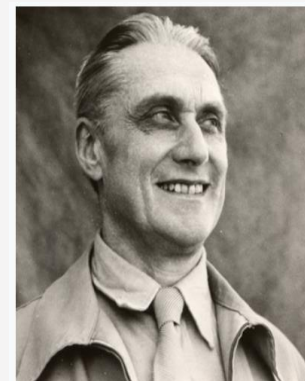
Wesley Clair Mitchell



Arthur Burns



Jan Tinbergen in 1982



Ragnar Anton Kittil Frisch

WHAT IS A BUSINESS CYCLES

- Burns and Mitchell (*Measuring Business Cycles*, 1946) makes five main points about business cycles:
 1. Business cycles are ***fluctuations of aggregate economic activity***, not a specific variable, about ***its trend***
 2. There are ***expansions*** and ***contractions; phase of cycle***
 3. The business cycle is ***recurrent***, but ***not periodic***
 4. The business cycle is ***persistent***
 5. Economic variables show ***comovement***—they have regular and predictable patterns of behavior over the course of the business cycle

1. Business cycles are *fluctuations of aggregate economic activity*, not a specific variable, about its *trend*

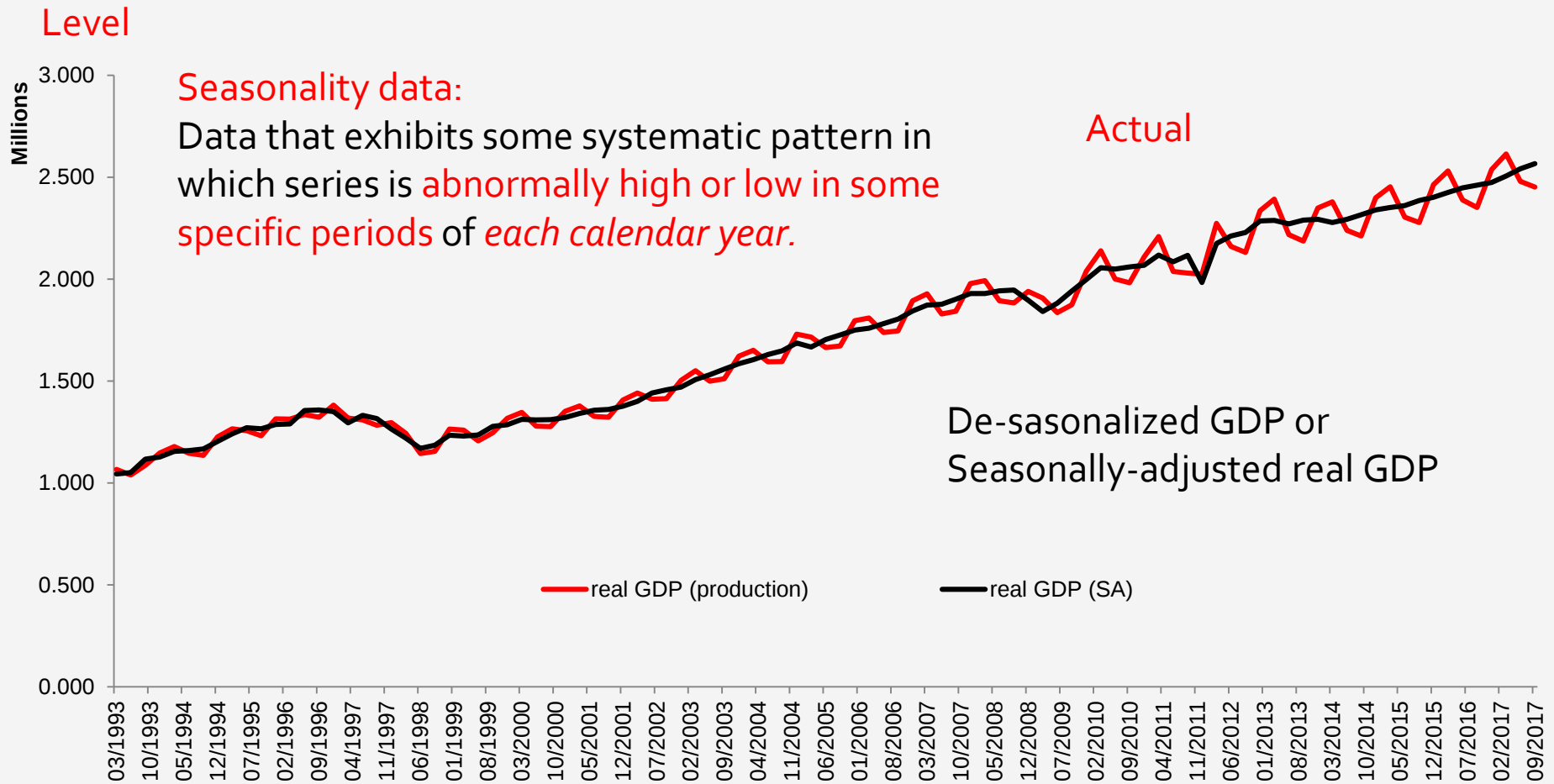
- Most aggregate variables are **time series**; data value can be observed at each point of time.
- One common approach is to characterize the behavior of the time series data is to think about the **decomposition**.

$$X = T + C + S$$

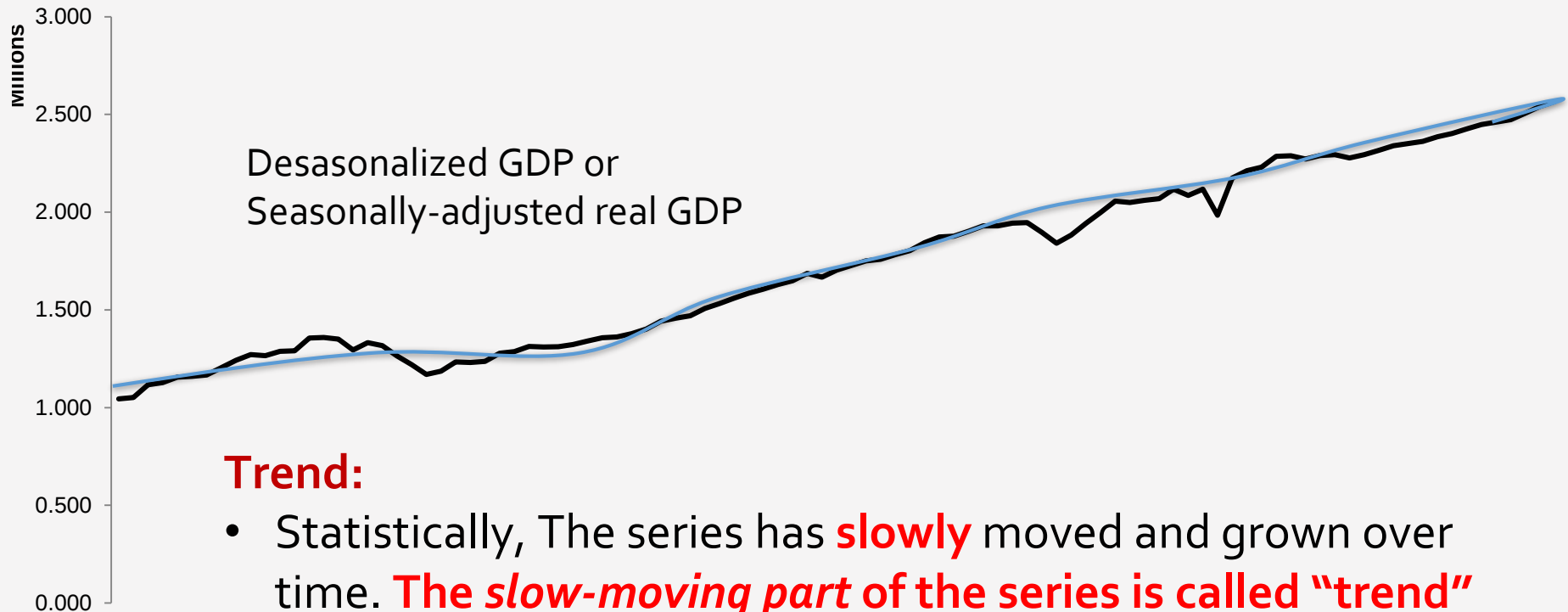
X = actual; T = trend; C=Cycle; S = Seasonal

For example: GDP = Trend GDP + Cycle GDP + Seasonal part

ACTUAL REAL GDP HAS CONTAINED SOME SEASONAL EFFECTS



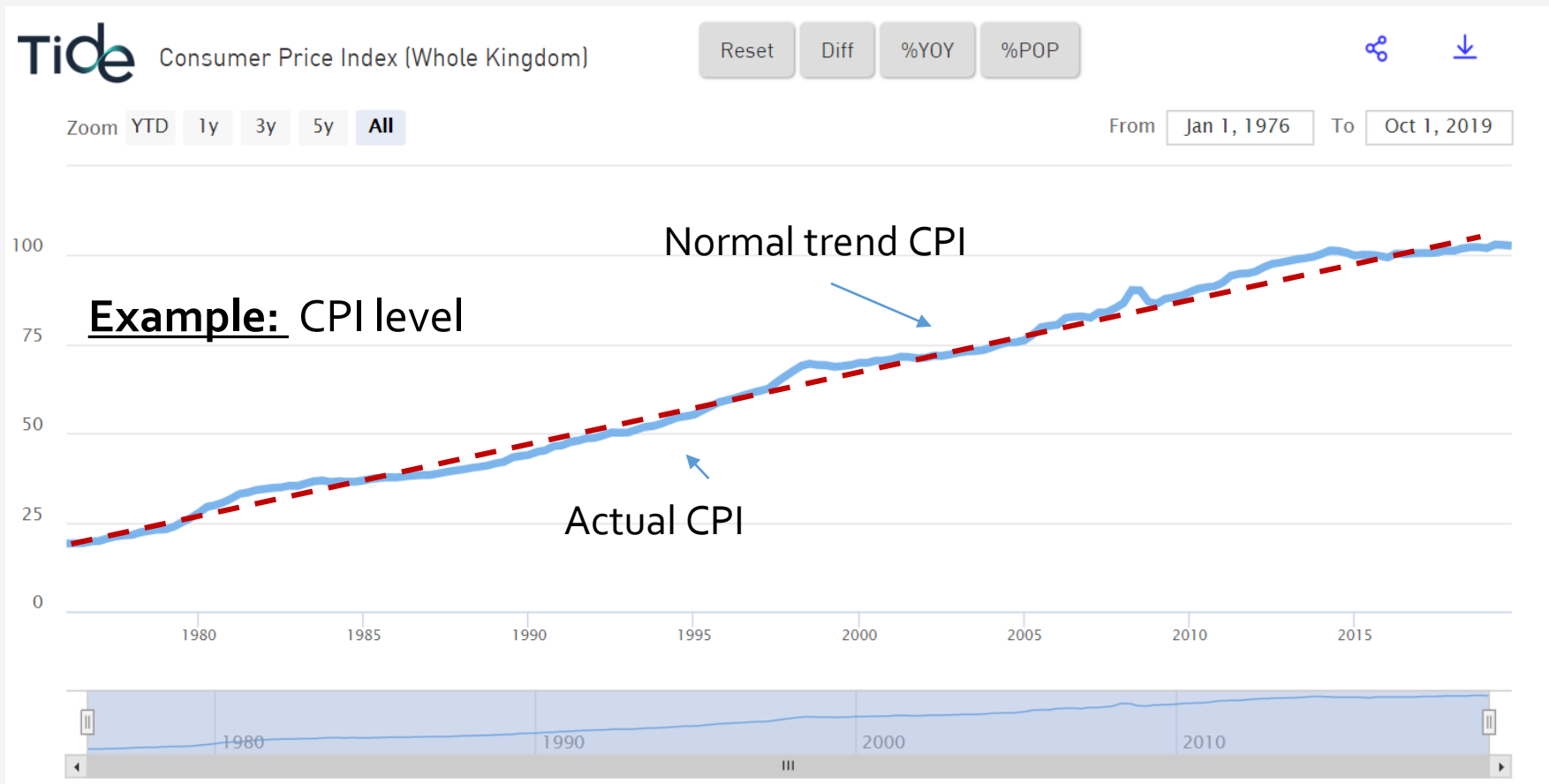
SEASONALLY-ADJUSTED REAL GDP HAS BECOME SMOOTHER AND GROWN OVER TIME, BUT FLUCTUATES AROUND ITS TREND



Trend:

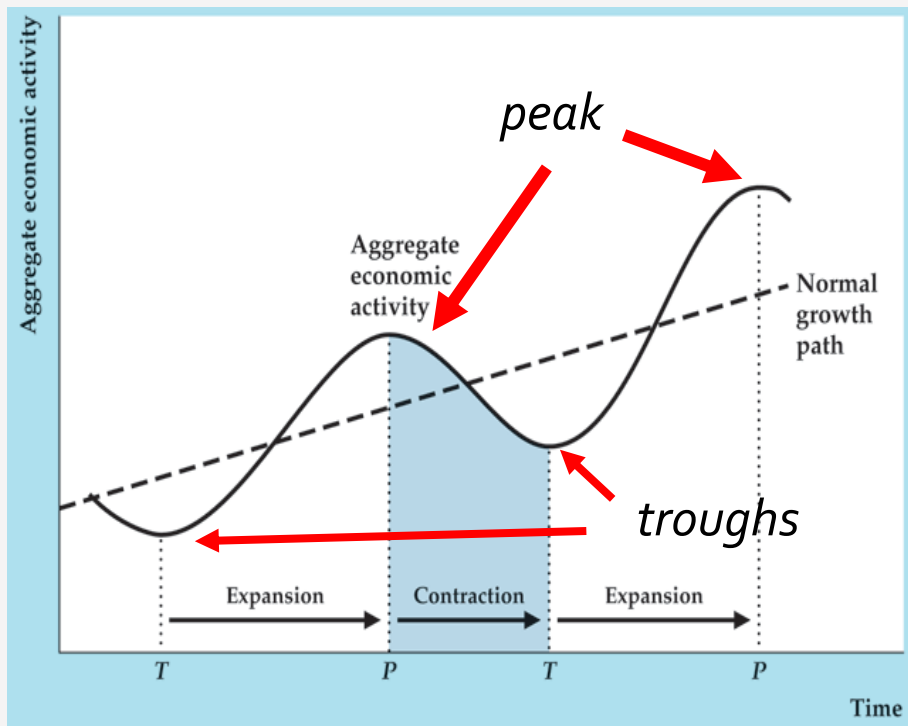
- Statistically, The series has **slowly** moved and grown over time. **The *slow-moving part of the series* is called "trend"**
- Economically, this trend is usually linked to **long-term factors**, i.e. **potential growth of the economy**.

1. BUSINESS CYCLES ARE *FLUCTUATIONS OF AGGREGATE ECONOMIC ACTIVITY, NOT A SPECIFIC VARIABLE, ABOUT ITS TREND*



2. There are expansions and contractions; phase of cyclical variations

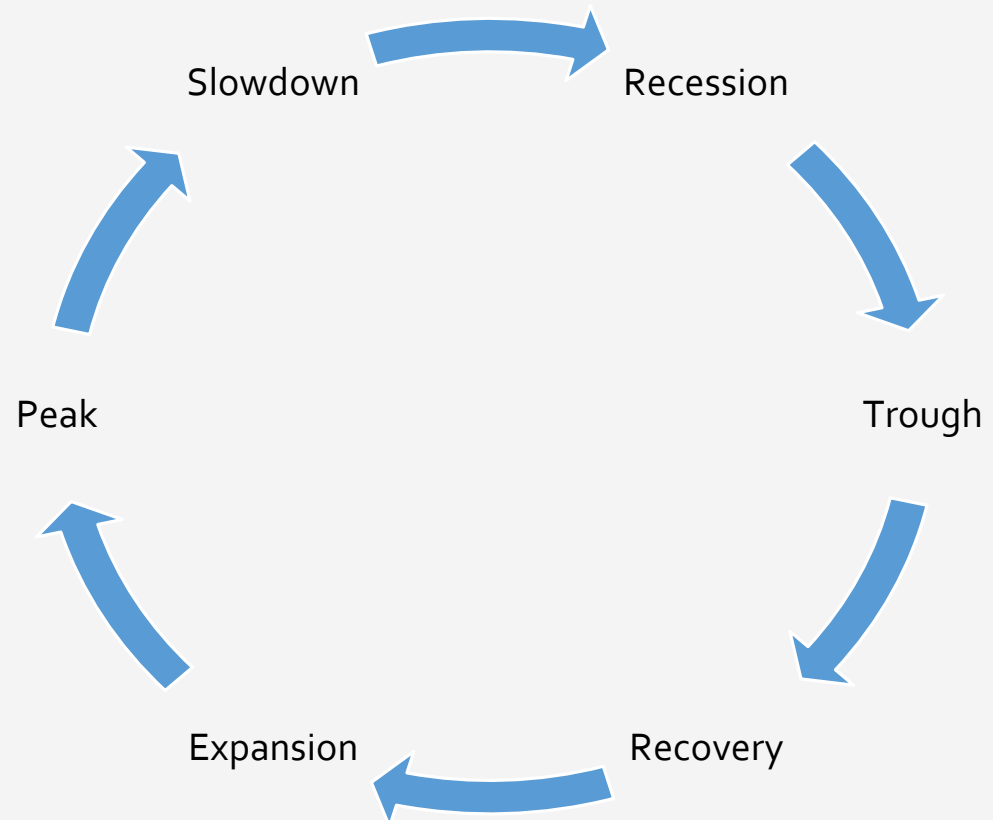
• Expansions and contractions: • Phase of business cycle



- After a trough, activity increases in an *expansion* or *boom* until it reaches a *peak*
- A particularly severe recession is called a *depression*
- The sequence from *one peak to the next*, or from *one trough to the next*, is a *business cycle*
- Peaks and troughs are *turning points*

3. THE BUSINESS CYCLE IS RECURRENT, BUT NOT PERIODIC

- Recurrent means the pattern of *contraction–trough–expansion–peak* occurs again and again
- Not being periodic means that it doesn't occur at regular, predictable intervals
 - Peak will come, but when?



4. THE BUSINESS CYCLE IS PERSISTENT

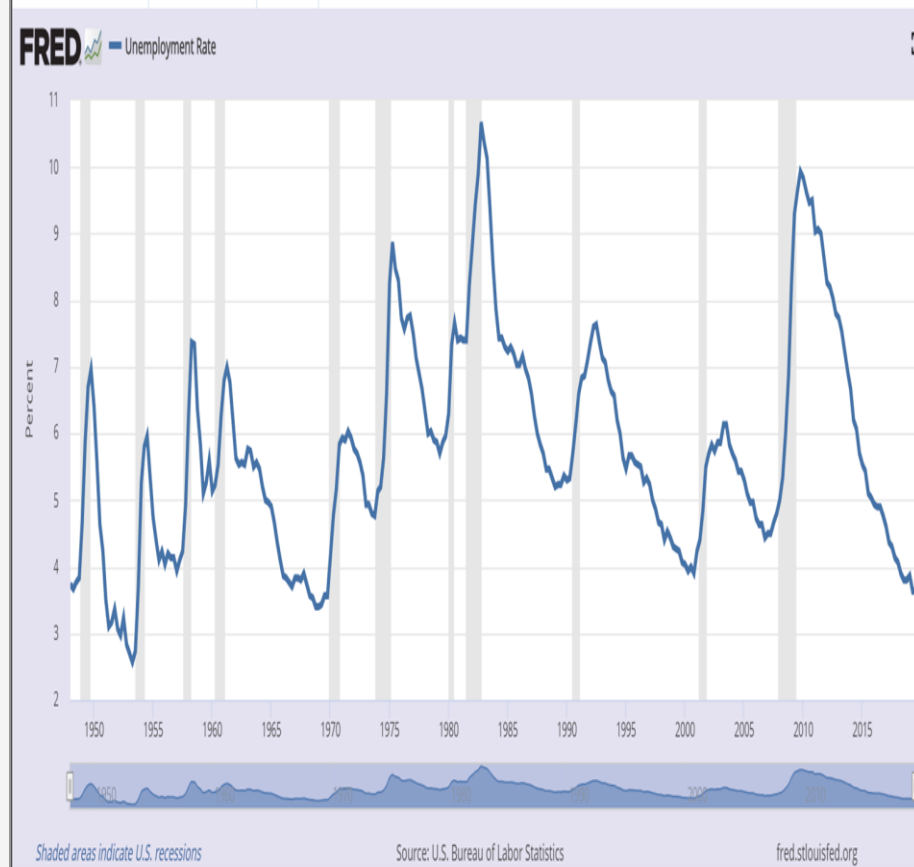
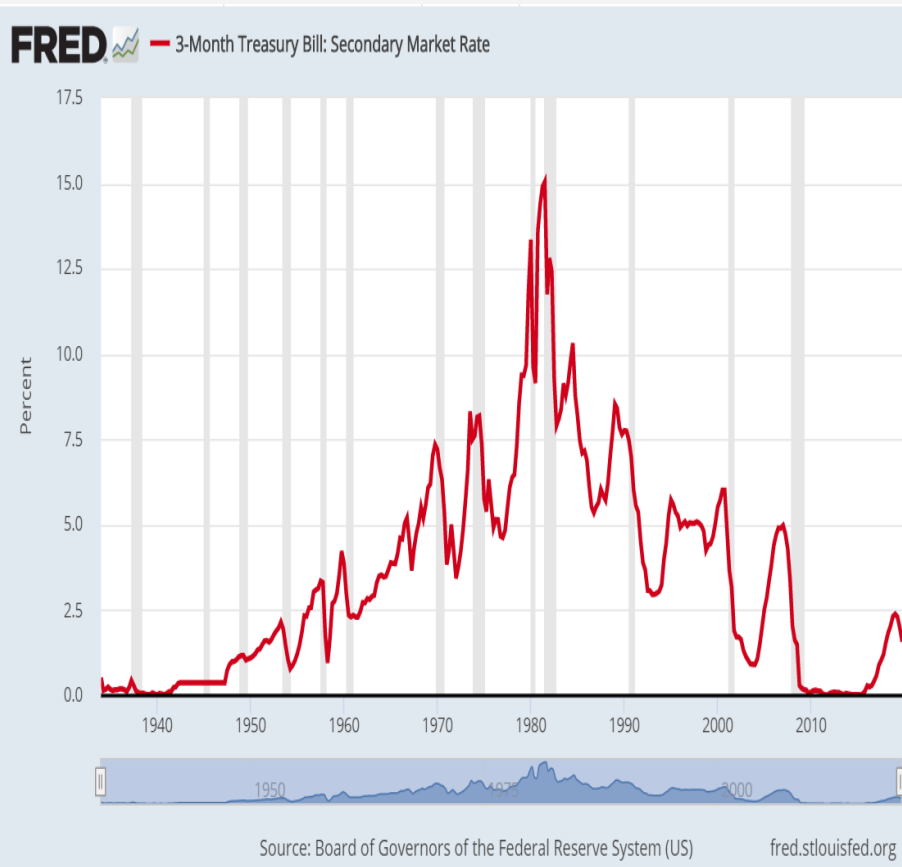
- **Persistent:** Declines are followed by further declines; growth is followed by more growth
- Because of persistence, forecasting turning points is quite important

NBER BUSINESS CYCLE TURNING POINTS AND DURATIONS OF POST-1854 BUSINESS CYCLES

Trough	Expansion (months from trough to peak)	Peak	Contraction (months from peak to next trough)
Dec. 1854	30	June 1857	18
Dec. 1858	22	Oct. 1860	8
June 1861	46 (Civil War)	Apr. 1865	32
Dec. 1867	18	June 1869	18
Dec. 1870	34	Oct. 1873	65
Mar. 1879	36	Mar. 1882	38
May 1885	22	Mar. 1887	13
Apr. 1888	27	July 1890	10
May 1891	20	Jan. 1893	17
June 1894	18	Dec. 1895	18
June 1897	24	June 1899	18
Dec. 1900	21	Sept. 1902	23
Aug. 1904	33	May 1907	13
June 1908	19	Jan. 1910	24
Jan. 1912	12	Jan. 1913	23
Dec. 1914	44 (WWI)	Aug. 1918	7
Mar. 1919	10	Jan. 1920	18
July 1921	22	May 1923	14
July 1924	27	Oct. 1926	13
Nov. 1927	21	Aug. 1929	43 (Depression)
Mar. 1933	50	May 1937	13 (Depression)
June 1938	80 (WWII)	Feb. 1945	8
Oct. 1945	37	Nov. 1948	11
Oct. 1949	45 (Korean War)	July 1953	10
May 1954	39	Aug. 1957	8
Apr. 1958	24	Apr. 1960	10
Feb. 1961	106 (Vietnam War)	Dec. 1969	11
Nov. 1970	36	Nov. 1973	16
Mar. 1975	58	Jan. 1980	6
July 1980	12	July 1981	16
Nov. 1982	92	July 1990	8
Mar. 1991	120	Mar. 2001	8
Nov. 2001	73	Dec. 2007	18
June 2009			

Source: NBER Web site, www.nber.org/cycles.html.

5. Economic variables show **comovement**—they have regular and predictable patterns of behavior over the course of the business cycle.





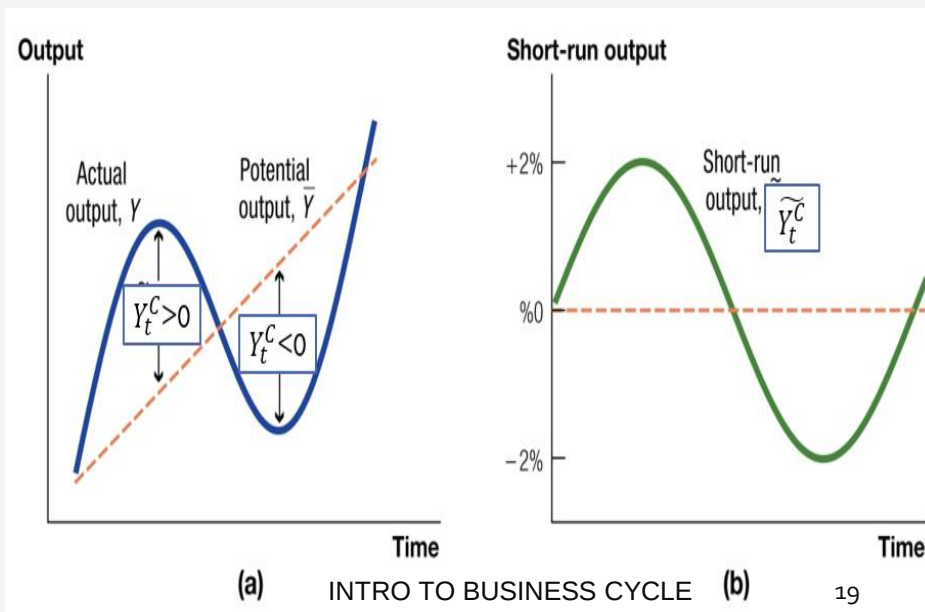
MEASURING AND CHARACTERIZING BUSINESS CYCLES

How do we measure the cyclical (business cycle) component of an economic variable?

- Cyclical measurement is usually made in percentage (**why? Normalization!**)
- **Example:** GDP cycle = The cyclical fluctuations are the percentage deviations from potential GDP.

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

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



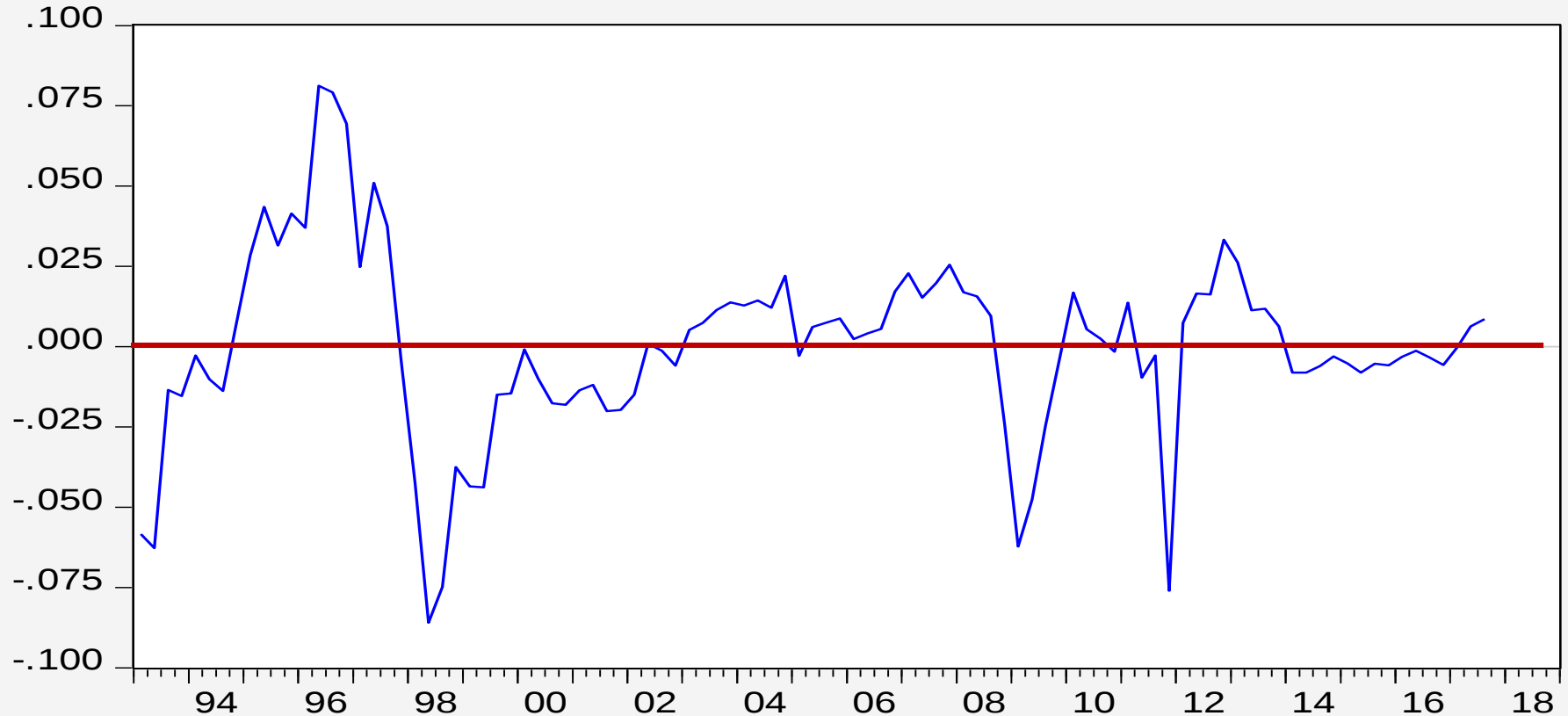
HOW DO WE MEASURE THE TREND COMPONENT?

- Simple constant average growth method
 - Use historical data and calculate full-sample average growth.
 - Use the average growth and calculate the normal trend level of the series.
- Moving average growth assumption
 - Use historical data and calculate average growth under each rolling-window sample
- Statistical Filtering (very technical)
- Use structural econometric model (very technical)

FLUCTUATIONS AROUND TREND: BUSINESS CYCLE OF THAILAND REAL GDP

Decimal points

RGDP_SA_CYC



HOW DO WE CHARACTERIZE THE CYCLICAL BEHAVIOR OF MACROECONOMIC DATA?

- Document **some common features** of business cycle.
- As the cycles are uncertain, economists treat the cyclical component of each macroeconomic data as a **random variable**
- Then describe its **statistical properties** using some statistic

CYCLICAL BEHAVIOR THROUGH THE LENSES OF STATISTICAL CONCEPT

- What aspects of business cycle do economists aim to look into?
 - **Average duration / Average amplitude of cycle**
 - **Size of variability:** Volatility
 - **Direction:** Comovement
 - **Timing:** Leading and Lagging

CYCLICAL BEHAVIOR THROUGH THE LENSES OF STATISTICAL CONCEPT: Average duration / amplitude

NBER studies

Average, all cycles:

1854-2009 (33 cycles)

1854-1919 (16 cycles)

1919-1945 (6 cycles)

1945-2009 (11 cycles)

* 32 cycles

** 15 cycles

DURATION IN MONTHS

Contraction

Expansion

Cycle

*Peak
to
Trough*

*Previous trough
to
this peak*

*Trough from
Previous
Trough*

*Peak from
Previous
Peak*

17.5

38.7

56.2

56.4*

21.6

26.6

48.2

48.9**

18.2

35.0

53.2

53.0

11.1

58.4

69.5

68.5

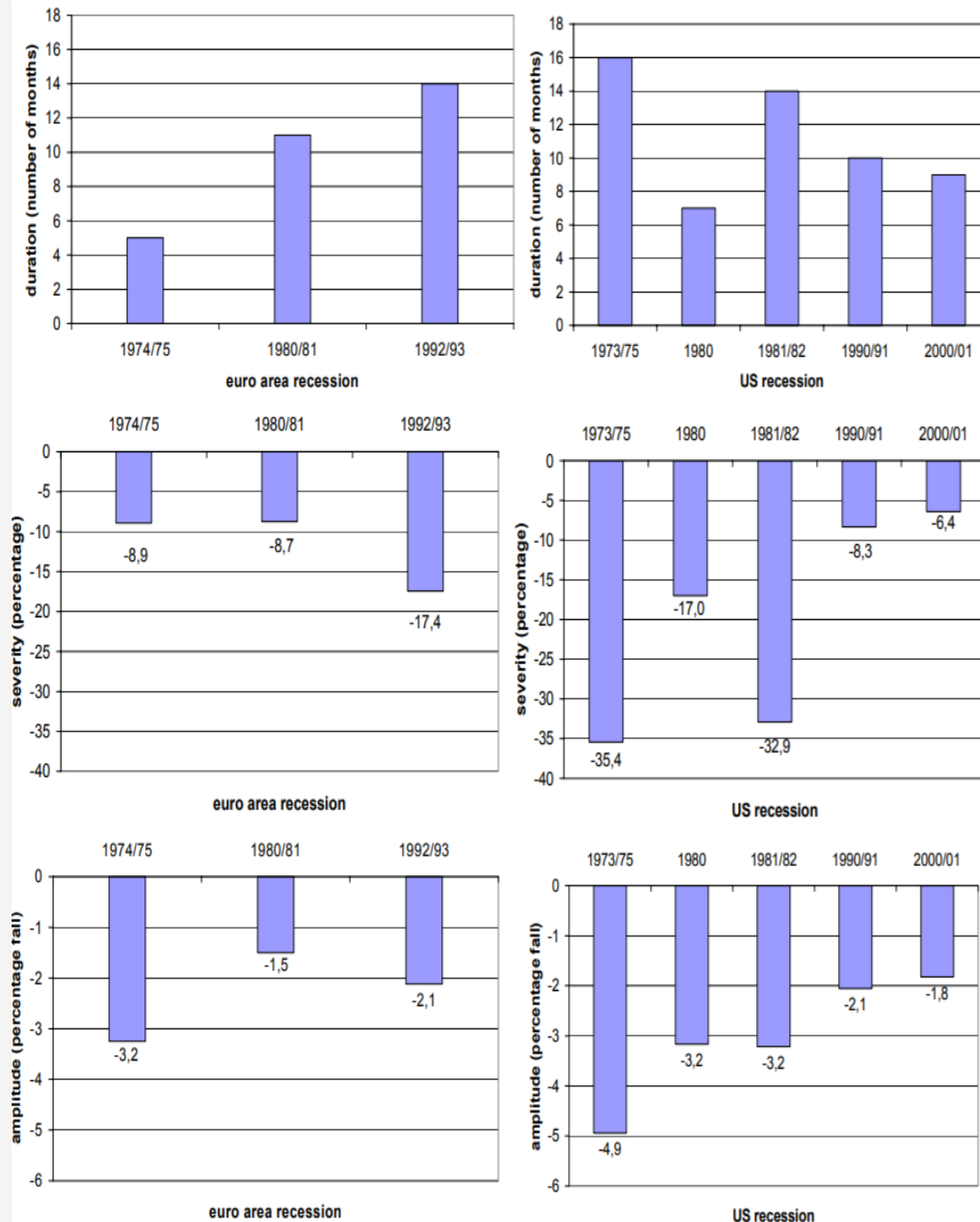


Figure 1 – Duration, amplitude and severity of recessions

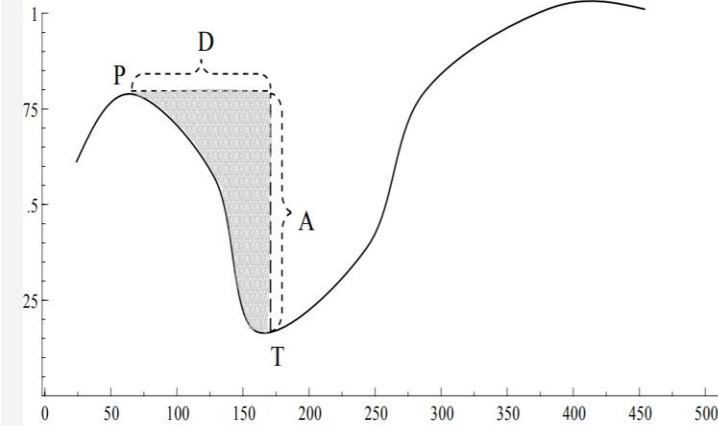
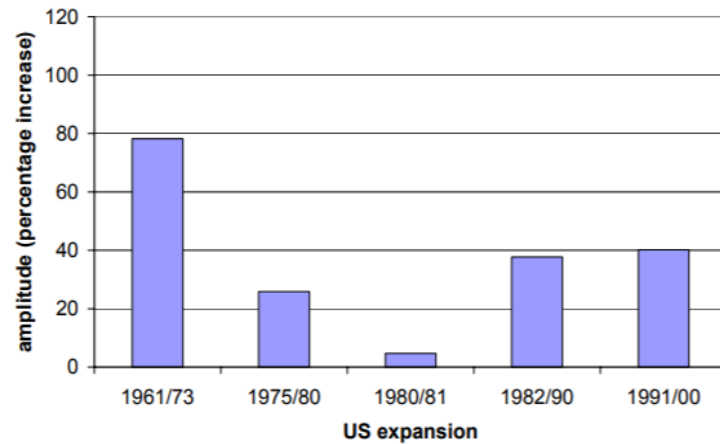
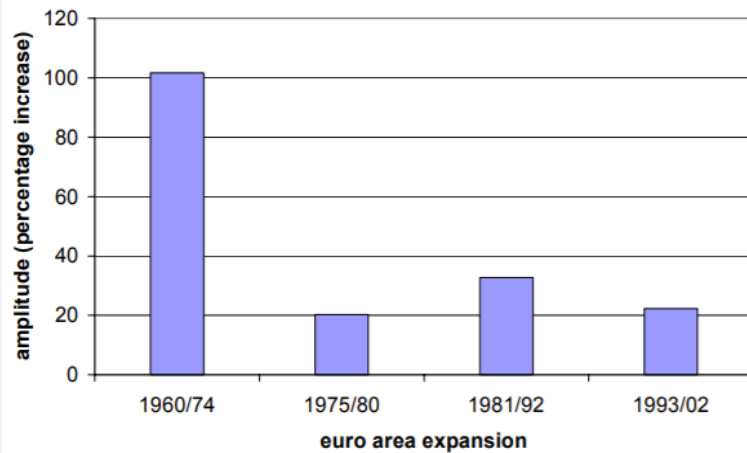
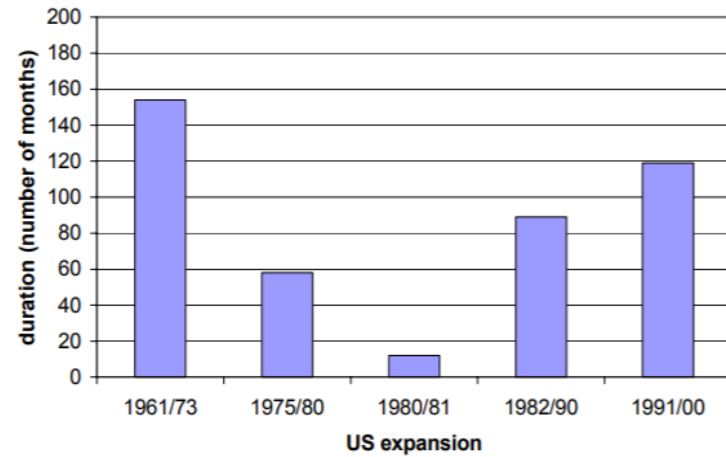
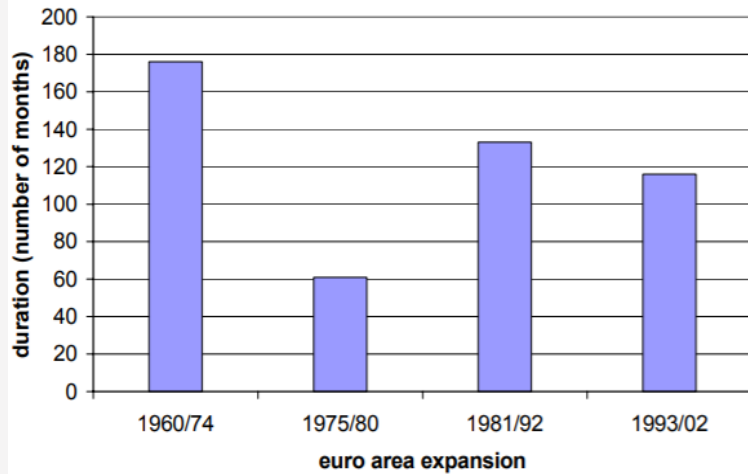


Figure 1 illustrates some of the various characteristics that are examined with reference to a typical recession: duration (measured by the horizontal segment D), amplitude (measured by the vertical segment A) and severity of recessions or slowdowns (measured by approximation by the grey area delimited by D, A and the index from P to T).

Figure 5 – Duration and amplitude of expansions



CYCLICAL BEHAVIOR THROUGH THE LENSES OF STATISTICAL CONCEPT: SIZE

- All business cycles have features in common
 - The cyclical behavior of economic variables—**size**, direction and timing
- What is the size of a variable's movements relative to aggregate economic activity (real GDP)? , or relative variability
 - *Volatility can be statistically measured by the **standard deviation***
- **Example:** Commonly found in the data of most countries, volatility of private investment is much higher than those of private consumption and real GDP.

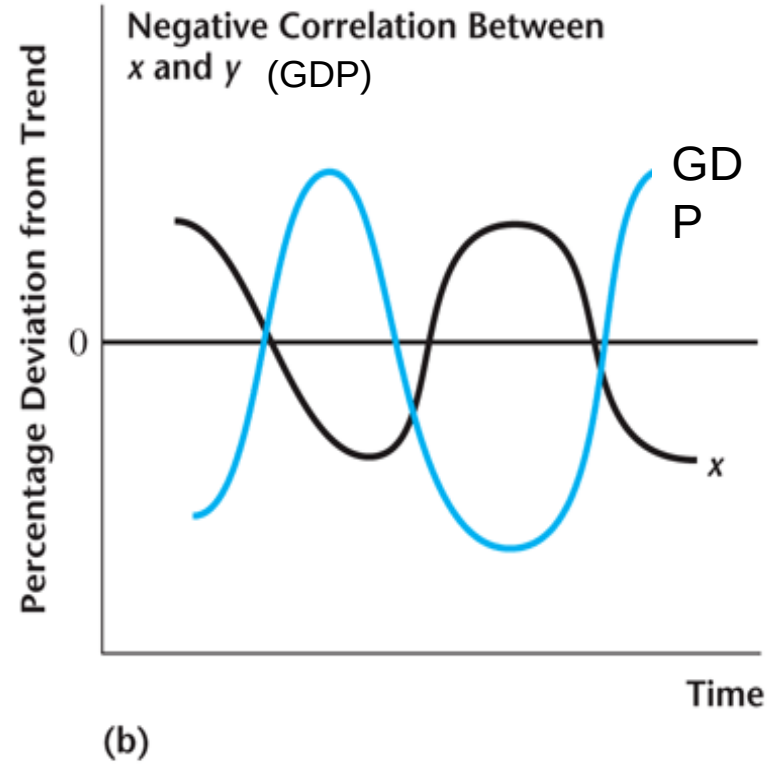
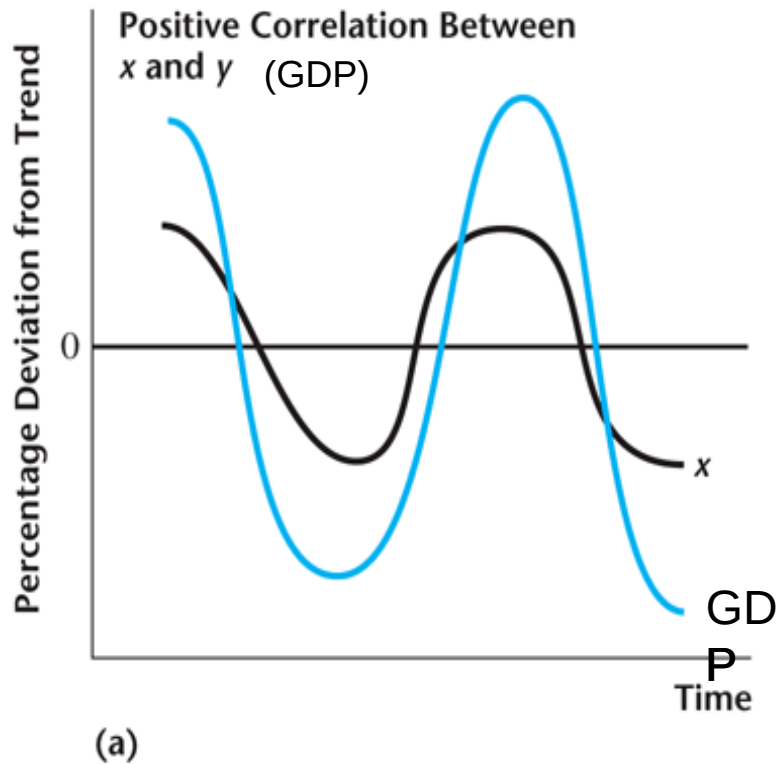
CYCLICAL BEHAVIOR THROUGH THE LENSES OF STATISTICAL CONCEPT: DIRECTION

- All business cycles have features in common
 - The cyclical behavior of economic variables—size, **direction** and timing
- What is the direction of a variable's movements relative to aggregate economic activity (real GDP)?, or comovement behavior
 - *Procyclical*: same direction
 - *Countercyclical*: opposite direction
 - *Acyclical*: no clear pattern

CYCLICAL BEHAVIOR THROUGH THE LENSES OF STATISTICAL CONCEPT: DIRECTION

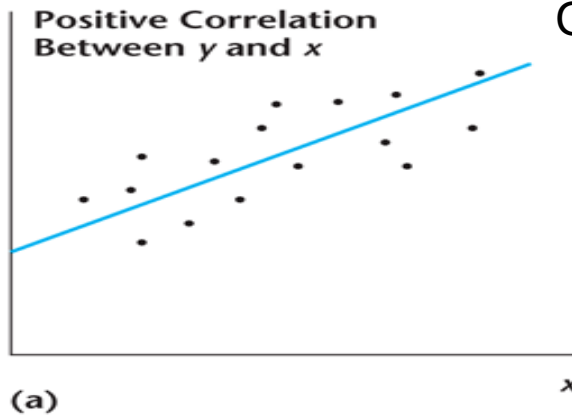
- Typically, we measure the strength of business cycle comovement using the “**correlation**”, rather than the covariance. (Why?)
- Conventional treatment: A variable “X” is said to be
 - A **procyclical variable** if $\text{corr}(\text{GDP}, x) > 0$.
 - A **counter-cyclical** variable if $\text{corr}(\text{GDP}, x) < 0$.
 - **Acyclical variable** if $\text{corr}(\text{GDP}, x) = 0$

CYCLICAL BEHAVIOR THROUGH THE LENSES OF STATISTICAL CONCEPT: DIRECTION

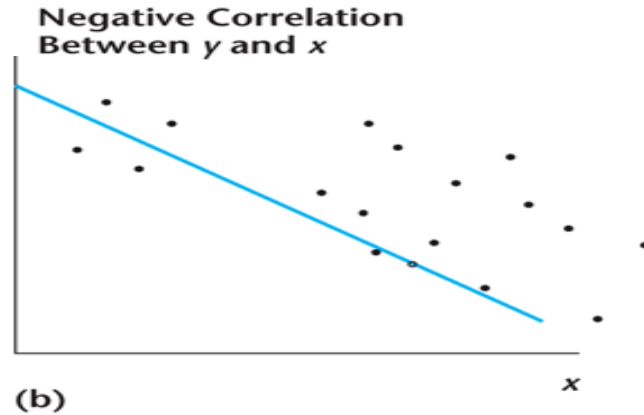


CYCLICAL BEHAVIOR THROUGH THE LENSES OF STATISTICAL CONCEPT: DIRECTION

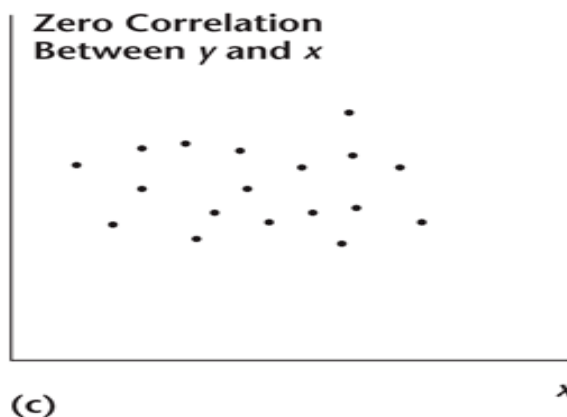
GDP



GDP



GDP



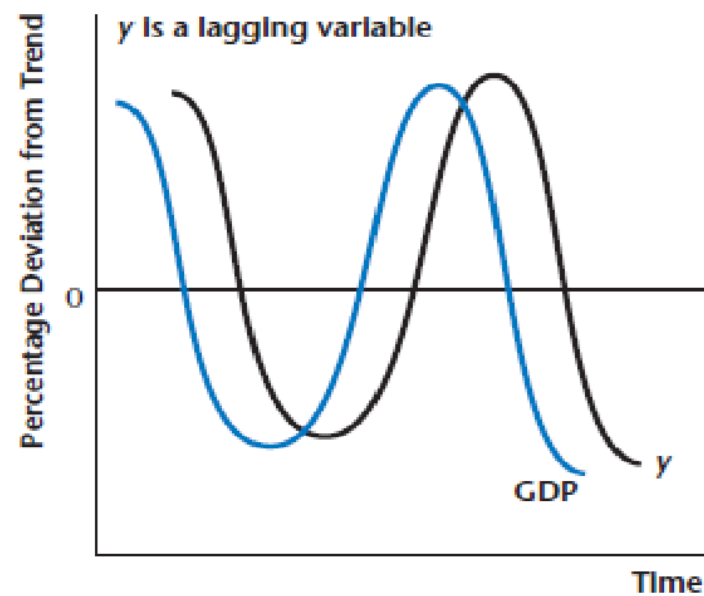
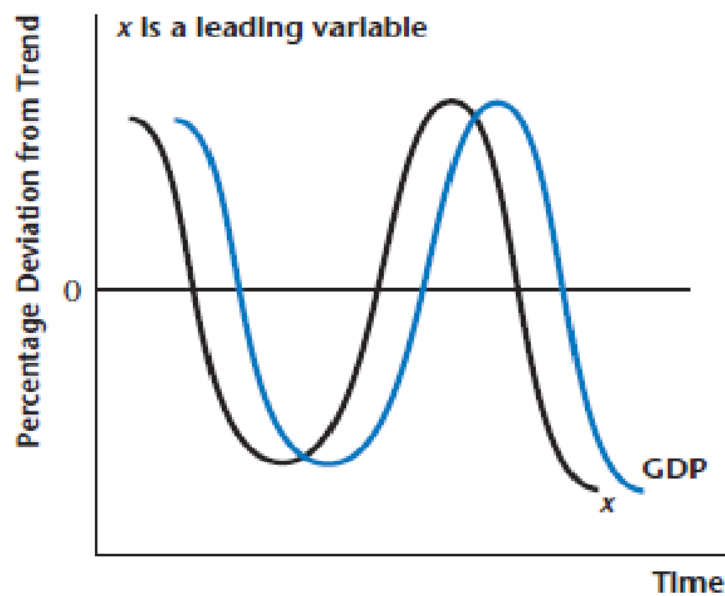
CYCLICAL BEHAVIOR THROUGH THE LENSES OF STATISTICAL CONCEPT: TIMING

- All business cycles have features in common
 - The cyclical behavior of economic variables—size, direction and **timing**
- What is the **timing** of a variable's movements relative to aggregate economic activity (real GDP)?
 - *Leading*: in advance
 - *Coincident*: at the same time
 - *Lagging*: after

CYCLICAL BEHAVIOR THROUGH THE LENSES OF STATISTICAL CONCEPT: TIMING

Figure 3.7 Leading and Lagging Variables

In (a), x is a leading variable, as its peaks and troughs tend to precede those of real GDP. In (b), y is a lagging variable, as the peaks and troughs in real GDP tend to lead those in y .



The Cyclical Behavior of Key Macroeconomic Variables (The Business Cycle Facts)

Variable	Direction	Timing
Production		
Industrial production	Procyclical	Coincident
<i>Durable goods industries are more volatile than nondurable goods and services</i>		
Expenditure		
Consumption	Procyclical	Coincident
Business fixed investment	Procyclical	Coincident
Residential investment	Procyclical	Leading
Inventory investment	Procyclical	Leading
Government purchases	Procyclical	— ^a
<i>Investment is more volatile than consumption</i>		
Labor Market Variables		
Employment	Procyclical	Coincident
Unemployment	Countercyclical	Unclassified ^b
Average labor productivity	Procyclical	Leading ^a
Real wage	Procyclical	— ^a
Money Supply and Inflation		
Money supply	Procyclical	Leading
Inflation	Procyclical	Lagging
Financial Variables		
Stock prices	Procyclical	Leading
Nominal interest rates	Procyclical	Lagging
Real interest rates	Acyclical	— ^a

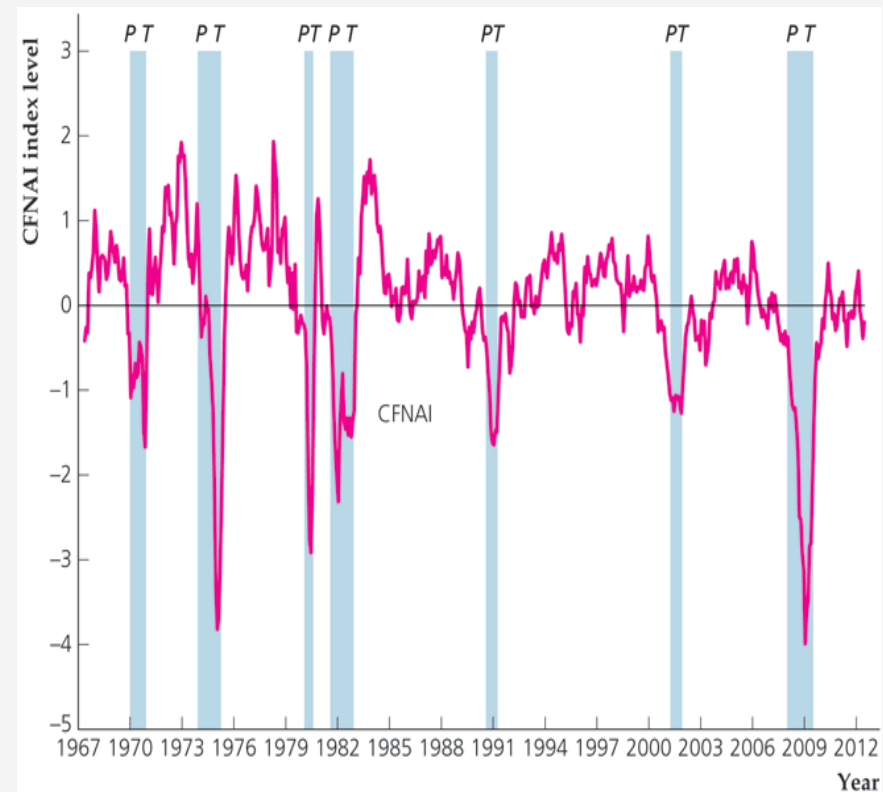
^a Timing is not designated by The Conference Board.

^b Designated as “unclassified” by The Conference Board; leading at peaks and lagging at troughs.

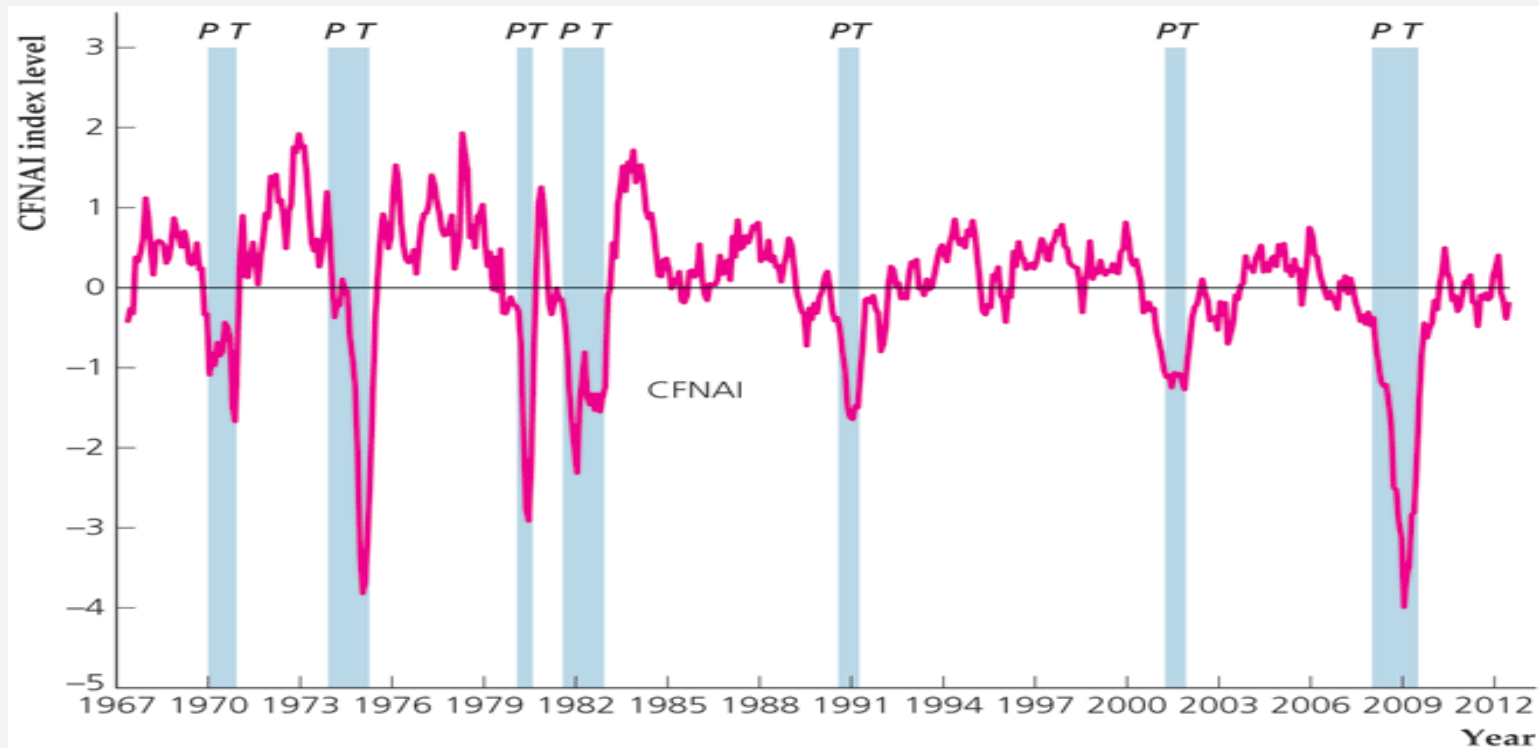
Source: Business Cycle Indicators, September 2008. Industrial production: series 47 (industrial production); consumption: series 57 (manufacturing and trade sales, constant dollars); business fixed investment: series 86 (gross private nonresidential fixed investment); residential investment: series 28 (new private housing units started); inventory investment: series 30 (change in business inventories, constant dollars); employment: series 41 (employees on nonagricultural payrolls); unemployment: series 43 (civilian unemployment rate); money supply: series 106 (money supply M2, constant dollars); inflation: series 120 (CPI for services, change over six-month span); stock prices: series 19 (index of stock prices, 500 common stocks); nominal interest rates: series 119 (Federal funds rate), series 114 (discount rate on new 91-day Treasury bills), series 109 (average prime rate charged by banks).

What can we make use of our knowledge of business cycle?

- Detecting the current state:
coincident index
 - Telling the state of macroeconomy using panels of coincident variables
 - Why? Lag report in quarterly data; don't know if GDP is high or low!
 - Possible related to the concept of **"NOWCASTING"**



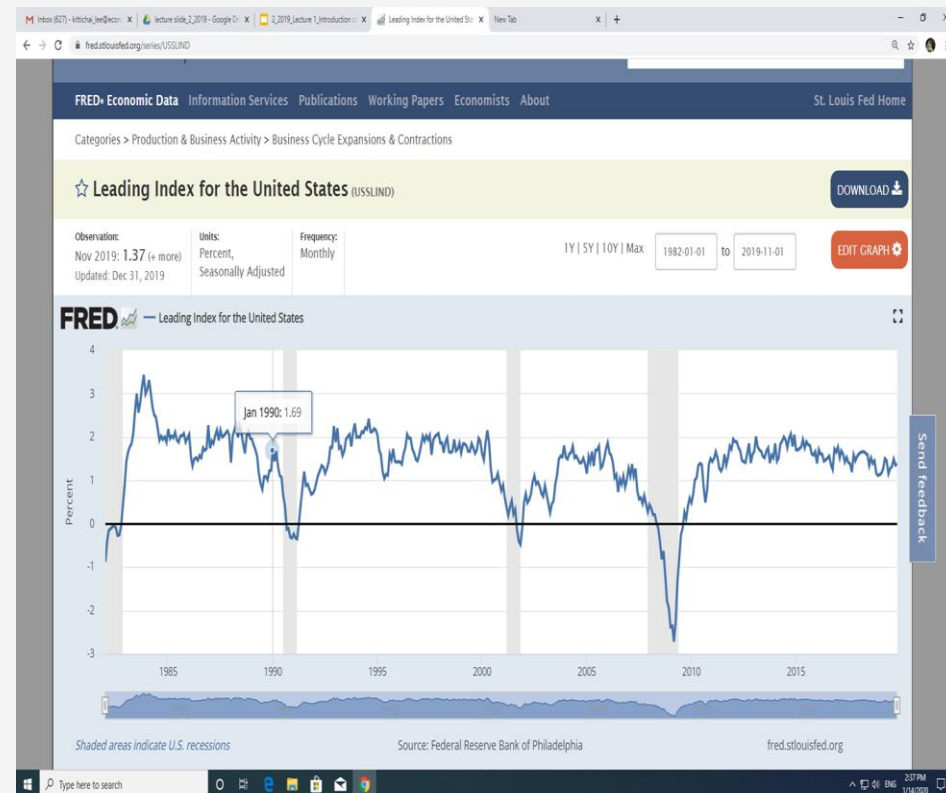
What can we make use of our knowledge of business cycle?



Source: Federal Reserve Bank of Chicago Web site, www.chicagofed.org/economic_research_and_data/cfnai.cfm.

What can we make use of our knowledge of business cycle?

- Predicting the future:
leading economic index
 - Telling us when the recession might be coming
 - Using collection of data with high predictive power of future real GDP change
 - **Problems:** Possible false alarm, cannot predict crisis!





BUSINESS CYCLE ANALYSIS: A PREVIEW

BUSINESS CYCLE ANALYSIS: A PREVIEW

- **What explains business cycle fluctuations?**
 - TWO major components of business cycle theories
 - A description of the shocks
 - A model of how the economy responds to shocks
 - TWO major business cycle theories: Time horizons
 - Classical theory : long-run theory
 - Keynesian theory : short-run and medium-run theory
 - Study both theories in aggregate demand-aggregate supply (*AD-AS*) framework

BUSINESS CYCLE ANALYSIS: STRUCTURE OF AD-AS MODEL

- Aggregate demand and aggregate supply: a brief introduction
 - The model (along with the **building block** *IS-LM* model) will be reviewed later
 - The model has 3 main components; all plotted in (P, Y) space
 - aggregate demand curve
 - Very short-run aggregate supply curve
 - short-run aggregate supply curve
 - long-run aggregate supply curve

BUSINESS CYCLE ANALYSIS: AD CURVE

- **Aggregate demand curve**
 - Shows quantity of goods and services demanded (Y) for any price level (P)
 - Higher P means less aggregate demand (lower Y), so the aggregate demand curve slopes downward; reasons why discussed in later!

BUSINESS CYCLE ANALYSIS: AD CURVE

- **Aggregate demand curve: move along the curve v.s. change in demand curve**
 - An increase in aggregate demand for a given P shifts the aggregate demand curve up and to the right; and vice-versa
 - **Example 1:** a rise in the stock market increases consumption, shifting the aggregate demand curve up and to the right
 - **Example 2:** a decline in government purchases shifts the aggregate demand curve down and to the left

BUSINESS CYCLE ANALYSIS: AS CURVE

- **Aggregate supply curve**
 - The aggregate supply curve shows how much output producers are willing to supply at any given price level
 - The shape of AS curve depends on the **time horizon of business cycle analysis**

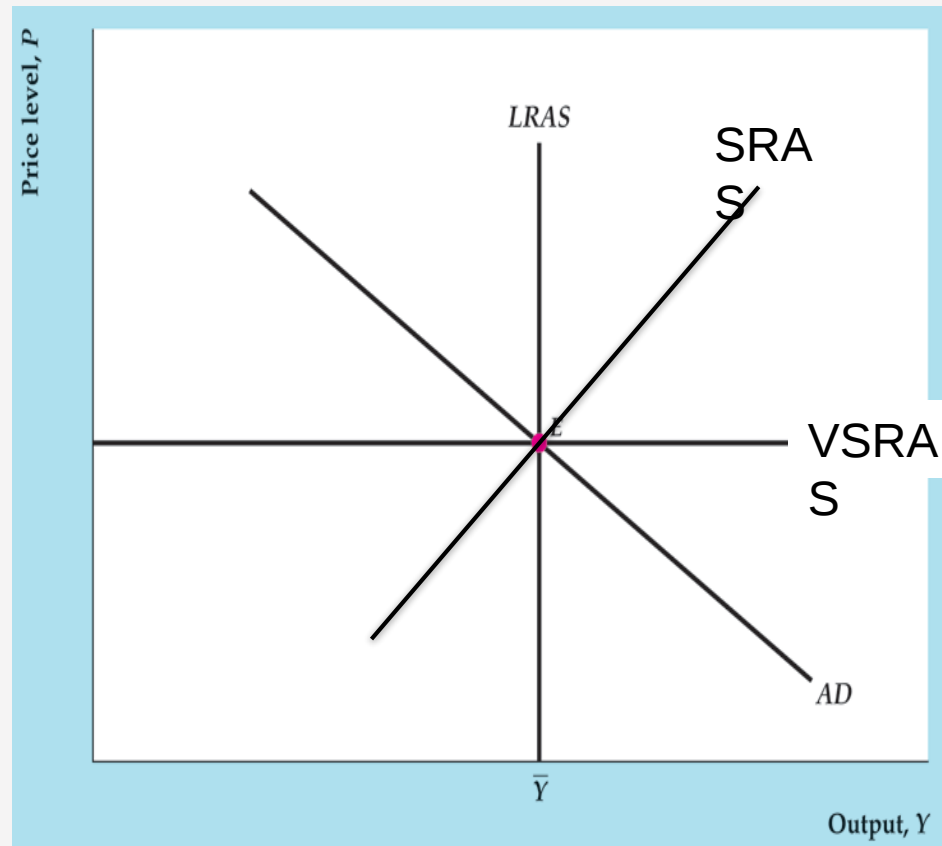
BUSINESS CYCLE ANALYSIS: AS CURVE

- **Aggregate supply curve**
 - The **very short-run aggregate supply curve (VSRAS)** is horizontal; prices are fixed in the very short run
 - The **short-run aggregate supply curve (SRAS)** is upward sloping; prices/wages are not fully adjustable fixed in the short run
 - Under the long-run horizon, prices and wages are fully responsive; the **long-run aggregate supply curve (LRAS)** is vertical at the full-employment level of output

BUSINESS CYCLE ANALYSIS: AD-AS EQUILIBRIUM

- **Equilibrium notions:**

- (very) Short-run equilibrium: the aggregate demand curve intersects the (very) short-run aggregate supply curve
- Short-run equilibrium: the aggregate demand curve intersects the short-run aggregate supply curve
- Long-run equilibrium: the aggregate demand curve intersects the long-run aggregate supply curve



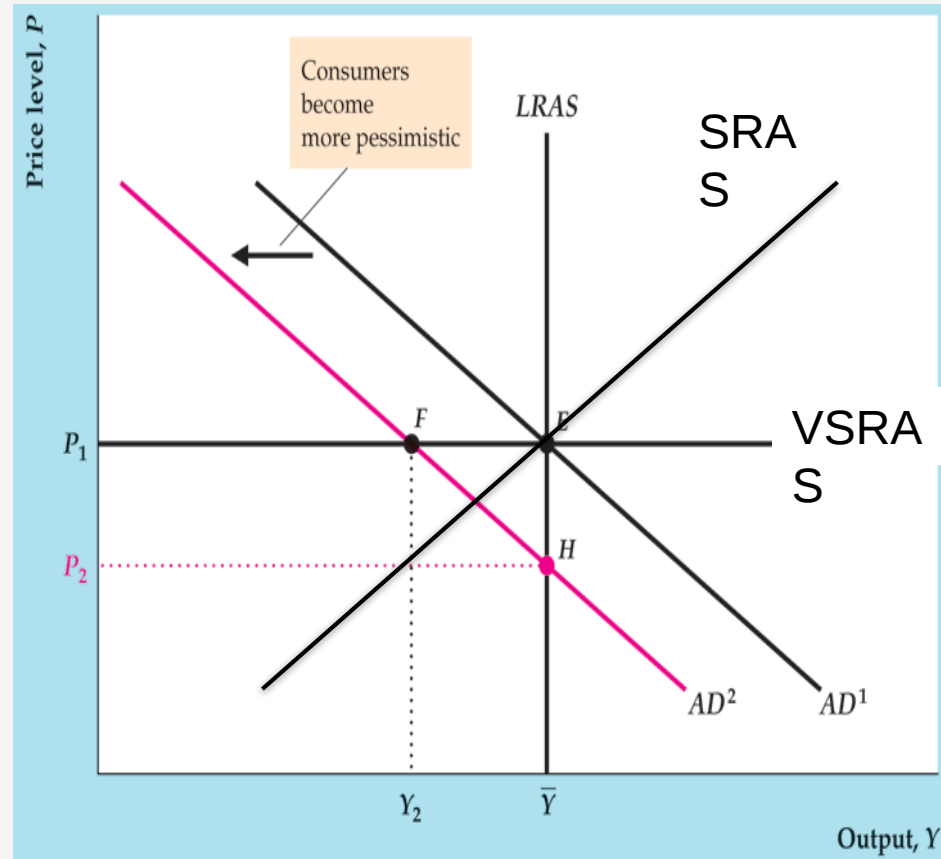
BUSINESS CYCLE ANALYSIS: INTERPRETING THE CYCLE THROUGH THE LENSES OF AD-AS

- The recurrent fluctuations of aggregate variables can be explained and rationalized through the lenses of AD-AS model
 - With the AD shocks and AS shocks, the economy is perturbed, causing a possible deviation from **“trend”** or **“full-potential situation”**
 - The AD-AS model summarize the structure of macroeconomy and the channels in which shocks propagate (transmit)

BUSINESS CYCLE ANALYSIS: DEMAND-DRIVEN FLUCTUATIONS

- Aggregate demand shocks

- An aggregate demand shock is a change that shifts the aggregate demand curve
- Example:** a negative aggregate demand shock
 - The aggregate demand curve shifts down and to the left
 - Prediction:** Price is a procyclical variable under AD shocks.



BUSINESS CYCLE ANALYSIS: DEMAND-DRIVEN FLUCTUATIONS

- Matching with the nature of business cycle pattern, the model allow us to discuss about impact of shocks over the **short-run** and **medium-run analysis**
- The impact can be analyzed under both **“permanent”** and **“temporary”** shocks
 - Permanent shocks = Changes that last forever
 - Temporary shocks = Changes that occur for one time, and then gone

BUSINESS CYCLE ANALYSIS: TIME HORIZON OF THE ANALYSIS

Short-run analysis

- Comparative static analysis: before and after
- Shock-propagating mechanism or channel of transmission of shocks
- Large / Small?

Medium-run analysis

- Provide some explanation about dynamic adjustments
- The underlying mechanism in which economy reverts to the potential situation
- What causes it so long for the self-adjustment process to kick in

BUSINESS CYCLE ANALYSIS: TWO COMPETING PROPOSAL

Classical theory: prices adjust rapidly

- So recessions are short-lived
- No need for government intervention; the more government gets involved, the more trouble it creates

Keynesian theory: prices (and wages) adjust slowly

- Adjustment may take several years
- So the government can fight recessions by taking action to shift the aggregate demand curve; policy is welfare-improving

BUSINESS CYCLE ANALYSIS: AS SHOCKS

- Business cycle could be explained by AS shocks as well
- AD-AS model provide us a good framework for understanding the nature of business cycles driven by both **permanent AS shocks** and **temporary AS shocks**

Temporary

- Oil price
- Earthquake
- Weather condition

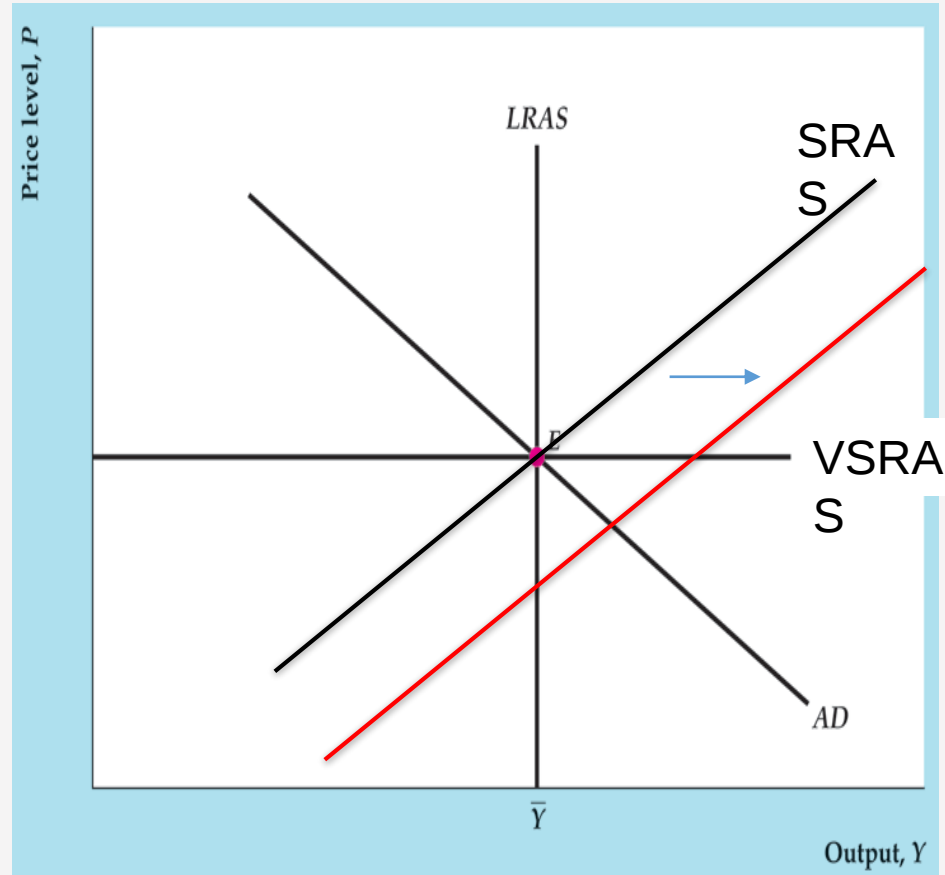
Permanent

- Technology innovation
- Demographic factor
- Climate change

BUSINESS CYCLE ANALYSIS

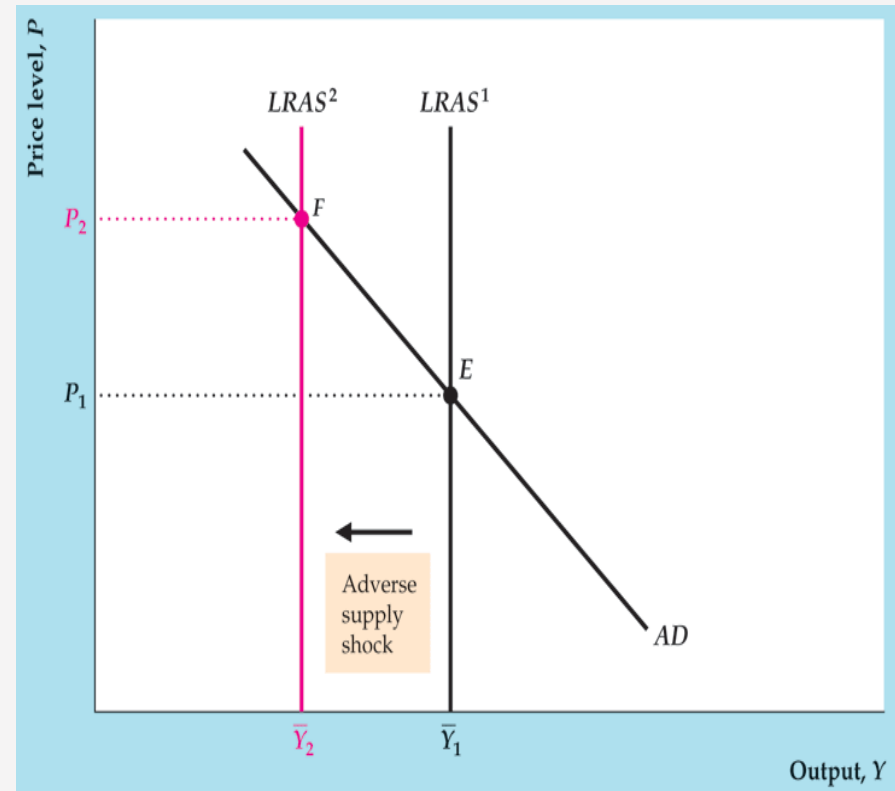
- **Aggregate Supply shocks**

- An aggregate supply shock is a change that shifts the aggregate supply curve
- **Example:** a temporary decrease in oil price
 - The aggregate supply curve shifts to the right.



BUSINESS CYCLE ANALYSIS

- **Aggregate supply shocks**
 - Classicals view aggregate supply shocks as the main cause of fluctuations in output
 - An aggregate supply shock is a shift of the long-run aggregate supply curve
 - Factors that cause aggregate supply shocks are things like changes in productivity or labor supply



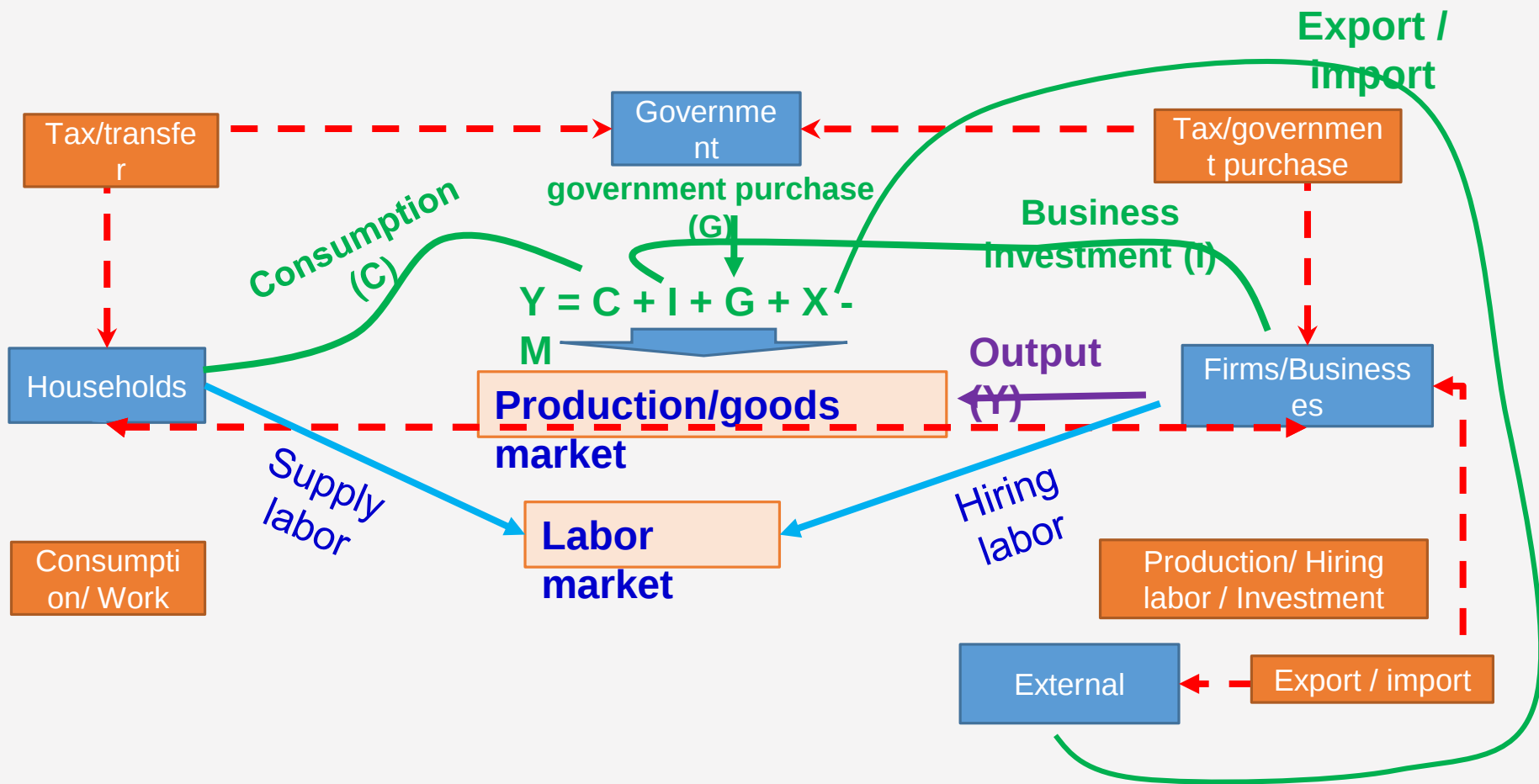


APPENDIX: IMPORTANT MACROECONOMIC DATA AND INDICATORS

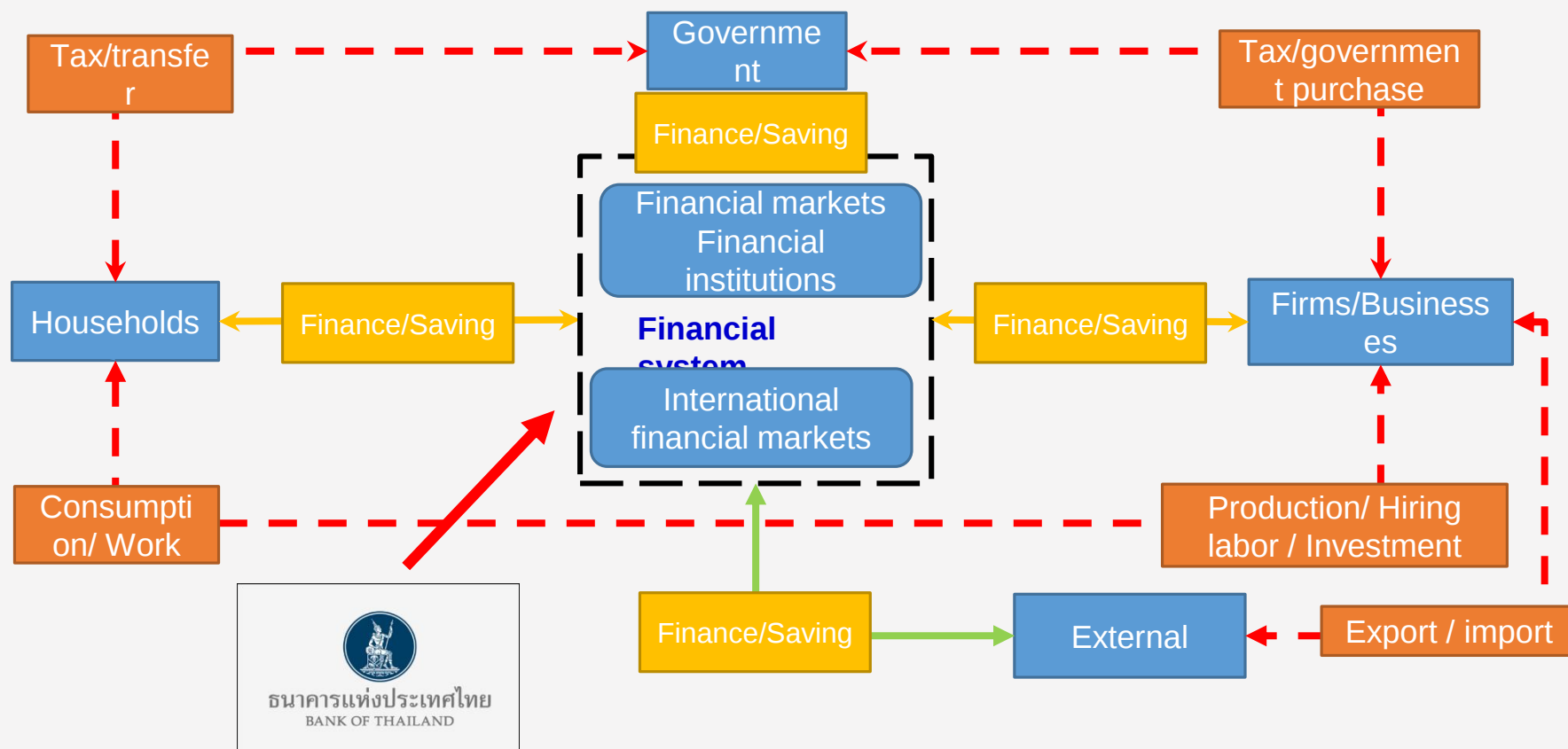
A HELICOPTER TOUR ON THE STRUCTURE OF MACROECONOMY

- Macroeconomics is about studying the **interlinkage** among different **players/ segmented markets/** in the economy.
 - **Players:** Firms, households, business sector, governments, ROTW etc...
 - **Segmented markets:** production/goods, labor, international, financial and capital markets, etc...

DIAGRAMMATIC REPRESENTATION OF THE INTERCONNECTIONS IN MACROECONOMY: MARKETS AND PLAYERS



DIAGRAMMATIC REPRESENTATION OF THE INTERCONNECTIONS IN MACROECONOMY



Helicopter tour and indicators		Measuring business cycles		Business cycles model	
Production	Prices	Labor	Financial	External	

DIAGRAMMATIC REPRESENTATION OF INTERCONNECTION IN MACROECONOMY

- The outcome that emerged from their interaction can be represented in terms of **macroeconomic data**.
- Contains millions of datasets; **let's group them by markets**
 - Production and real economic activities
 - Prices
 - Labor indicators
 - Financial and monetary variables
 - External

Helicopter tour and indicators		Measuring business cycles		Business cycles model	
Production	Prices	Labor	Financial	External	

REAL ECONOMIC ACTIVATES

- “Real” Production “activities” ☐ commonly referred to **“NIPA accounts”**
 - Highly aggregate one is the concept of current market value GDP
 - Three different **bottom-up approaches**: Income, **Production (value-added)**, **Expenditure**.
- 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 the data available in **quarterly** basis. (why?)
 - Reporting statistic has some lagged periods of the announcement for 1.5 months.

Production

Prices

Labor

Financial

External

DEEPER LOOK INTO THAI DATA: PRODUCTION-BASED NOMINAL GDP

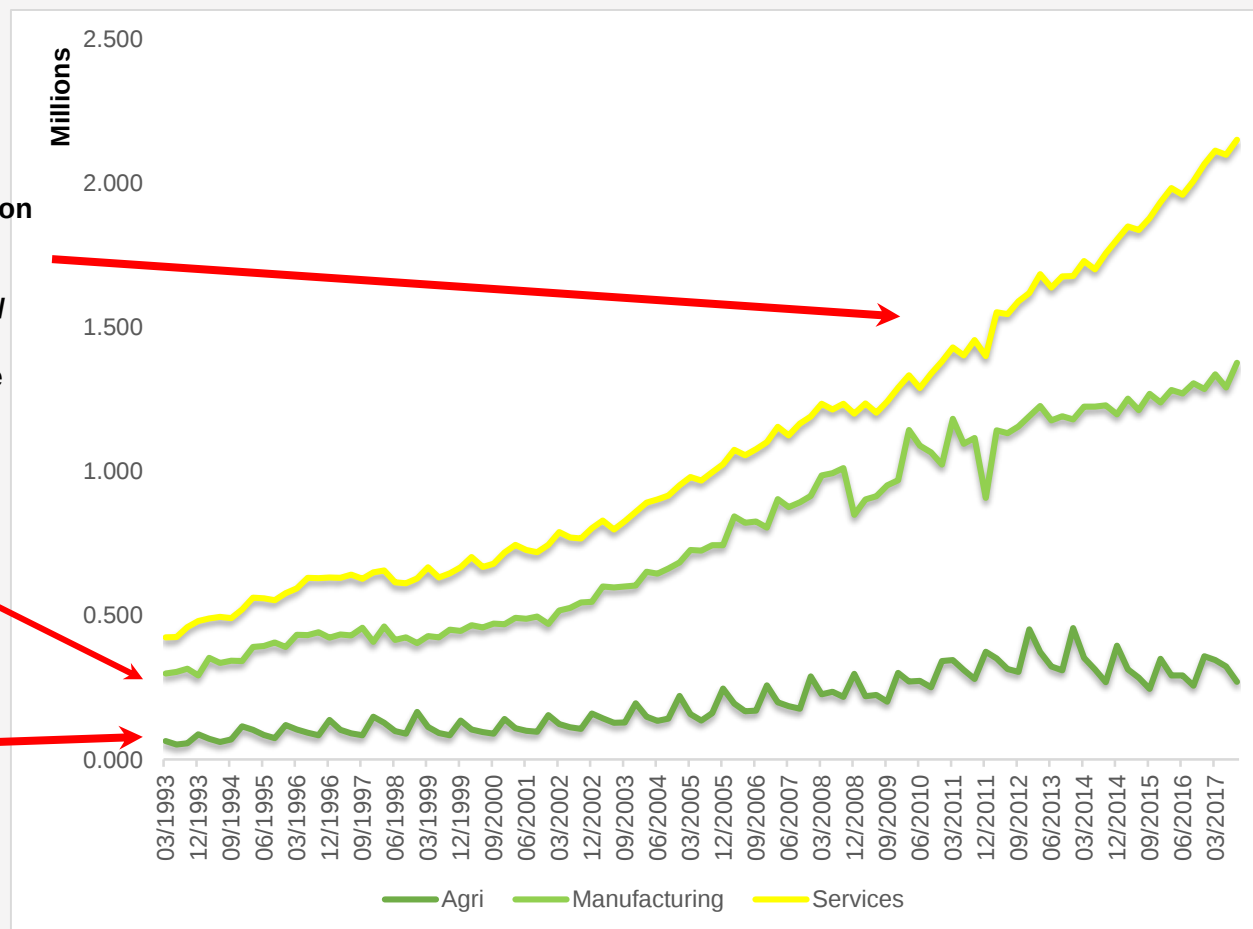
Service

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

Agricultural



Production

Prices

Labor

Financial

External

Sectoral share to market-value GDP (Nominal GDP)

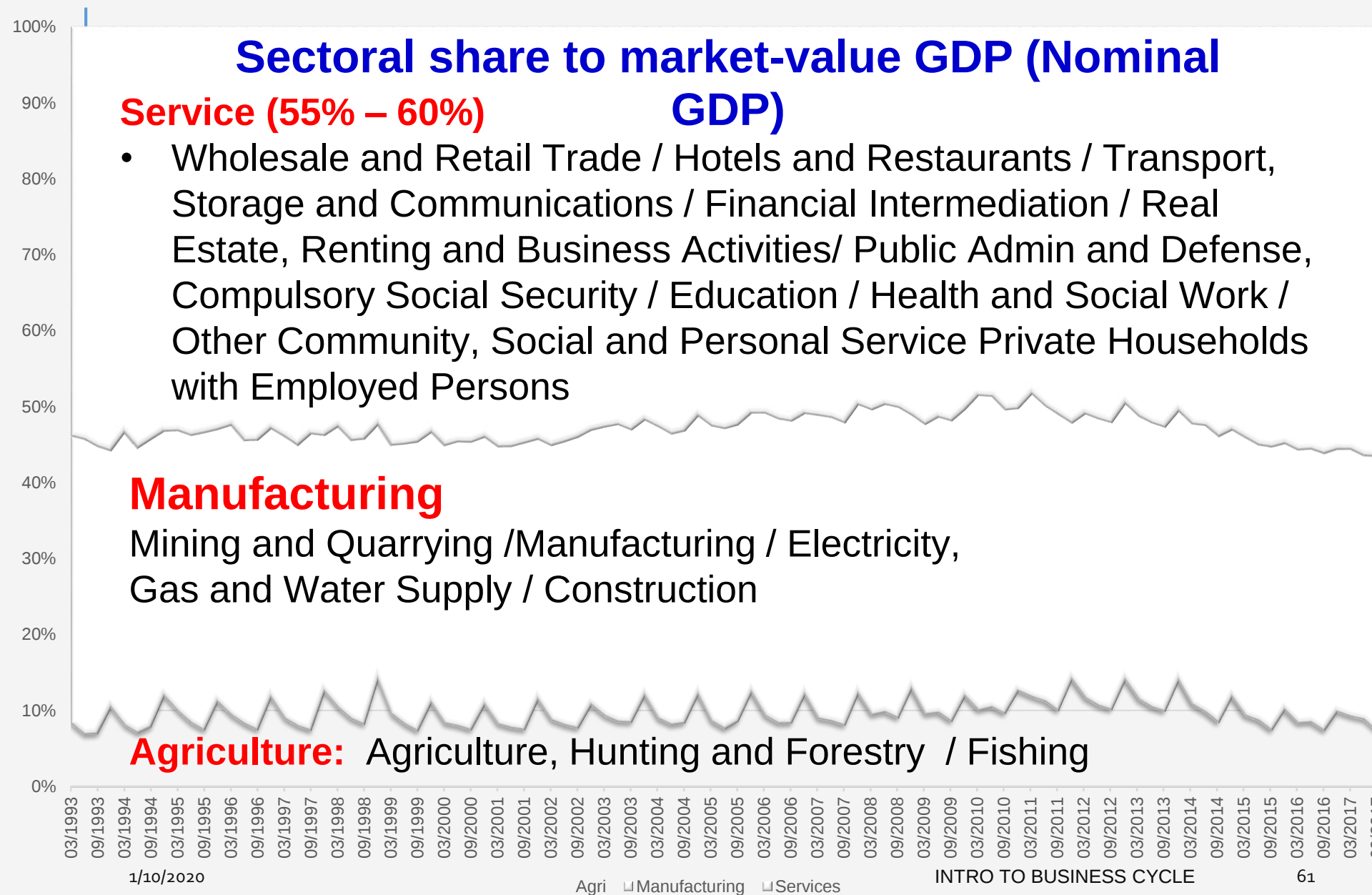
Service (55% – 60%)

- 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



1/10/2020

Agri Manufacturing Services

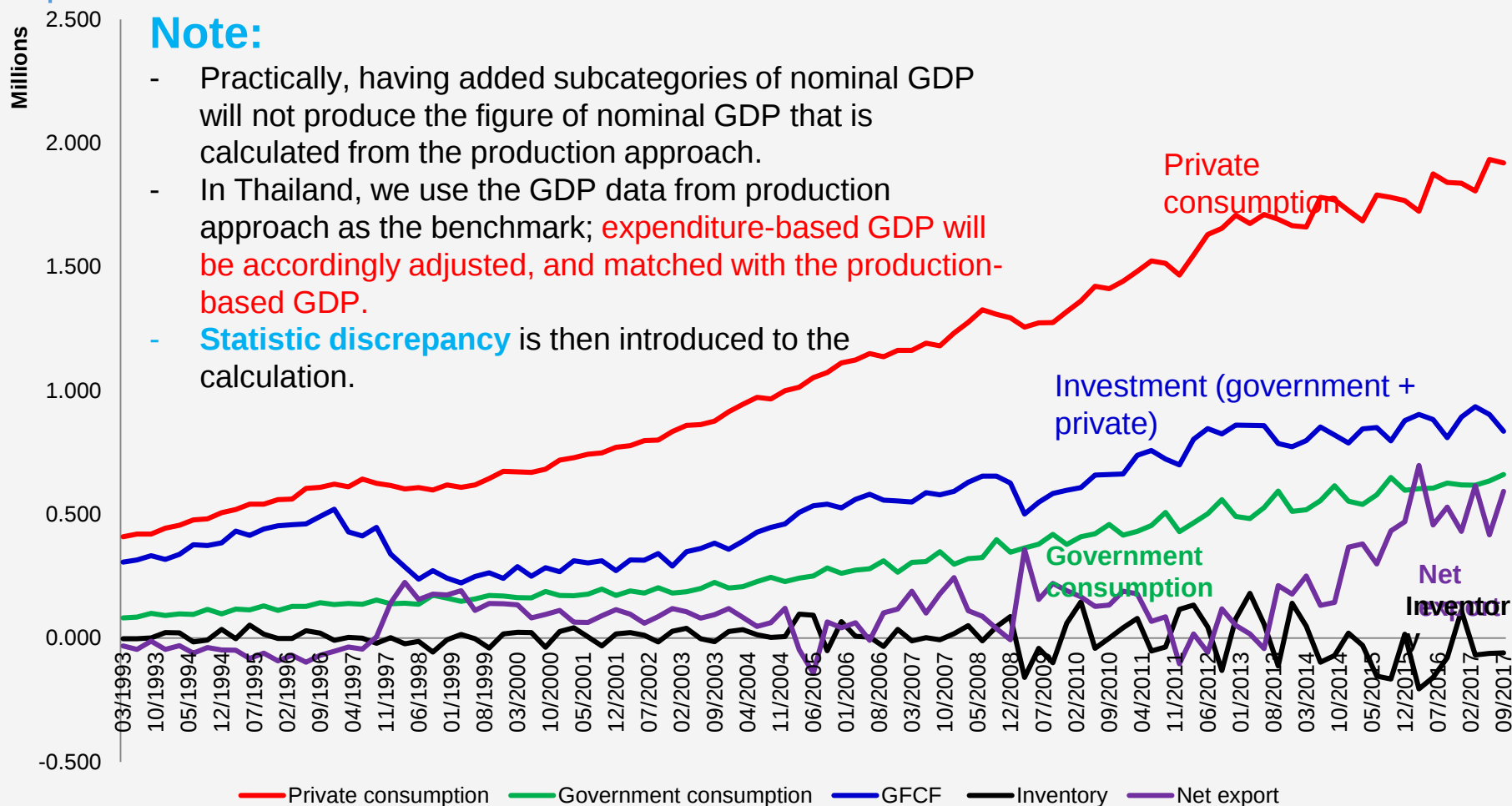
INTRO TO BUSINESS CYCLE

61

EXPENDITURE-BASED GDP: ITS NOMINAL COMPONENT

Note:

- Practically, having added subcategories of nominal GDP will not produce the figure of nominal 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, and matched with the production-based GDP.
- **Statistic discrepancy** is then introduced to the calculation.



PROBLEM WITH THE MARKET VALUE MEASUREMENT

- Misleading about the **true state of production**
 - Market value = $P * Q$; Growing because of higher price
- Idea: **eliminate the price effect (extract the volume effect or real quantity)**
- Proposal: One simple method is to calculate the value output **using prices in a fixed base year**.

REAL GDP: FIXED BASE YEAR

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

$$rGDP^{2018} = \sum_i (P_i^{1988} * Q_i^{2018})$$

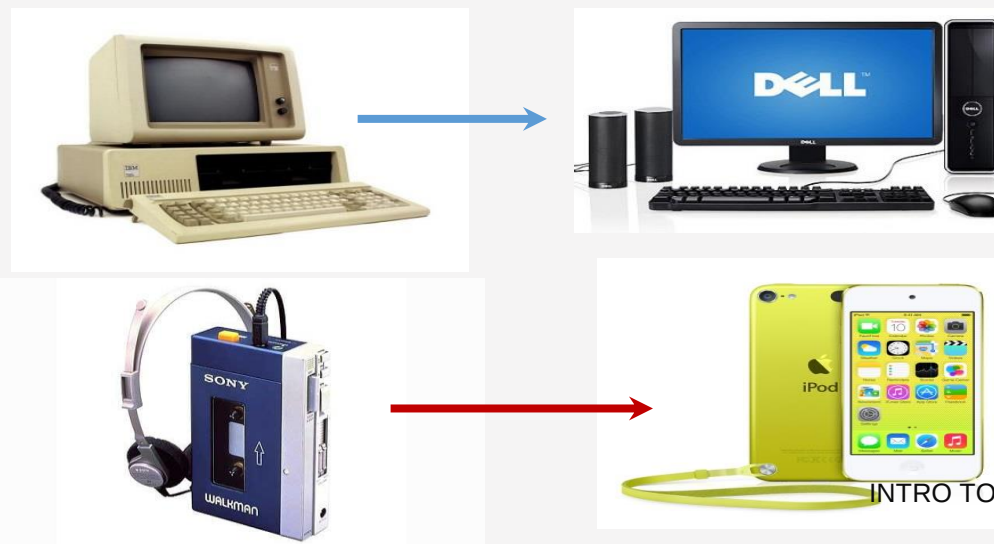
$$rGDP^{2017} = \sum_i (P_i^{1988} * Q_i^{2017})$$

$$g^{2018} = \left[\frac{rGDP^{2018}}{rGDP^{2017}} - 1 \right] * 100\%$$

With this method, the growing economy is due to the quantity effect,
but not due to the price.

PROBLEM WITH THE FIXED BASE YEAR

- 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 2018)
 - Improved quality of existing products.
 - New goods come to markets; old goods die out.



Helicopter tour and indicators		Measuring business cycles		Business cycles model	
Production	Prices	Labor	Financial	External	

PROBLEM WITH THE FIXED BASE YEAR ? SOLUTION?

- An easy solution is to periodically change the base year.
 - In Thailand, we have been changing the base year for several times: 1956 1962 1972 1988.
- However, updating fixed-base year revises not only historical series of real GDP, but also the entire historical path of growth rate.
- Modern approach recommends the calculation using the **Chained-volume measure GDP, e.g. CVM-GDP.**

CHAINED-VOLUME MEASURE GDP

- The method is to continuously rebase the year prices used in the calculation.
 - Very technical idea
 - Define CI_t as cumulative growth index t-period from the reference period

$$CI_t = \frac{\sum P_0 Q_1}{\sum P_0 Q_0} * \frac{\sum P_1 Q_2}{\sum P_1 Q_1} * \frac{\sum P_2 Q_3}{\sum P_2 Q_2} * \dots * \frac{\sum P_{t-1} Q_t}{\sum P_{t-1} Q_{t-1}} \times 100$$

$$cvmRGDP_t = \sum P_0 Q_0 * (CI_t)$$

Production

Prices

Labor

Financial

External

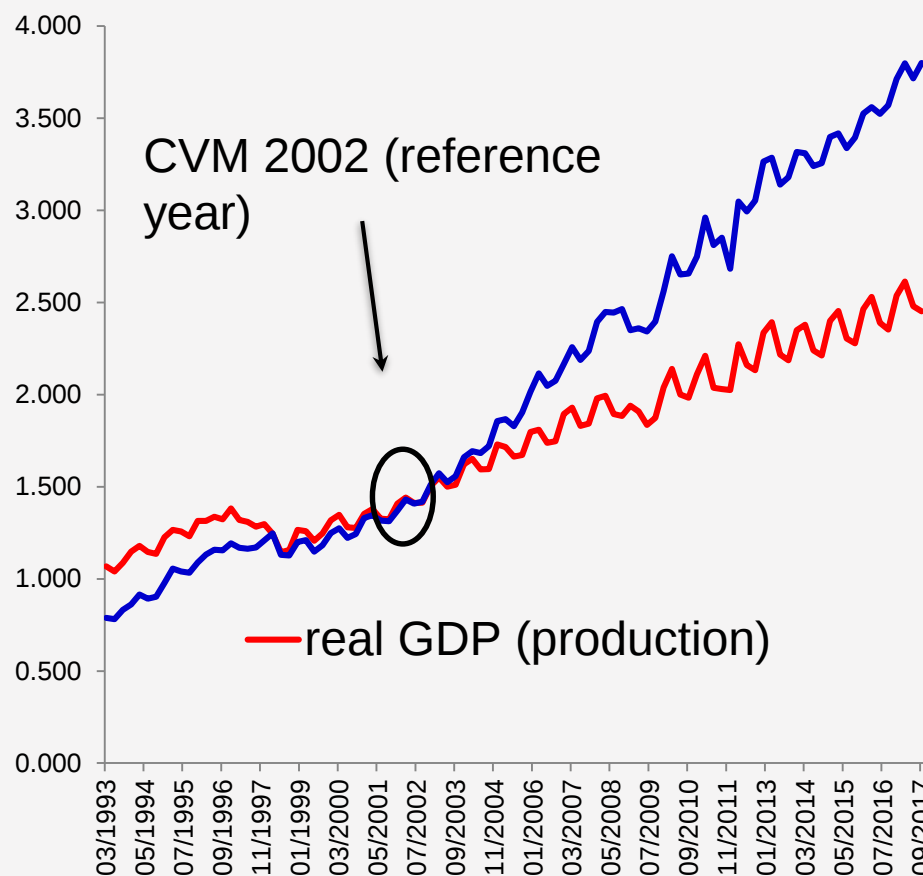
CVM GDP: EXAMPLE

Period 0..... Period 1..... Period 2.....

Commodity	Price (P_0)	Quantity (Q_0)	Current price estimate of value (P_0Q_0)	Price (P_1)	Quantity (Q_1)	Current price estimate of value (P_1Q_1)	Chain volume estimate	Price (P_2)	Quantity (Q_2)	Current price estimate of value (P_2Q_2)	Chain volume estimate
Apples	\$1	5	\$5	\$2	8	\$16	\$8	\$3	13	\$39	\$13
Oranges	\$3	3	\$9	\$4	5	\$20	\$15	\$5	10	\$50	\$30
Total (current prices)			\$14			\$36				\$89	
Total (chain volume estimate) (a)							\$23				\$42.17
Chain volume index number			100.0				164.3				301.2

(a) Chain volume index referenced to Period 0 current price estimate.

REAL V.S. NOMINAL GDP MEASUREMENT



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

$$RGDP \neq RGDP_SERVICE + RGDP_MANU + RGDP_AGRI$$

$$RGDP \neq RPC + RPI + RG + RX - RM$$

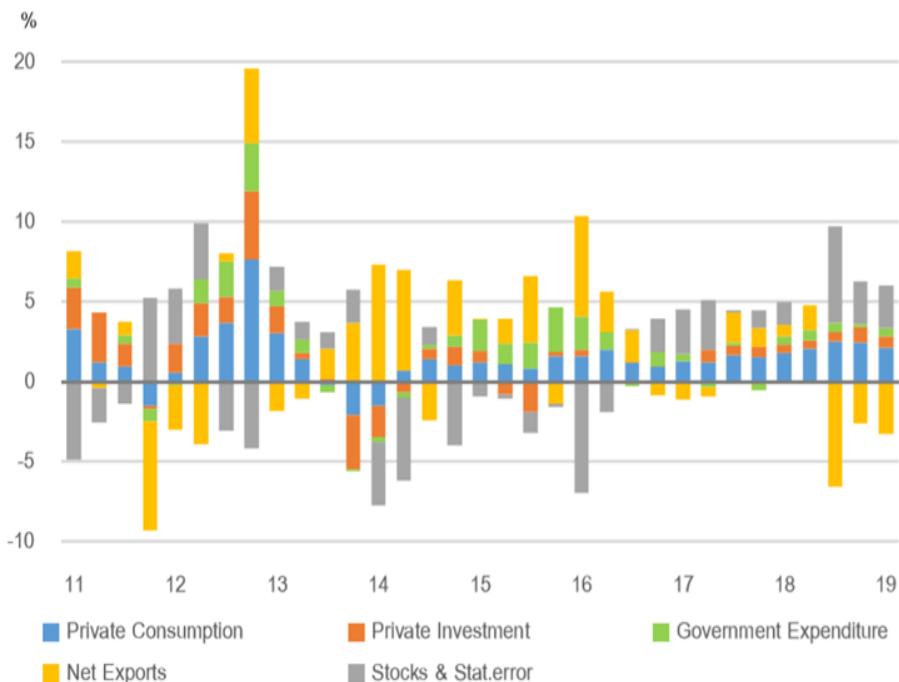
- In terms of accounting, this is technically adjusted by “**residual terms**”.

CVM GDP IN THAILAND

$$Y = x_1 + x_2 + x_3 + \dots + x_N \rightarrow \% \Delta Y = \frac{x_1}{Y} \% \Delta x_1 + \frac{x_2}{Y} \% \Delta x_2 + \frac{x_3}{Y} \% \Delta x_3 + \dots + \frac{x_N}{Y} \% \Delta x_N$$

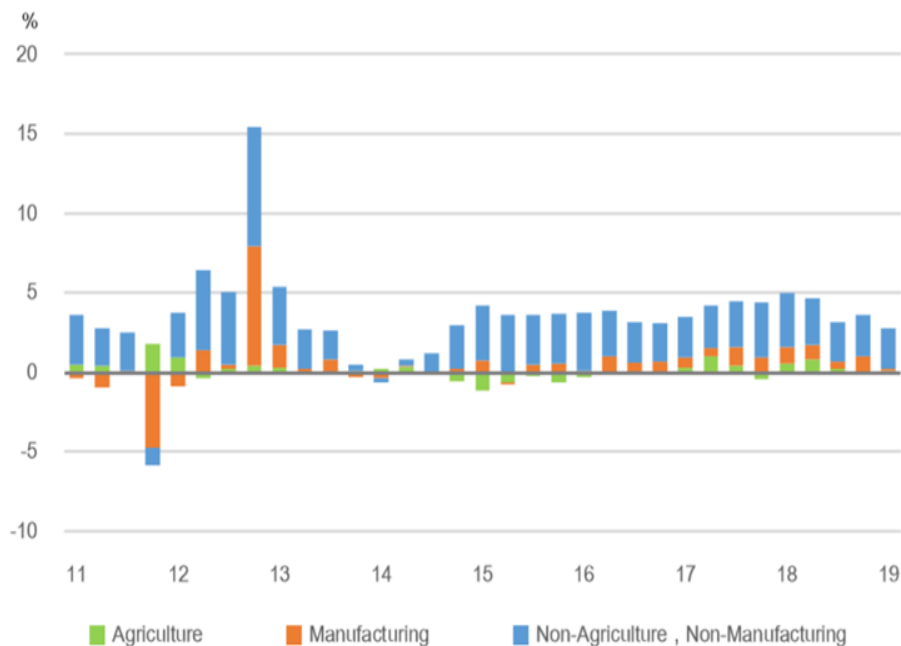
$\frac{x_1}{Y} \% \Delta x_1$ = contribution of x_1 to growth in Y (fraction of growth in Y explained by factor x_1)

Contribution to GDP Expenditure [Q]



Source: Office of the National Economic and Social Development Board,
1/10/2020
calculated by Bank of Thailand

Contribution to GDP Production [Q]



Source: Office of the National Economic and Social Development Board,
calculated by Bank of Thailand

Helicopter tour and indicators		Measuring business cycles		Business cycles model	
Production	Prices	Labor	Financial	External	

PRICES

- At the aggregate level, we refer to the measurement of **overall prices of goods and services**
 - Cheap / expensive ? **overall cost of production / overall cost of living**
- Problem: Million items ? Million prices...how to measure the overall price then
- **Construct *price index*!**

WHAT IS AN INDEX NUMBER?

- In general, an **index number** is an economic figure reflecting "**price or quantity**" compared with **a base value reported in a given year**.
 - e.g. SET index, Industrial production index etc.
- To construction an index, we need "**individual data**" and "**base value**" for comparison.
- In practice, most index numbers would set its value equal to 100 in the base year, and basically take the form,

$$X_t = \sum_{i=1}^N w_{i,t} * x_{i,t} \times 100$$

IMPLICIT GDP PRICE DEFLATOR INDEX

- 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**.

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

IMPLICIT GDP PRICE DEFLATOR INDEX

- The ratio of the nominal GDP to the real GDP of a given year.
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$$\text{Implicit GDP price deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} * 100$$

IMPLICIT GDP PRICE DEFLATOR INDEX

- Note that

$$P_t = \frac{\text{Nominal}}{\text{Real}} \times 100 = \frac{\sum_{i=1}^N P_{i,t} Q_{i,t}}{\sum_{i=1}^N P_{i,0} Q_{i,t}} \times 100 = \sum_{i=1}^N \frac{P_{i,t} \left(\frac{P_{i,0}}{P_{i,0}} \right) Q_{i,t}}{\sum_{i=1}^N P_{i,0} Q_{i,t}} \times 100$$

$$= \sum_{i=1}^N \frac{P_{i,0} Q_{i,t}}{\sum_{i=1}^N P_{i,0} Q_{i,t}} \left(\frac{P_{i,t}}{P_{i,0}} \right) \times 100$$

$$X_t = \sum_{i=1}^N (\mathbf{w}_{i,t} * \mathbf{x}_{i,t}) \times 100$$

SOME OTHER IMPORTANT PRICE INDICES

- **Producer Price Index** : overall prices measured at the firm level
- **Consumer Price Index**: overall prices measured at the final purchase by households

Source: Bureau of Trade and Economic Indices.

- **Private consumption expenditure price index**: overall prices measured by using the private consumption data compiled in the NIPA

Source: NESDB.

Consumer Price Index: 2011=100

Consumer Price Index: 2011=100: Bangkok

Consumer Price Index: 2011=100: By Region

Consumer Price Index: 2011=100: Low Income

Consumer Price Index: 2011=100: Rural

Consumer Price Index: 2011=100: Weights

Producer Price Index: 1995=100: Classification of Production by Activities (CPA)

Producer Price Index: 1995=100: Stage of Processing (SOP)

Producer Price Index: 2000=100: Classification of Production by Activities (CPA)

Producer Price Index: 2000=100: Stage of Processing (SOP)

Producer Price Index: 2005=100: Classification of Production by Activities (CPA)

Producer Price Index: 2005=100: Stage of Processing (SOP)

Producer Price Index: 2010=100: Classification of Production by Activities (CPA)

Producer Price Index: 2010=100: Stage of Processing (SOP)

Rice Export Price

Sugar Export Price

Wholesale Price

CONSUMER PRICE INDEX

- **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?
- **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; $CPI_{2007} = 100$

$$CPI_{2018} = \frac{\sum Q_{2007}^i P_{2012}^i}{\sum Q_{2007}^i P_{2007}^i} \times 100$$

$$CPI_{2018} = \sum \frac{Q_{2007}^i P_{2007}^i}{\sum Q_{2007}^i P_{2007}^i} \left(\frac{P_{2012}^i}{P_{2007}^i} \right) \times 100$$

- CPI inflation is % change in the CPI for any two consecutive periods.

$$CPI \text{ inflation}_{2018} = \frac{CPI_{2018}}{CPI_{2017}} \times 100$$

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 (original) bundle *or*
 - 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***. (See Boskin 1996)
- Miscalculation matters a lot for public policy.
 - Social security payments are typically tied to inflation.
 - Upward biased calculation of COL generated in CPI inflation hence results in over-budgeting.

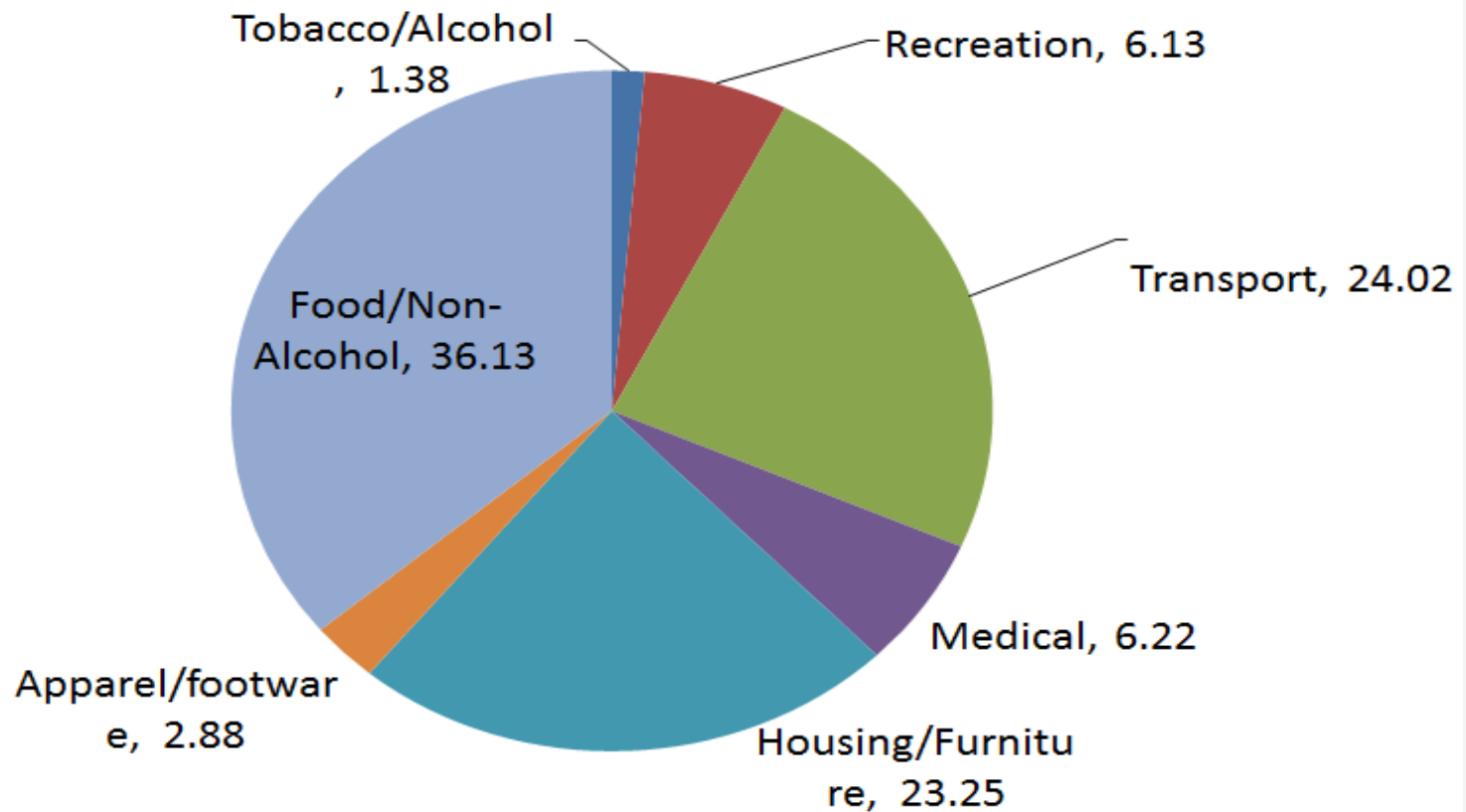
THAILAND'S INFLATION FIGURES

- The series are calculated monthly by the **Bureau of Trade and Economic Indices**, Internal Trade Department Ministry of Commerce (สำนักดัชนีเศรษฐกิจการค้า กรมการค้าภายใน)
- Data is collected on monthly basis, based on the survey.
 - **Headline (General) CPI**: prices of 7 groups (373 items) of goods and services.
 - **Core CPI**: prices of 266 items, excluding raw food and energy group (107 items; 27.40% based on overall weights for the whole kingdom).

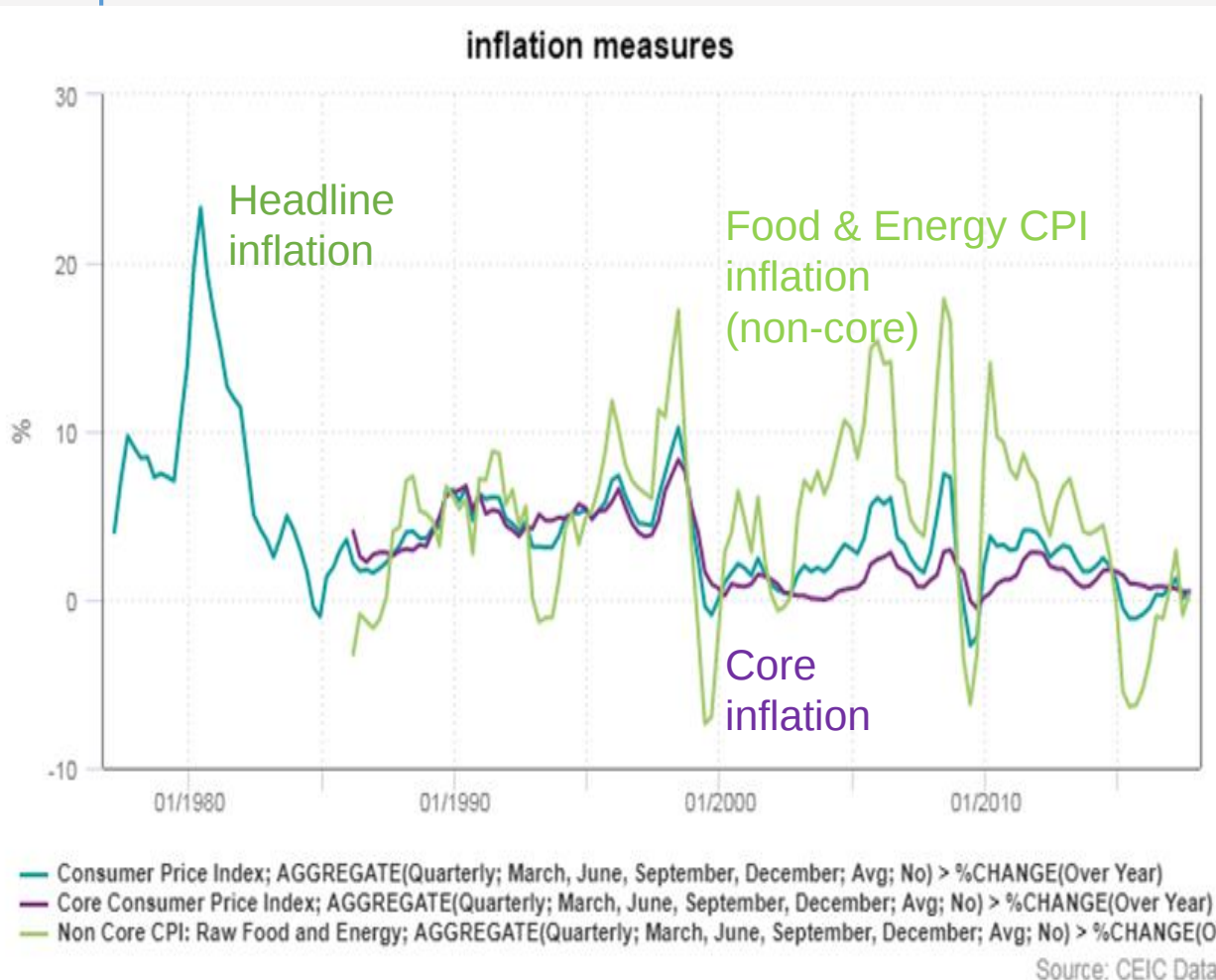
7 Components

1. Food and Beverages
2. Clothing
3. Housing
4. Healthcare
5. Transportation
6. Recreation and Education
7. Tobacco and Alcohol

WEIGHT IN THE CALCULATION OF CPI



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.

Helicopter tour and indicators		Measuring business cycles	Business cycles model	
Production	Prices	Labor	Financial	External

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 (LFS)**.
- **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.

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%

Helicopter tour and indicators		Measuring business cycles	Business cycles model	
Production	Prices	Labor	Financial	External

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.
- **Employment rate** = Employed person / working-age population

LABOR FORCE PARTICIPATION RATE

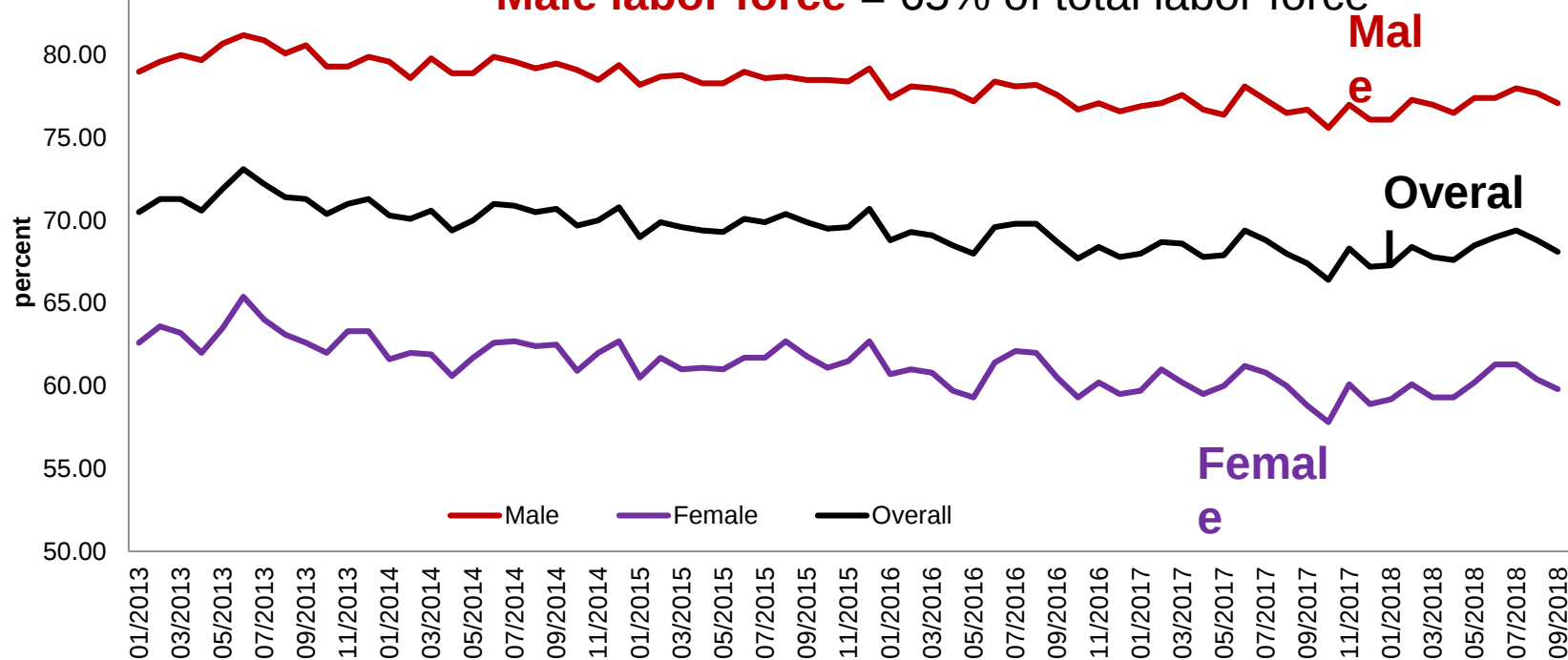
- Labor force participation** = Labor force / Pop > 15
- Male participation rate is higher than that of female.

Labor force participation

Facts

Female pop > 15 = 51.6%

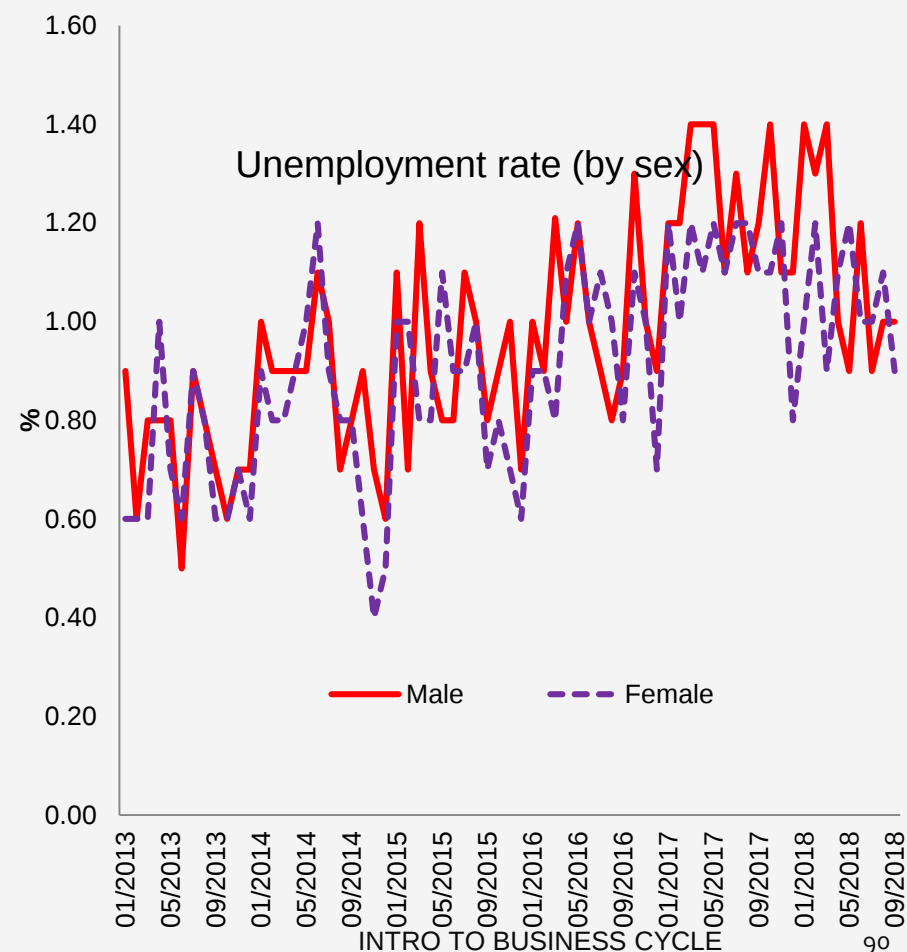
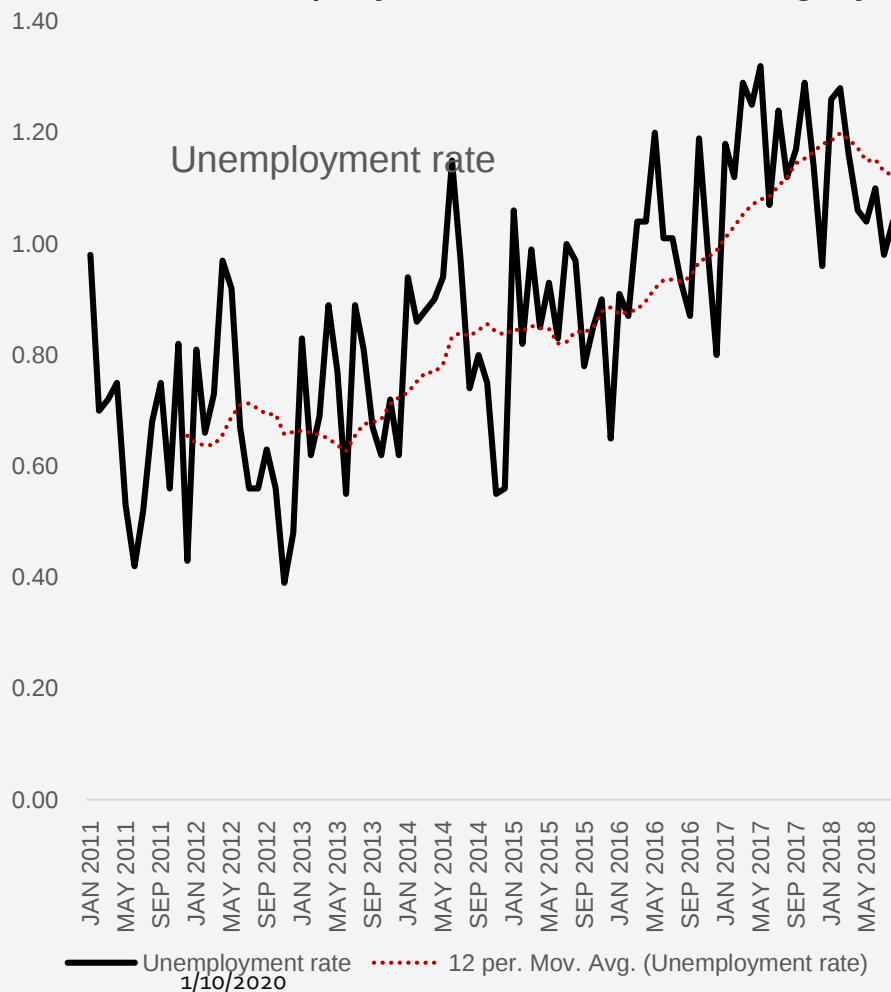
Male labor force = 65% of total labor force



UNEMPLOYMENT RATE (1/2)

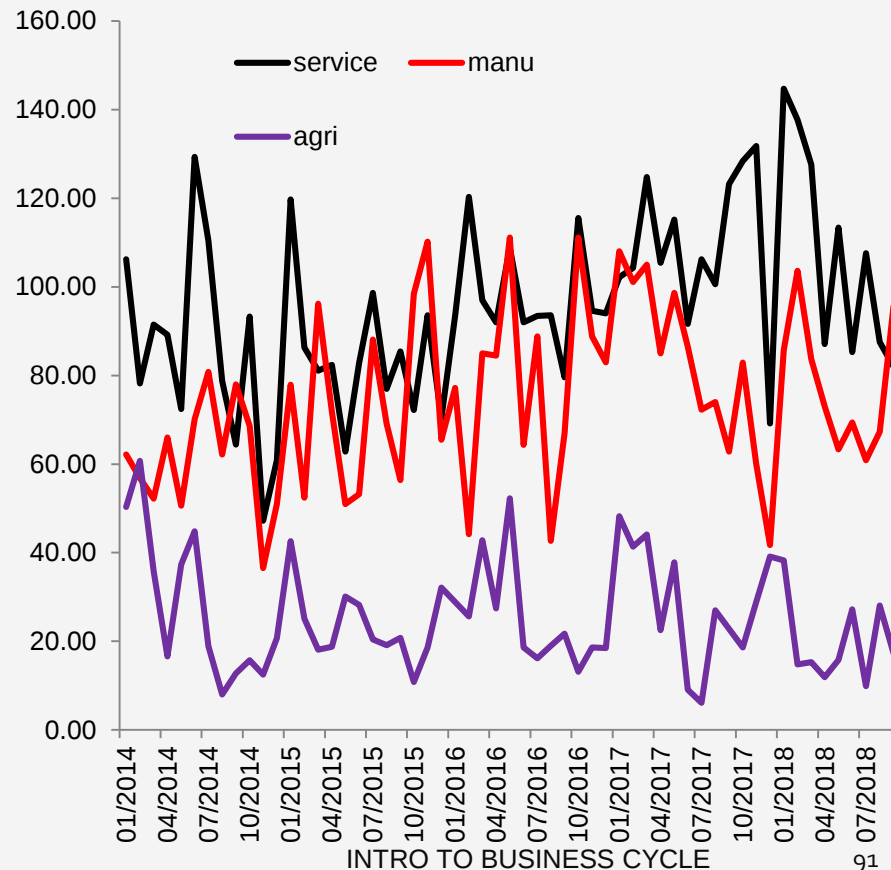
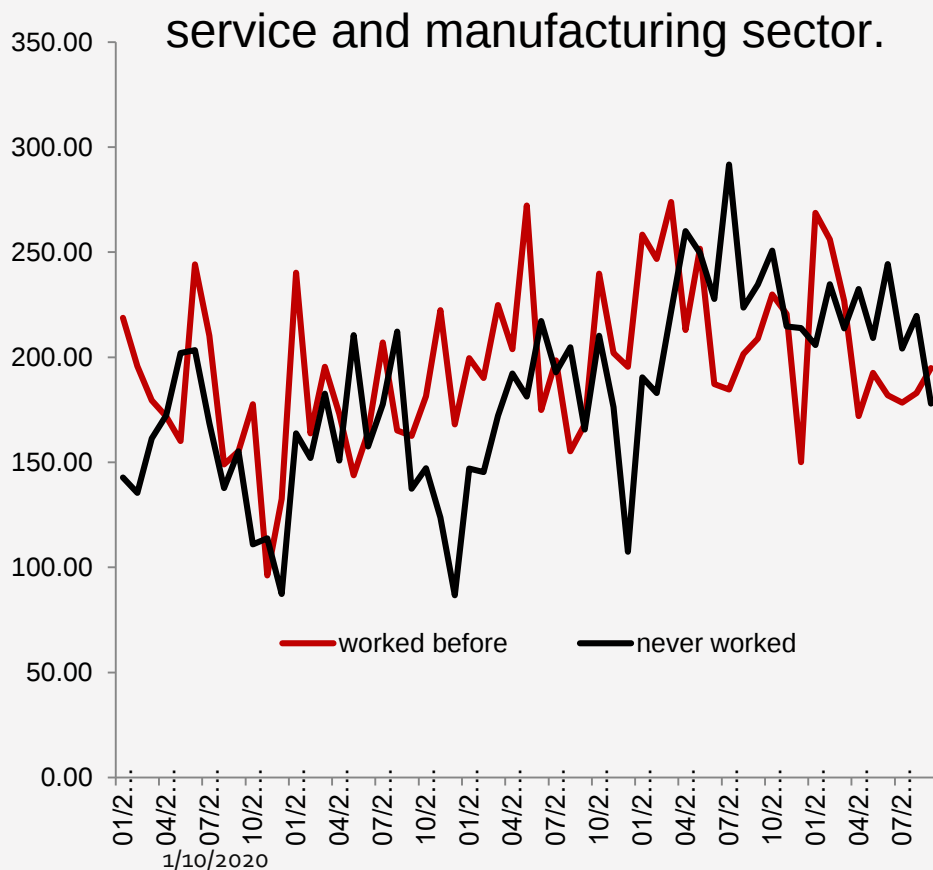
unemployment rate = unemployment / Labor force

Unemployment rates are roughly comparable across sex.



UNEMPLOYMENT RATE (2/2)

1. First-time unemployed persons are roughly comparable to repeating unemployed persons
2. Unemployed persons, classified by last job, are relatively high among service and manufacturing sector.

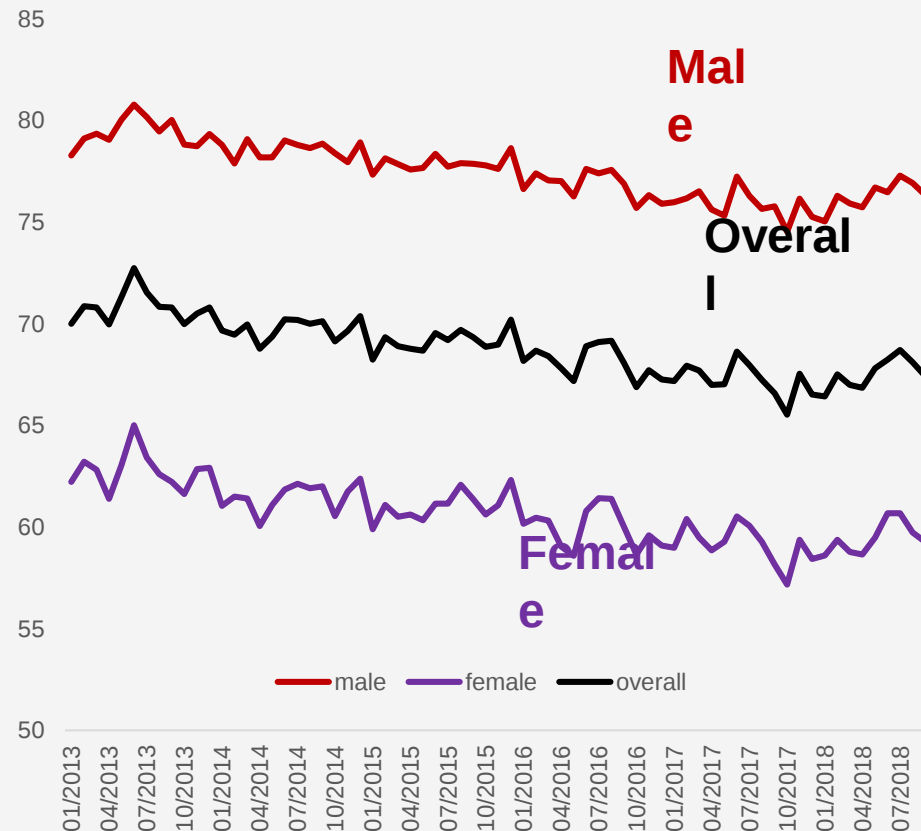
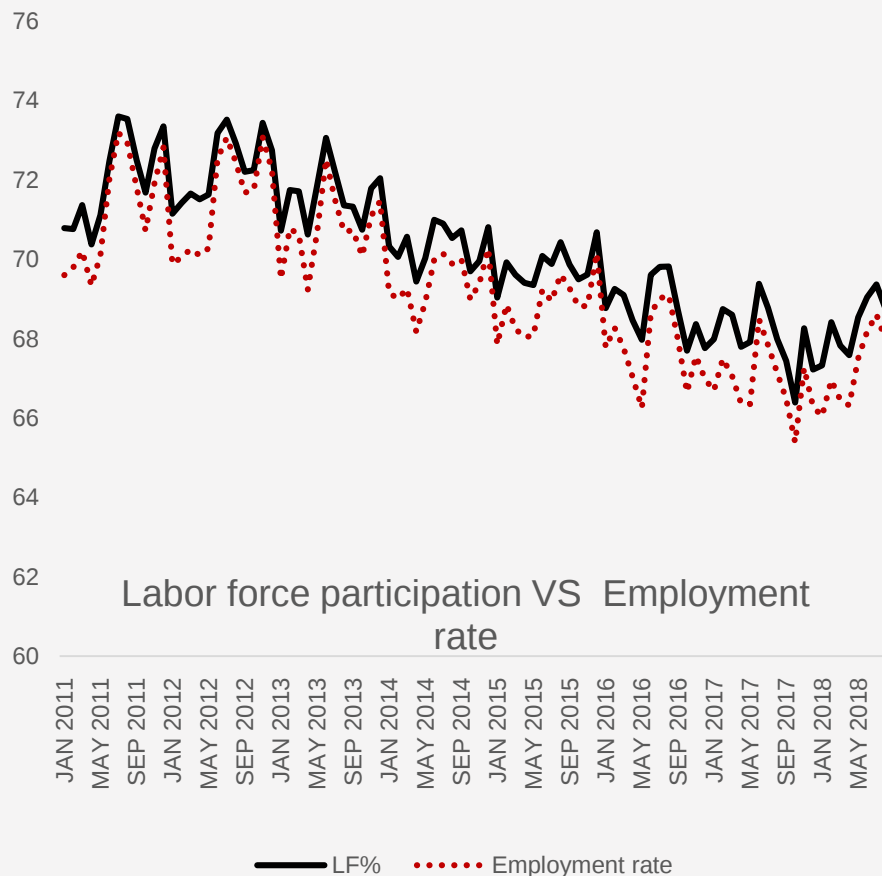


EMPLOYMENT RATE (1/3)

Employment rate = Employment / Pop > 15

= (Employment / Labor force) * LF participation rate

Female employment rate is due to lower female LF participation rate.



EMPLOYMENT RATE (2/3): WHEY DO THEY GO?

- Having classified by sex, male employment accounts for 55% of the total labor employment in Thailand
- **Informal sector** accounts for over 55% of the total labor employment in Thailand, both male and female.

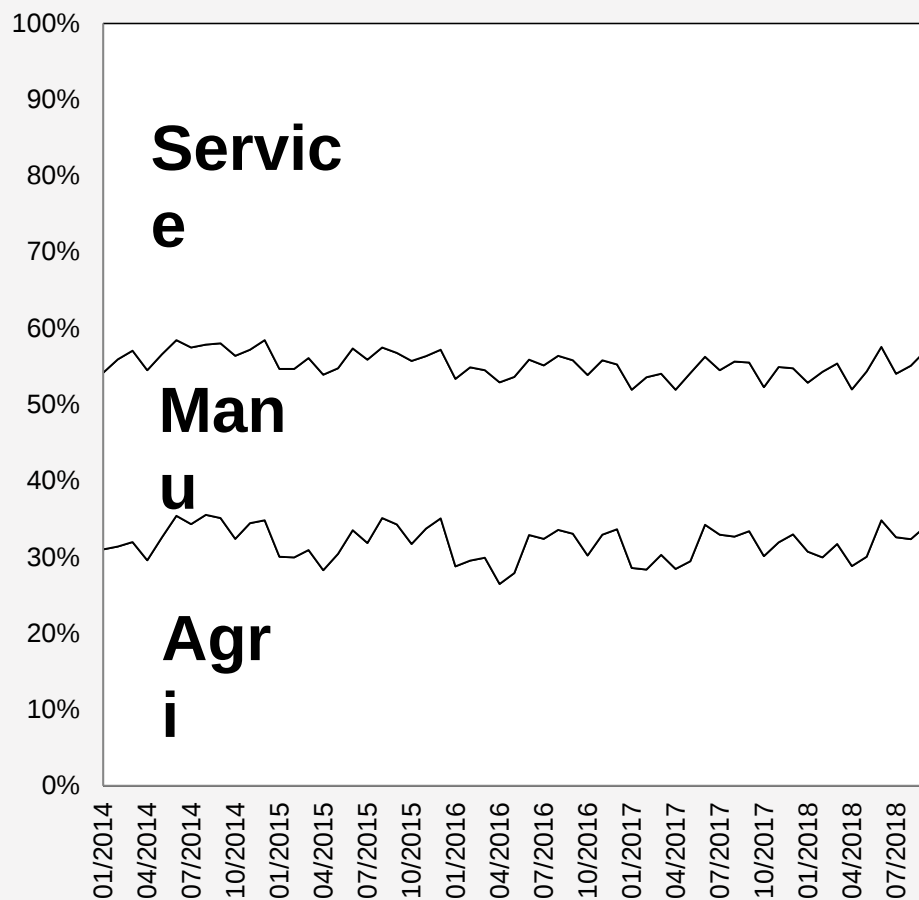
	Male	Female	
Employment share	54.20	45.80	
	Overall	Male	Female
Informal	55.86	56.31	55.33
Formal	44.14	43.69	44.67

Source: NSO, informal sector survey,

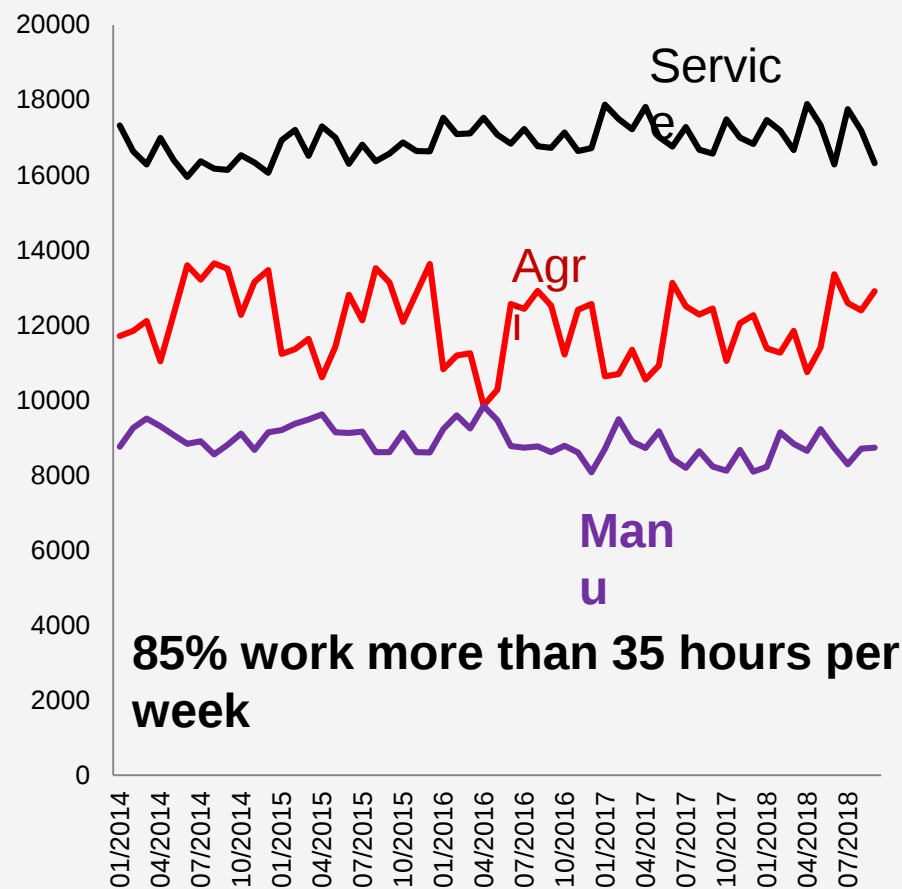
1/10/2020
2017

EMPLOYMENT RATE (3/3): WHEY DO THEY GO?

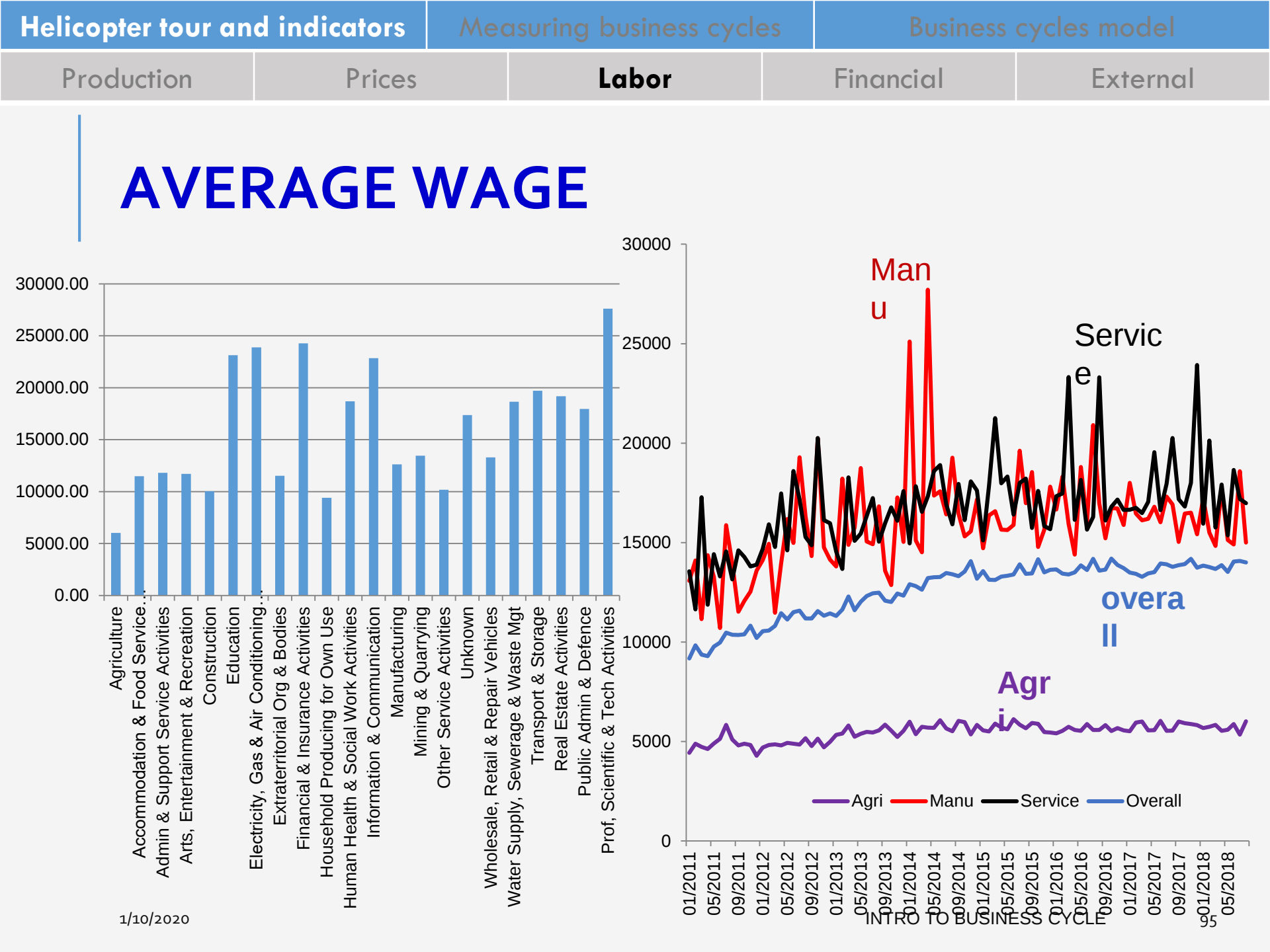
Sectoral employment by ISIC code (Share)



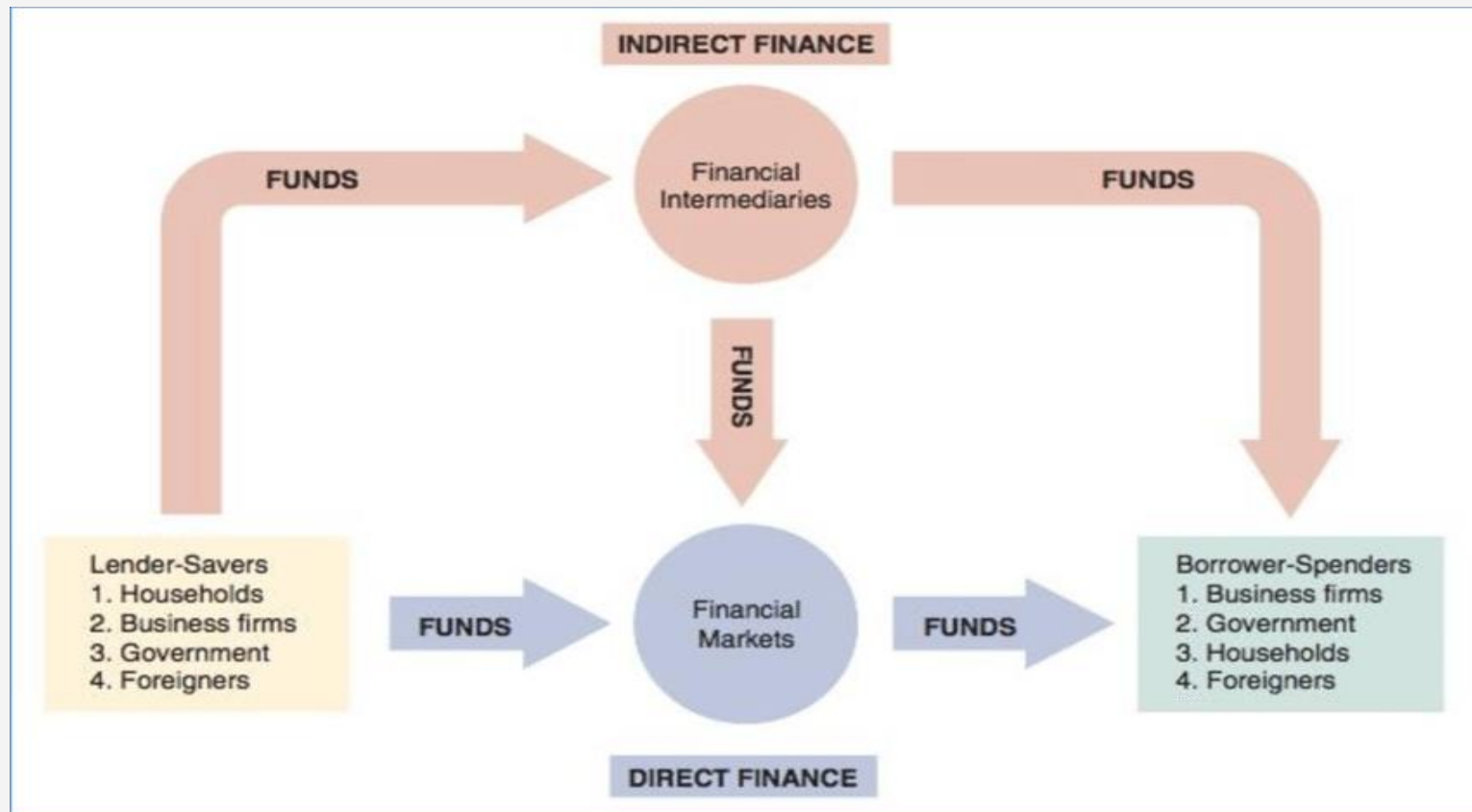
Sectoral employment (level)



85% work more than 35 hours per week



MONETARY AND FINANCIAL VARIABLES: FINANCIAL SYSTEM



MONETARY AND FINANCIAL VARIABLES

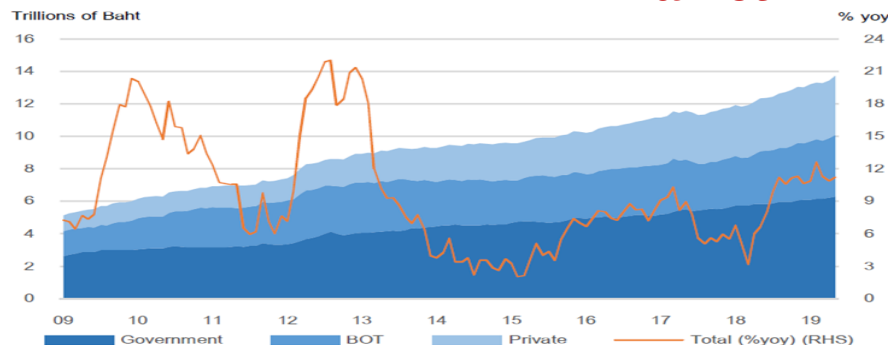
- Key important variables in financial system

Financial system	Quantity	Price
Bond market (short-term / long-term)	• Outstanding value of instruments New issued of instruments • Market Capitalization	Short-term yield Long-term yield
Stock market		SET index
Credit market by Fis	• Saving / Time deposit • Credit intermediated by Fis	Saving rate / Time-deposit rate MLR, MRR

MONETARY AND FINANCIAL VARIABLES

Key indicators in bond market

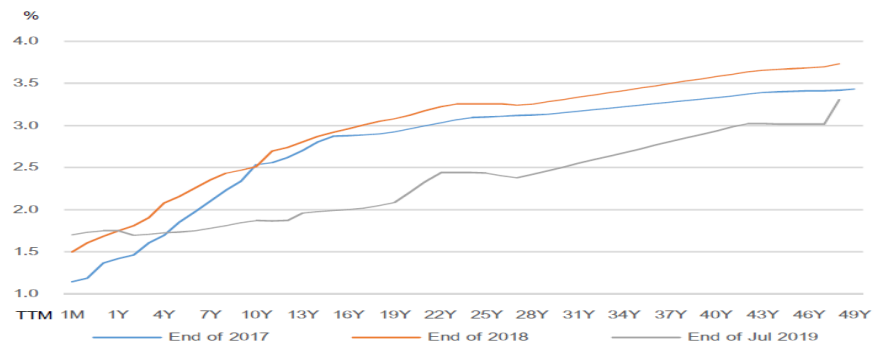
Outstanding of Debt Securities in Thailand by Issuer [M]



Source: Thai Bond Market Association, Securities and Exchange Commission, and Bank of Thailand

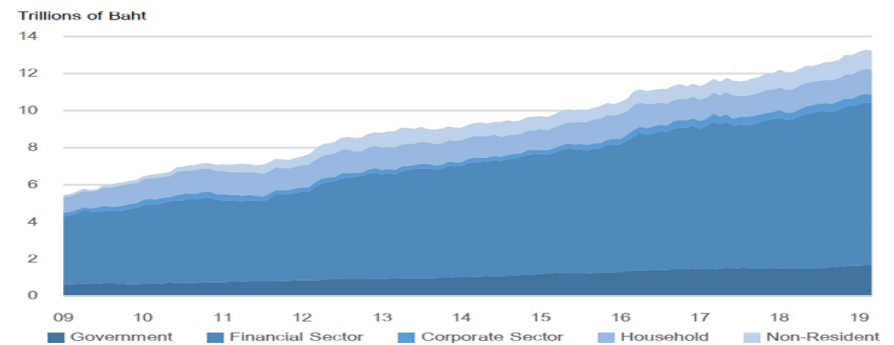
Remark: Private Issuer refers to corporates and non-residents

Government Bond Yield Curve [M]



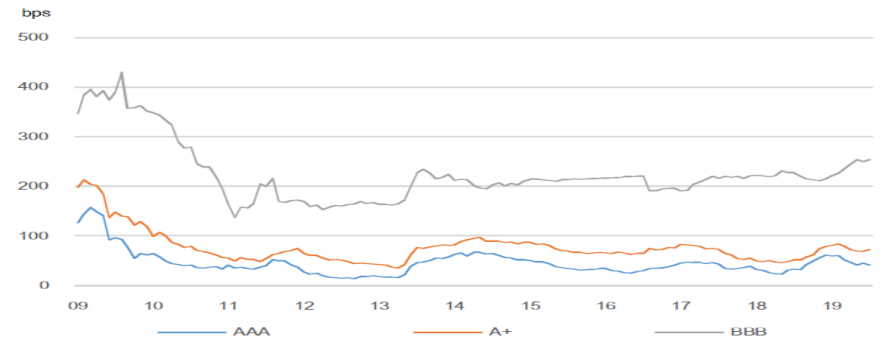
Source: Thai Bond Market Association

Outstanding of Debt Securities in Thailand by Holder [M]



Source: Thai Bond Market Association, Securities and Exchange Commission, and Bank of Thailand

Thai Corporate Bond Spreads [M]



Source: Thai Bond Market Association

Remark: Spread over government bond yields for 3-year remaining maturity corporate bonds

MONETARY AND FINANCIAL VARIABLES

Key financial indicators in the stock

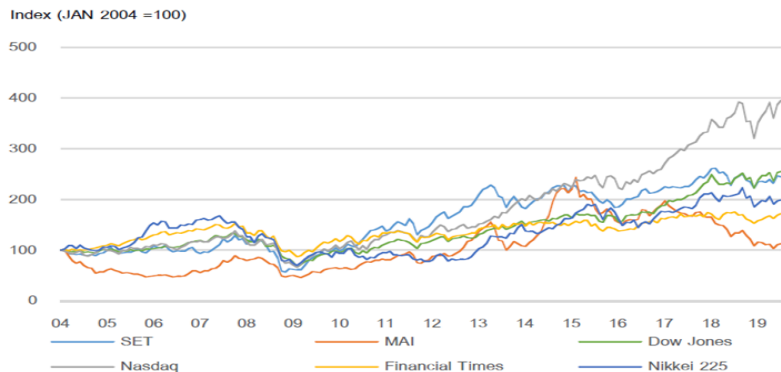
Outstanding of Equity Securities [M]



Source: Stock Exchange of Thailand, compiled by Bank of Thailand

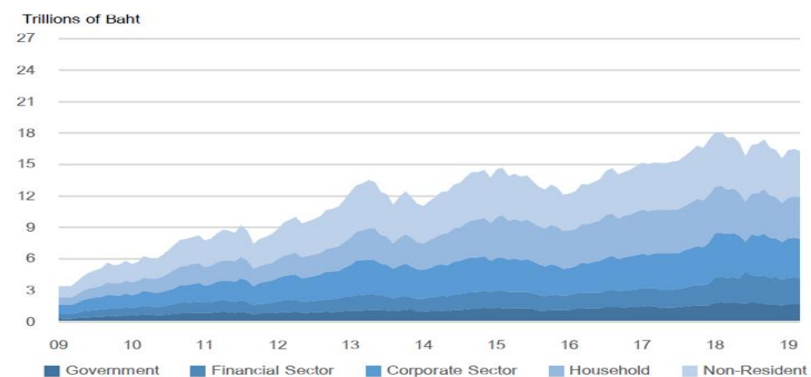
Remark: Equity Securities include common stocks and preferred stocks in SET and MAI.

Stock Market Indexes [M]



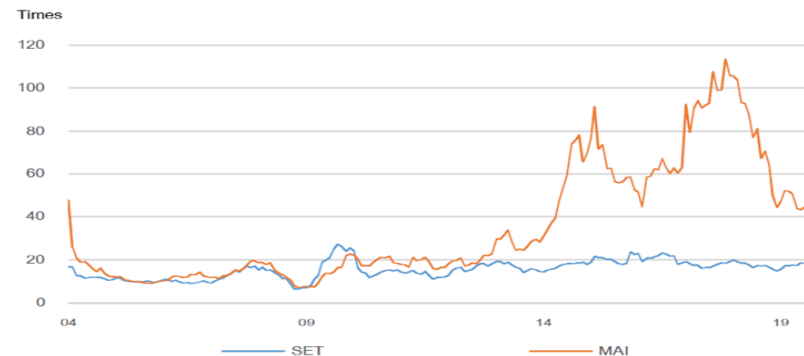
Source: Stock Exchange of Thailand and Reuters, calculated by Bank of Thailand

Outstanding of Equity Securities by Holder [M]



Source: Stock Exchange of Thailand, compiled by Bank of Thailand

P/E Ratio [M]



Source: Stock Exchange of Thailand

MONETARY AND FINANCIAL VARIABLES

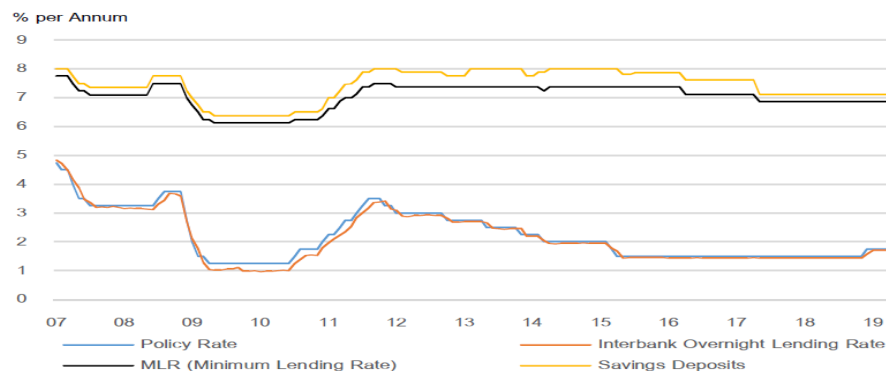
Key financial indicators in the banking sector

Broad Money & Credit Growth



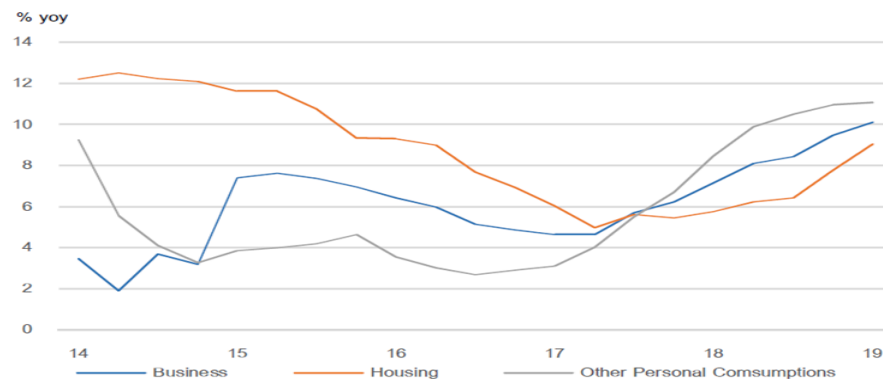
Source: Bank of Thailand (Board Money) (Total Credits)
 Remark: Other depository corporations' credits

Interest Rate



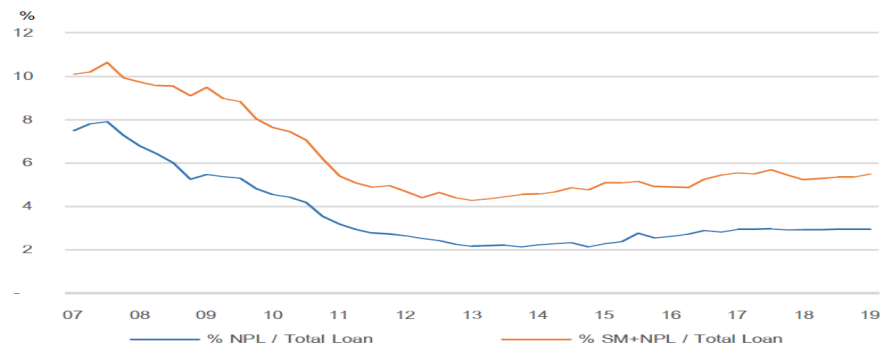
Source: Bank of Thailand
 Remark: MLR and saving deposit interest rates are maximum rate.

Credit Growth by Sector



Source: Bank of Thailand
 Remark: Commercial banks' credits only

Non-Performing Loan



Source: Bank of Thailand
 Remark: SM = Special Mention Loan, NPL = Non-Performing Loan
 SM + NPL are outstandings of commercial banks only

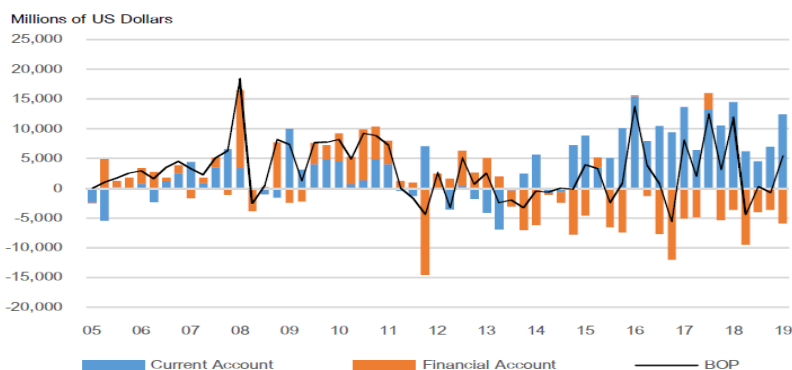
EXTERNAL VARIABLES

- Exchange rates
- Balance of payments, Capital flows, current accounts
- FDI
- Economic activities of trading partners

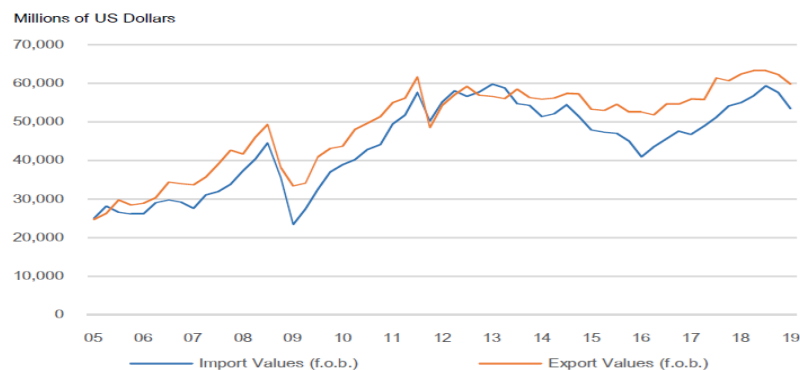
EXTERNAL VARIABLES

Key indicators for measuring external conditions

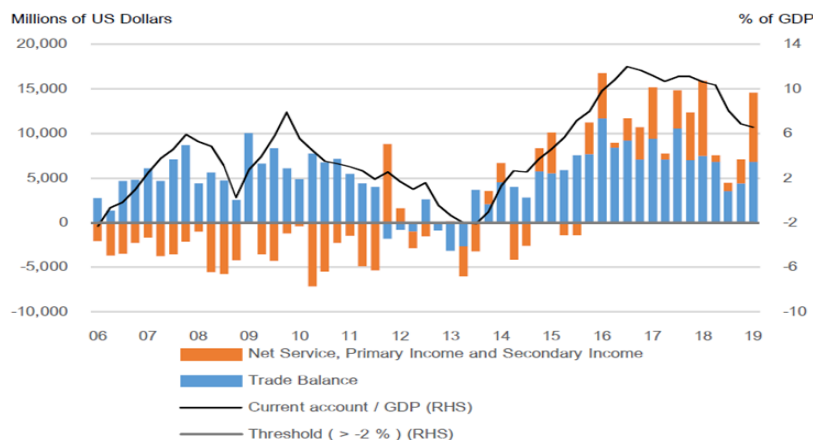
Balance of Payments [Q]



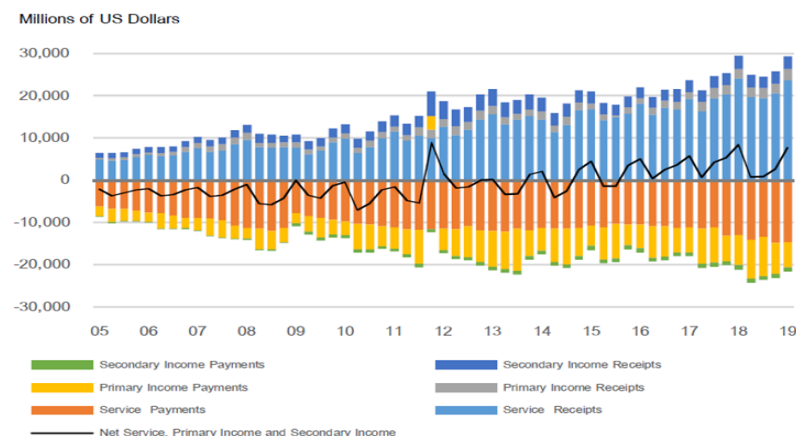
International Trade [Q]



Current Account Components and Current Account to GDP [Q]



Service, Primary Income and Secondary Income [Q]



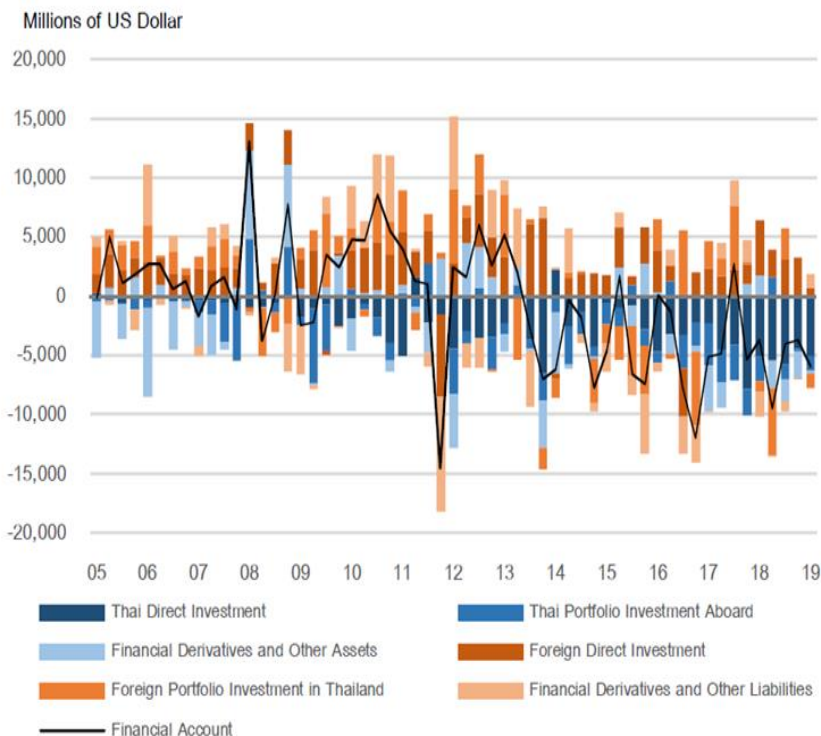
Source: Bank of Thailand

Source: Bank of Thailand

EXTERNAL VARIABLES

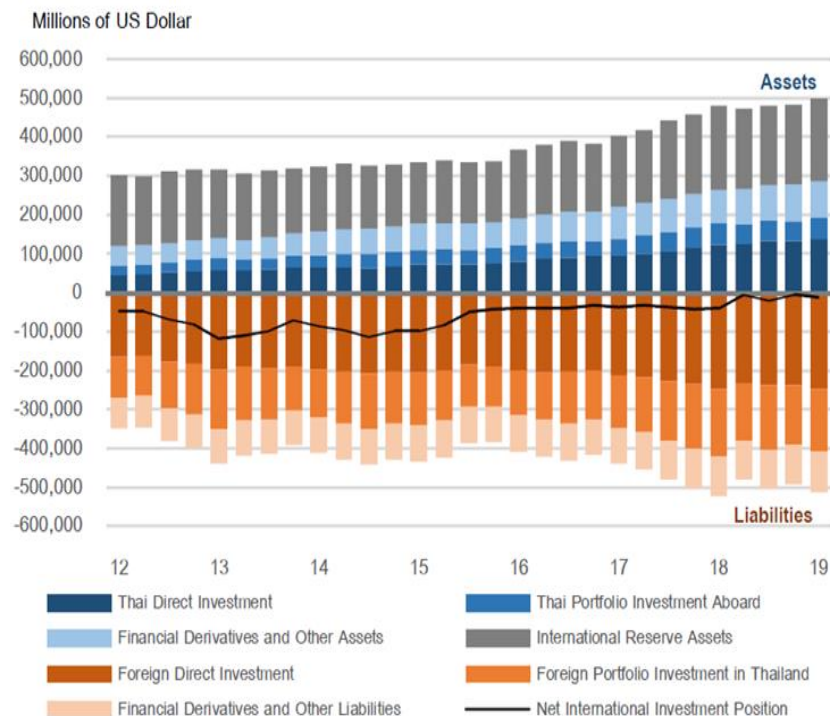
Key indicators for measuring external conditions

Financial Account [Q]



Source: Bank of Thailand

International Investment Position [Q]



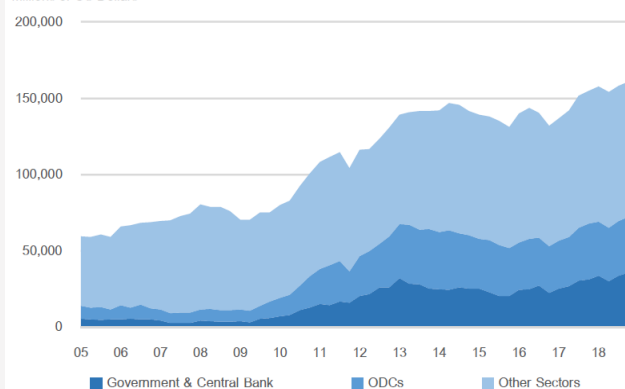
Source: Bank of Thailand

EXTERNAL VARIABLES

Key indicators for measuring external

External Debt by Sector

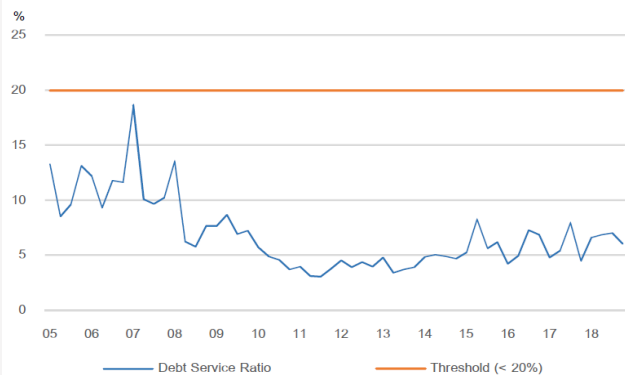
Millions of US Dollars



Source: Bank of Thailand

Remark: Other Depository Corporations (ODCs) comprise domestically registered commercial banks, branches of foreign banks, international banking facilities, finance companies and specialized banks.

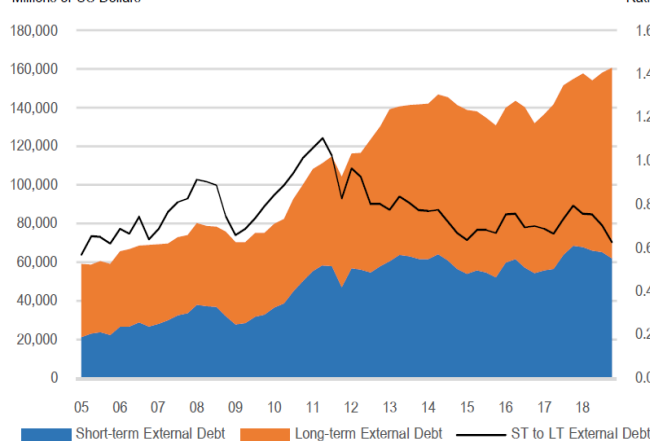
Debt Service Ratio on External Debt



Source: Bank of Thailand

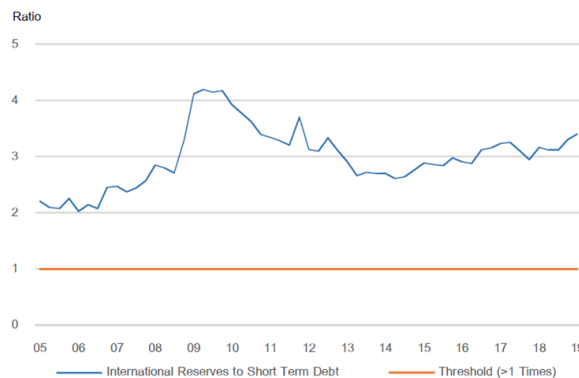
[Q] Short and Long Term External Debt

Millions of US Dollars



Source: Bank of Thailand

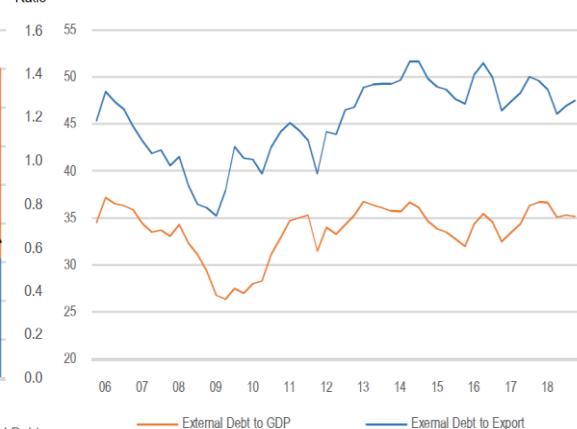
[Q] International Reserves to Short Term Debt



Source: Bank of Thailand

[Q] External Debt to GDP & External Debt to Export

Ratio %



Source: Bank of Thailand

[Q] International Reserves to Import



Source: Bank of Thailand

INTRO TO BUSINESS CYCLE