EE312 Chapter 3
The Core AD-AS Framework

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1 Introduction

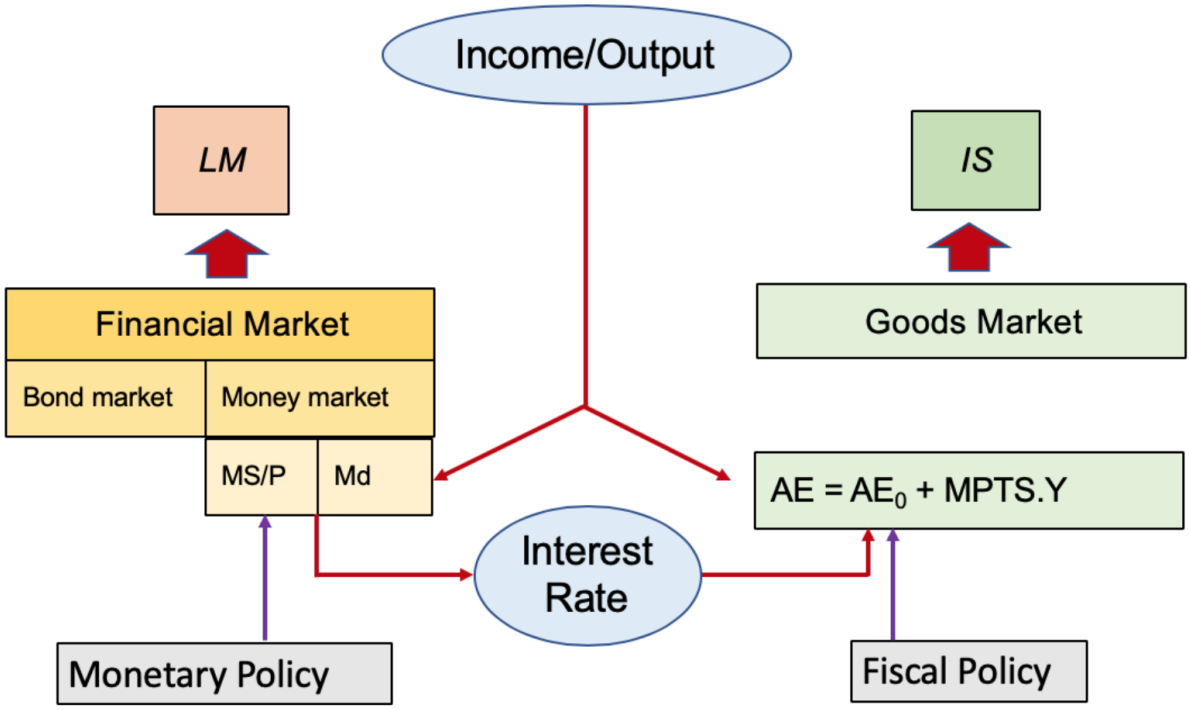
- We will discuss about long-run macroeconomy.
- In particular, what determine the "potential output" and "natural rate of unemployment"
- Laid out some important ingredients of market-clearing model for understanding the long-run macroeconomy.
- Review the basic concepts of two important foundations AD and AS
- Analyze the equilibrium and shock-propagaing mechanism under AD-AS framework.
- Look into the policy analysis

2 The IS-LM model and Aggregate Demand

2.1 Overview

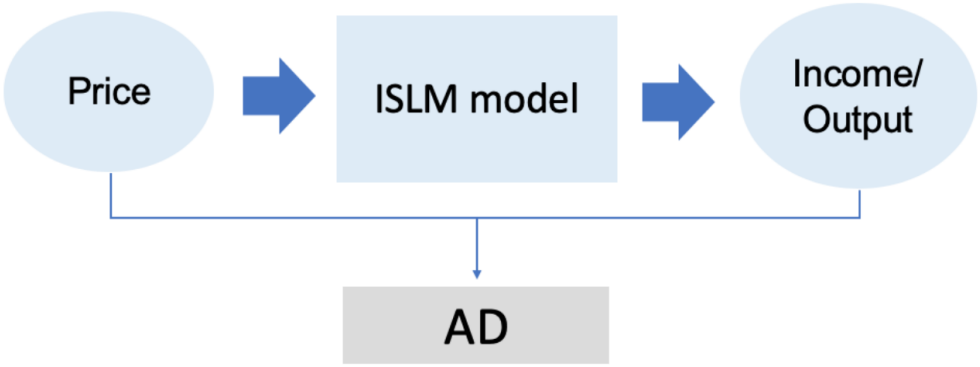
- Assume a closed economy. When price is fixed (in short run), IS-LM model is an economic model to analyze equilibrium in goods and money market.

Figure 1: IS-LM model



- When price is flexible (in the long run), AD curve can be derived

Figure 2: AD-AS model



2.2 IS-LM model

2.2.1 IS

Derivation of IS

- Equilibrium in the goods market

  $r \uparrow \Rightarrow I$..... $\Rightarrow DAE$..... $\Rightarrow Y$.....

- r and Y has ..... relationship
- IS has ..... slope

IS Slope

- Marginal propensity to consume (MPC)

  MPC is high, income multiplier is .....

  $r \uparrow \Rightarrow I$..... $\Rightarrow DAE$..... $\Rightarrow Y$.....

  MPC is high, IS is .....

- Interest elasticity of investment (ϵ_r^I)

  Investment is very sensitive to interest rate change

  $r \uparrow \Rightarrow I \downarrow$ ..... $\Rightarrow DAE \downarrow \Rightarrow Y \downarrow$ .....

  Investment is very sensitive to interest rate change $\Rightarrow$ IS is .....

  ϵ_r^I is high, IS is .....

Shift in IS

- $G \uparrow \Rightarrow$ LM shifts to the .....
- $T \downarrow \Rightarrow$ LM shifts to the .....
- $G \uparrow$ by equal amount as $T \uparrow \Rightarrow$ IS shifts to the .....
- C or I $\uparrow$ for all level of r and Y $\Rightarrow$ IS shifts to the .....

Questions to discuss (IS)

1. Size of IS shift (horizontally measure = holding r constant)

   Suppose G increases for 1unit, how does IS shift? To what direction and by how much?

   Suppose T increases for 1 unit, how does IS shift? To what direction and by how much?

2. For the same amount of the change, which one would produce a bigger shift of IS curve T or G?

3. Does the size of horizontal shift have any relationship with the slope of IS curve? Why?

2.2.2 LM

Derivation of LM

- Equilibrium in the money market
  $Y \uparrow \ \Rightarrow M \ \Rightarrow r$

- r and Y has ..... relationship
- LM has ..... slope

LM Slope

- Money demand elasticity of income ($\epsilon_Y^{M^d}$)
  Money demand is highly sensitive to income change
  $Y \uparrow$ a little $\Rightarrow M^d \uparrow$ ..... $\Rightarrow r \uparrow$ .....
  $\epsilon_Y^{M^d}$ is high, LM is ..... Y

- Money Demand Elasticity of interest ($\epsilon_r^{M^d}$)
  Money demand is highly sensitive to interest rate change
  $Y \uparrow \Rightarrow M^d \uparrow$ ..... but M^s remain constant $\Rightarrow$ then, r must..... (a .....) to make M^d ..... (offsetting the previous increase in M^d to make money market in equilibrium again.)
  $\epsilon_r^{M^d}$ is high $\Rightarrow$ LM is .....

Shift in LM

- $M^s \uparrow \Rightarrow$ LM shifts to the .....
- $M^s \downarrow \Rightarrow$ LM shifts to the .....
- $M^d \uparrow$ for all levels of r and Y $\Rightarrow$ LM shifts to the .....
- P $\uparrow \Rightarrow$ LM shifts to the .....

Questions to discuss (LM)

1. Does the panic in banking sector affect LM curve?

2. How do negative shocks on autonomous investment spending affect the economy? Analyze by using the IS-LM model.

Exercise (IS-LM) Use the IS-LM model to analyze the effects of

1. a boom in the stock market that makes consumers wealthier.
2. after a wave of credit card fraud, consumers using cash more frequently in transactions. (Odds number)

For each shock,

- Use the IS-LM diagram to show the effects of the shock on Y and r. Explain the mechanism.
- Determine what happens to C and I.

US Recession in 2001

2.3 Aggregate Demand

2.3.1 Introduction to AD

- IS-LM model was built on the assumption that price is fixed.
- What if price can be adjusted? How would this affect behavior of aggregate output?
- The relationship that links between "price" and "income" obtained from the IS-LM model is called the aggregate demand relationship.
- Aggregate demand curve is downward sloping in price.
- Use IS-LM to plot the relationship that underpinned the AD curve.

2.3.2 Derivation of AD

- Suppose that nominal money supply is fixed at M_1^S and initial price level is P_1. IS-LM equilibrium is then at (r_1, Y_1).
- Consider two alternative scenarios: $P_3 > P_2 > P_1 \Rightarrow \frac{M_1^S}{P_1} < \frac{M_1^S}{P_2} < \frac{M_1^S}{P_3}$
- Graphically, rising price causes real money supply to drop; LM curve shifted left: $LM_1 \rightarrow LM_2 \rightarrow LM_3$
- AD curve can be derived from the equilibrium of the IS-LM model; downward sloping slope.

2.3.3 Shift of AD

- Aggregate demand can be shifted to the right (more demand for any given prices) and to the left (less demand for any given prices.)
- All underlying factors that determine the IS curve and the LM curve can cause the change in aggregate demand curve.
- LM shifts to the right $\Rightarrow$ AD shifts to the right
- IS shifts to the right $\Rightarrow$ AD shifts to the right

- Monetary Policy: Changes in nominal money supply
  - Consider a fixed level of price P_1. Suppose a central bank increases money supply: M_1^s to M_2^s
  - Positive money creation will cause the LM curve to shift right $LM_1(\frac{M_1^s}{P_1})$ to $LM_2(\frac{M_2^s}{P_1})$
  - Income will rise from Y_1 to Y_2.
  - Y_1 is no longer aggregate quantity demanded at P_1 when money supply is now $M_2^s > M_1^s$; aggregate demand curve then shifts right.
  - For any level of prices, increasing money supply would cause LM to shift to the right and hence the AD curve.
  - On the contrary, lowering money supply would cause LM to shift to the left and hence the AD curve.

- Fiscal Policy: Changes in autonomous government spending
  - Consider a fixed level of price P_1
  - Suppose government increases spending from G_1 to G_2
  - Positive changes in government spending will cause the IS curve to shift to the right ; $IS_1(G1)$ to $IS_2(G_2)$; income will rise from Y_1 to Y_2
  - Y1 is no longer aggregate quantity demanded at P1 when government spending is now $G_2 > G_1$; aggregate demand curve then shifts right
  - For any level of prices, increasing G(from $G_1 \rightarrow G_2$) ; aggregate demand curve then shifts right.
  - For any level of prices, decreasing G(from $G_1 \rightarrow G_3$) ; aggregate demand curve then shifts left.

2.3.4 Questions to discuss (AD)

1. How does the deterioration in the level of consumer and business confidence affect aggregate demand curve?

2. How does the introduction and acceptance of digital currency affect aggregate demand curve?

3. When does the fiscal and monetary policy generate a big shift in AD curve?

3 Labor market and Aggregate Supply

3.1 Intro to AS

- This section provides a foundation for the theory of aggregate supply.
- Aggregate supply is the theory that describes the relationship between "price" and "(aggregate) amount of the output produced by firms".
- The foundation of AS theory can be derived from micro-founded individual supply theory.
- Understanding AS requires your priori understanding on production function and optimal labor input decision.
- In the short-rum, nominal wages are not completely flexible.
- In the long-run, nominal wages are completely flexible. The economy is always at full-employment.

3.2 Aggregate production function

- To understnad the long-run macroeconomy, economists typically build their concepts upon the idea of aggregate production function.
- Aggregate Production Function: $Y = zF(K, N)$ where:

  Y = output of consumption goods;

  K = capital input;

  N^d= labor input (hours);

  z = total factor productivity (TFP) = the effectiveness with which capital and labor are used.
- Capital stock is treated as fixed (at least in short run).
- Analytical representation of aggregate production function is therefore to focus on the relationship between output and labor input.

- The shape of the production function

  - Marginal product of labor is equal to slope of production function: MPN $= \frac{\Delta Y}{\Delta N}$
    - MPN always positive
    - Diminishing marginal productivity of labor

- Example: weather, innovations, government regulation, oil prices

  - Negative (adverse) shock : usually slope of production function decreases at each level of input (for example, if shock causes parameter z to decline)
  - Positive shock : usually slope of production function increases at each level of output (for example, if parameter z increases)

- What is the level of total output produced by the macroeconomy?
  - Given the aggregate production function, the total output produced will be determined by the level of labor input utilization.
  - The level of labor utilization is determined by two forces: labor market demand and labor market supply.

3.3 Labor Market

- Households provide labor force to the labor market: Labor Supply (N^s)
- Firms hire labor in the labor market: Labor Demand (N^d)

3.3.1 Labor Demand: Firm Decision

- How much labor do firms want to use?
  - Assumptions

    Hold capital stock fixed

    Workers are all alike

    Labor market is competitive

    Firms maximize profit

- Mathenatically, firm chooses for optimal level of workers (N) that maximizes profit.

$$\begin{aligned} \Pi &= \text{Total Revenue} - \text{Total Cost} \\ &= P \cdot Y - W \cdot N - \text{Fixed Cost} \\ &= P \cdot F(\bar{K}, N) - W \cdot N - \text{Fixed Cost} \end{aligned}$$

- Profit maximizing condition: $\frac{\partial \Pi}{\partial N} = P \cdot \frac{\partial F(\bar{K},N)}{\partial N} - W = 0$
- Standard optimality condition indicates that the optimal workers hired can be given by

1. Firms hire workers using the real productivity rule: $\frac{W}{P} = \frac{\partial F(\bar{K},N)}{\partial N}$

   Real wage = Marginal product of labor

2. Firms hire workers using the nominal value of productivity rule:
   $W = P \cdot \frac{\partial F(\bar{K},N)}{\partial N}$
   Nominal wage $= P \cdot MPN = VMP$

- Example:

Labor (number)	Output (number)	Marginal Product of labor (MPN)	Value of MPN P=2	Value of MPN P=3
0	0			
1	10			
2	19			
3	26			
4	31			
5	34			

- MPN is the labor demand curve: Downward sloping in real wage

$$N^d = f(\frac{W}{P})$$

- Alternatively, labor demand curve can be expressed in terms of nominal wage (W), i.e. the VMP curve. For given prices, VMP is downward sloping, and hence labor demand curve.

- Question to discuss (N^d)

    1. Suppose price increases. What will happen to the production function and labor demand curve?

    2. Positive productivity shocks (higher z) or an increase in capital stock (higher K). What will happen to the production function and labor demand curve?

- Factors that shift the labor demand curve
  - Supply shocks : Beneficial supply shocks raises MPN, so shifts labor demand curve to the right; opposite for adverse supply shocks
  - Size of capital shocks : Higher capital stock raises MPN, so shifts labor demand curve to the right; opposite for lower capital stock.
- Note a change in the wage causes a movement along the labor demand curve not a shift of the curve.

3.3.2 Labor Supply: Worker's Decision

- Households supply labor force to the market. They work and get paid; income earned can be used for purchasing goods in the goods market.
- Theorem for labor market supply emerges from foundation of individual labor supply, i.e. the consumption-leisure model.
- Key features of consumption-leisure model
  - Households choose consumption (C) and leisure (l)
  - Household preference set is defined over the two object bundles (C, l) and can be represented by a utility function.
- Households choose for the optimal "C" and "l" that maximize the utility subject to budget constraint

$$\max_{\{C,l\}} U(C, l)$$
$$\text{subject to } P \cdot C = W \cdot (24 - l)$$

- Households must choose for optimal labor choice, given (known) price P
- Conceptually, rising real wage ($w = \frac{W}{P}$) makes it costly for households to take leisure; they work more.

3.3.3 Labor Market Equilibrium

- In the long-run, "fully flexible adjustment in labor market", the equilibrium employment is the level so called "full employment".
- Labor market equilibrium: labor demand = labor supply

  - At $w^* = \frac{W^*}{P^*}$, employment = N_F.
  - N_F is full-employment equilibrium.

- In the short-run, employment can be different from "full-employment" equilibrium.

  - People make their economic decision based on their expectation on "price level".
  - If they can predict the "price" level correctly. Employment will be at "full-employment" level.

3.4 Long-run Aggregate Supply and the full-employment output or potential output

- As price level increases, nominal wage will adjust until the market is at full-employment equilibrium.
- Shift in Long-run aggregate supply
  - change in productivity
  - change in the number of capital input

3.5 Short-run aggregate supply

- Notion of long-run AS is idealistic, and only holds in the long-run.
- Market has nominal frictions and incomplete adjustment.
  - Labor market: wage stickiness (present wages)
  - Good market: price stickiness (present prices)
- Two models of Aggregate Supply
  1. The sticky-wage model
  2. The sticky-price model
- Both models imply :

$$Y = \bar{Y} + \alpha(P - P^e)$$

- Output can be different from "natural rate of output" (Potential Output) when "expected price" is different from "price".

3.5.1 The Sticky-Wage Model

- In reality, workers get paid in nominal term
- Moreover, firms and worker usually negotiate contracts and fix the nominal wage before they know what the price level will turn out to be
- Households must choose for optimal labor choice, given expected price (P^e) .

$$\max_{\{C,l\}} U(C, l)$$
$$\text{subject to } P^e \cdot C = W \cdot (24 - l)$$

- Behavior of labor supply under pre-committed wage contract

  - Typical labor supply : upward sloping in nominal wage offered
  - Expectation is important
  - The higer expected price, the lower labor supply (the higher nomial wage required for each working hour).

- Equilibrium of labor market and the determination of the production level under sticky-wage

- Three different scenarios: If
  - $P = P^e$: Unemployment and output are at their natural rates
  - $P > P^e$: Real wage is less than its target, so firms hire more workers and output rises above its natural rate.
  - $P < P^e$: Real wage exceeds its target, so firm hire fewer workers and output falls below its natural rate
- Shifts in short-run AS
  - Output changes for all levels of price:
  - Example: Change in expected price, Production technology, Change in market structure, Government policies
  - Example: Higher expected price

- Example: Negative productivity shocks/Capital destruction

- Example: Firm Monopoly Power (mark-up power)

- Example: Labor Unionization

3.5.2 The Sticky-Price Model

- Reasons for sticky prices:
  - Long-term contracts between firms and customers
  - Menu costs
  - Firms not wishing to annoy customers with frequent price changes
- Assumption: Firms set their own prices (e.g., as with monopolies).
- An individual firm's desired price is

$$p = P + a(Y - \bar{Y})$$

  where $a > 0$
- Suppose two types of firms:
  - Firms with Flexible Prices: set prices as above
  - Firm with Sticky Prices must set their price before they know how P and Y will turn out

$$p = P^e + a(Y - \bar{Y})$$

- Assume sticky price firms expect that output will equal to its natural rate. Then,

$$p = P^e$$

- To derive the aggregate supply curve, we first find an expression for the overall price level.
- Let s denote the fraction of firms with sticky prices. Then, we can write the overall price level as

$$P = s \cdot P^e + (1 - s)[P + a(Y - \bar{Y})]$$

- Substact $(1 - s)P$ from both sides and divide both sides by s:

$$P = sP^e + \frac{(1 - s)}{s} a(Y - \bar{Y})$$

- High $P^e \Rightarrow$ High P:

  If firms expect high prices, then firms that must set prices in advance will set them high. Other firms respond by setting high prices.

- High $Y \Rightarrow$ High P

  When income is high, the demand for goods is high. Firms with flexible prices set high prices. The greater the fraction of flexible price firms, the smaller is s and the bigger is the effect of ΔY on P

- Finally, derive AS equation by solving for Y

$$Y = \bar{Y} + \alpha(Y - \bar{Y})$$

  where $\alpha = \frac{s}{(1-s)a}$

- Short-run AS and Long-run AS

4 AD-AS equilibrium analysis

4.1 AD-AS Equilibrium

- Given the expected price, AD-AS equilibrium constitutes a set of variables, including output (Y^*), price (P^*), interest rate (r^*), nominal wage (W^*) and labor employment (N^*) that clear all the markets.
- The equilibrium can be captureed by 4 main figures

4.2 Business Cycles from AD-AS Perspective

- Suppose we assume that initially the economy is at $Y^* = Y^F$, the potential level of output.
- The economy will deviate from Y^* if the economy is hit by shocks.
- The AD-AS frameworks can shed lights on our understanding over
  (i) the channel of transmission of shocks (shock propagation) and
  (ii) the pattern/nature of business cycles (large/small)
- In our framework, shocks can be classified into two types
  1. AD shocks (IS-shocks or LM-shocks)
  2. AS shocks
- The time frame of the analysis can be divided into two horizon
  1. Short-run: when shock hits and causes a deviation
  2. Medium-run: when the economy adjusts and revers to long-run potential level

4.2.1 Short-run fluctuations

- Example: negative IS shock (a fall in autonomous expenditure)

- Example: positive LM shock

- Example: negative supply shock

- Example: Fiscal Policy

Expansionary fiscal policy ($G \uparrow$):

1. If real interest rate remains the same ($\bar{r}$), DAE shifts .....
   $\Rightarrow$ output (Y) ..... for all level of .....
   $\Rightarrow$ IS shifts to the ..... ; the size of shift is ..... ΔG
2. As Y ....., Real money demand ..... , Excess ..... , ... bonds, Bond price ..... and equilribium interest rate .....

   As r ....., investment ....., output ..... (move along IS curve) the second effect is called the crowding out effect.

   ** If price were constant, total effect = (1) + (2)
3. From (1) and (2), IS curve shifts to the ....., and then Y ..... for all levels of price.

   Hence, AD shifts to the ..... Y ..... and P .....

- Labor market
  As P ..... , real wage ..... and Y ..... (movement along AS curve)
- IS-LM As P ....., real money supply ..... to .....
  LM shifts to the .....
  Output .....
  This is called the price effect.

Rising price offsets the initial impact of "G" as it tends to push up the market interest rate.

Multipliers	Scenarios
Traditional multiplier IS-LM multiplier	Typical Keynesian cross Fixing "r" and "P"
IS-LM multiplier	r endogenously adjusted. Crowding out effect; However, Price remains fixed.
AD-AS multiplier	Price changes along with the state of excess demand and excess supply

- Example: Monetary Policy

Expansionary monetary policy ($M^s \uparrow$):

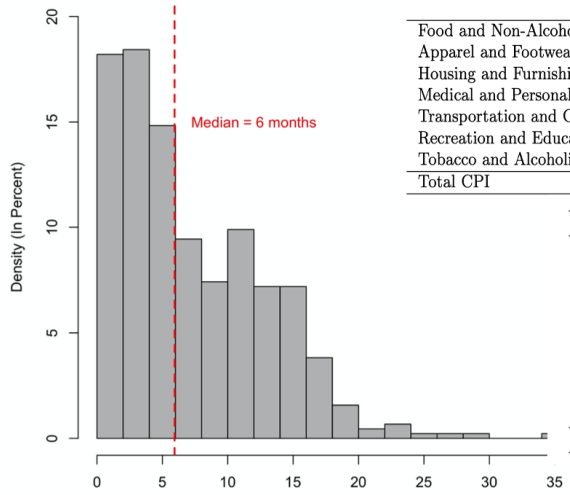
1. $\frac{M^s}{P}$ shifts to the .....
   Excess ..... , people ..... bonds,
   bond price ....., r ..... for all levels of .....
   LM shifts to the .....
   As r..... , investment ..... $\rightarrow$ Y ..... for all levels of price
2. As output ..... for all level of Price, AD shifts to the .....
   Price level ..... to ..... and Output ..... to .....
   - Labor market:
     P ..... , real wage ..... and Y ..... (movement along AS curve)
   - IS-LM:
     P ....., real money supply ..... to ..... LM shifts to the ..... Output ..... This is called the price effect.
3. The effect on Y is smaller than the effect under IS-LM Model.

4.2.2 Medium Run Adjustment and Self-Correcting Mechanism

- The effect of shocks die down; as time passes by, the economy reverts to long-term trend, i.e. at potential level of output
- Output gap becomes zero again.
- Economists refer to this process as the medium run adjustment or self-correcting mechanism.
- Self-correcting mechanism
  - Labor market will adjust to the imbalance that is generated by error in the price expectation
  - Workers renegotiate for higher age because they previously underestimated the actual price
  - Contraction in labor supply, and hence a rise wage, would cut the production as the cost of production increase
  - Natural rate or potential level can be restored with the medium-term adjustment process
- Expectation-driven Aggregate Supply and Effect of demand shock

- Medium-run adjustment: issues
  - How long does it take for the self-correction?
  - Economists propose different version of adjustments
    - Swift adjustment : Fast-trend reversion
      - Commonly known "New Classical" business cycle economist
      - No policy needed
    - Slow adjustment and Staggered adjustment: Gradual with persistent impact of shocks
      - Commonly known as Keynesion or New Keynesian business cycles economist
      - Policy might be welfare-improving.

- Micro-evidence on price settings: Thai inflation dynamics (Aphithan, Disyatat and Manopimoke, 2018)



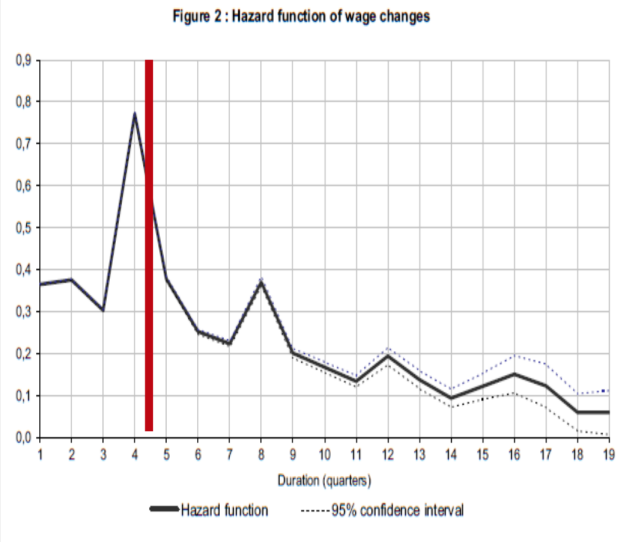
	Mean Frequency	Implied Mean Duration	Empirical Mean Duration
Food and Non-Alcoholic Beverages	0.23	3.91	5.37
Apparel and Footwear	0.03	29.37	13.42
Housing and Furnishing	0.13	7.37	6.37
Medical and Personal Care	0.07	13.03	8.68
Transportation and Communication	0.29	2.86	7.14
Recreation and Education	0.04	22.88	8.33
Tobacco and Alcoholic Beverages	0.11	8.70	7.15
Total CPI	0.20	4.40	6.79

	Mean Frequency	Implied Mean Duration	Empirical Mean Duration
Core	0.06	15.13	8.81
Non-core	0.50	1.44	2.47
Control	0.34	2.45	5.09
Non-Control	0.12	7.60	7.82
Service	0.04	22.76	10.30
Non-Service	0.22	3.94	6.33
Durables	0.07	14.38	8.07
Non-Durables	0.22	4.03	6.63
Total CPI	0.20	4.40	6.79

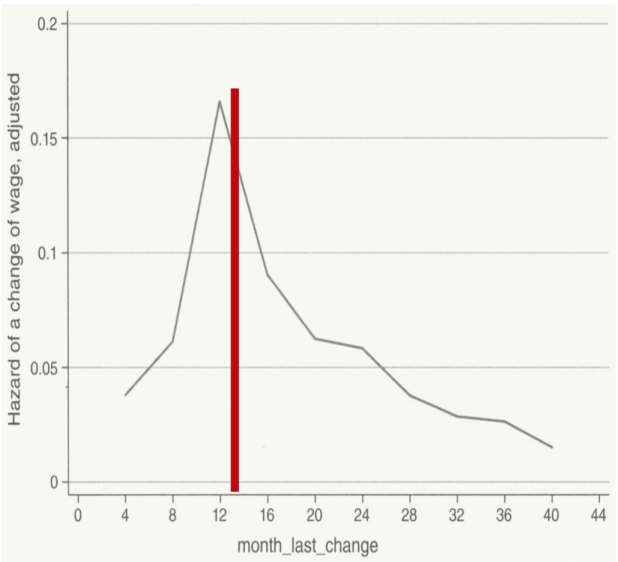
- Nominal rigidities: Wage setting

  Wage appears to be changed on the yearly basis

USA



EUROPEAN



- For an illustrative purpose, consider 4 types of firms with different speed of price adjustment
  - Firm 1: Gasoline station (fastest)
  - Firm 2: Logistic company
  - Firm 3: Electronic product
  - Firm 4: Service goods (hair cut/ noodle restaurant) (slowest)
- Suppose that workers for each of firm can adjust wage at the same time as their firms adjust price.
  - Things would be profound if we assume different degree.
- Staggered Adjustment
  1. Upward sloping Aggregate Supply in goods
     - Many individual firms might have flat supply curve at each point of time
     - A fraction of firms can adjust the price; individual supply for price-adjusting firm will be upward sloping
     - By aggregation, output should increases with the general price level.
  2. Similar intuition applies to upward sloping of Aggregate supply in labor.

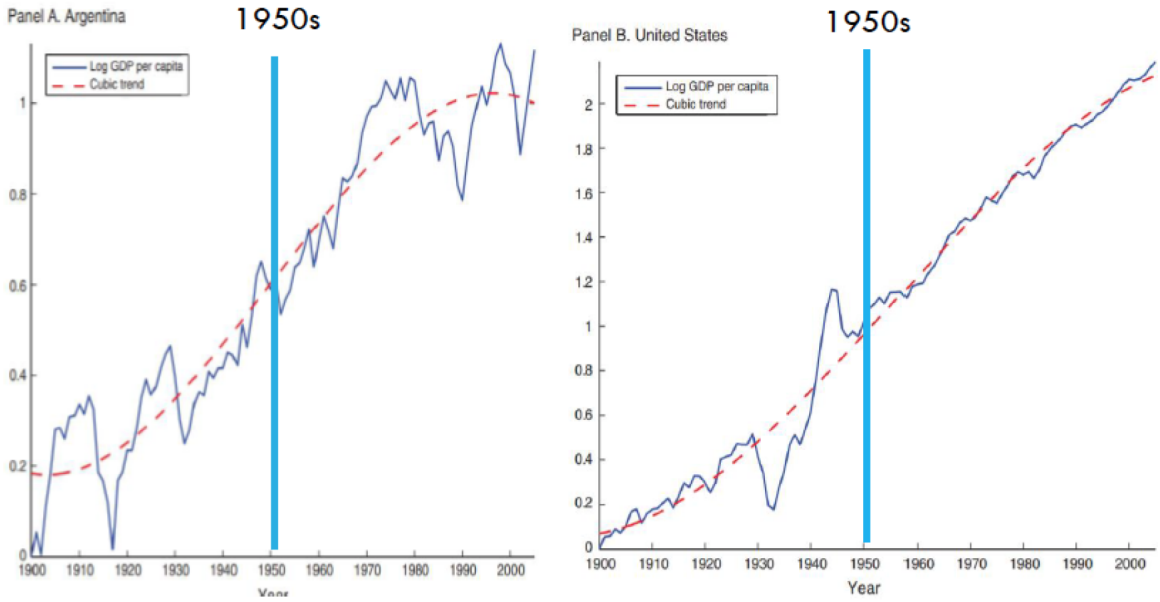
- Which version is right?
  - How can we justify the model?

    o Swift adjustment: Assumption does not fall in line with realities.

    o Gradual adjustment: Assumption does fall in line with realities. But Using correct assumptions imply empirical validity?

5 Case Discussion

5.1 What determine the size of business cycle volatilities?



- Business-cycle volatility is empirically observed.
- Large volatile business cycles could occur because of
  - Hit by many types of shocks
  - Each types of shocks is BIG
  - The structure of macroeconomy is prone to invite the large amplified effect of shocks

    - International frictions, e.g. labor market is slow to adjust
    - Policy is inefficient to combat and insulate the impact of shocks (sometimes, policy is the origin of the troubles)

5.2 How well does the AD-AS model explain data?

- Long-term view
    1. Long-term growth (positive; output growing over time)
    2. Inflation rate is positive (around 2% per year after 2001)
- Short-term view
    1. Output growing more in some periods; choppy fluctuations
    2. Inflation is sometimes higher or lower than the long-term trend (the 2% after 2001)

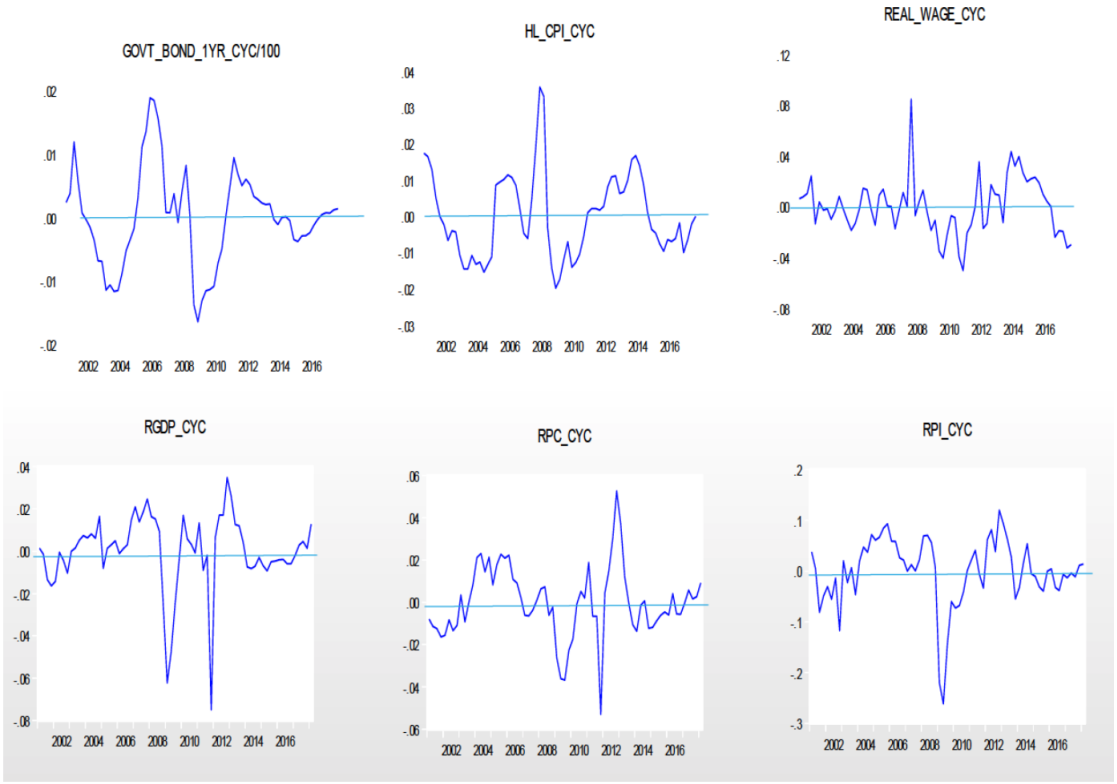
5.2.1 How can we explain/reconcile all theses with with in the AD-AS model. How to put all these stories together in the language of AD-AS model?

- Think about AD and AS growing over time.
    - Example:
        - Money supply grows over time; Government spending grows over time.
        - The level of technology improvement grow over time.
    - Account for positive inflation; Demand - side factor might need to be growing faster than supply-side factor

- Accounting for the cycle
  - Then, how does the cycles occur?
    - The cycle occurs because AD and AS might be growing more or less than the rate require to ensure x % output growth - e.g. potential growth.
    - These deviations usually come at surprise people call and treat them as shocks/disturbances
    - AD curve $\Rightarrow$ Demand shocks
      - IS shocks: private spending shocks, animal spirits, etc.
      - LM shocks: financial panic, financial innovations, etc.
    - AS curve $\Rightarrow$ Supply shocks

5.2.2 How fit does the AD-AS model explain the world?

- Data:
  - Real GDP/Consumption/Private investment,
  - Interest rates: 1-year government bond,
  - Real wage: average wage adjusted by headline CPI,
  - Price: headline CPI
- Treatment:
  - Detrend/Calculate: "Cyclical variations",
  - Compute pair-wise correlation.



Covariance Analysis: Ordinary
Date: 08/27/18 Time: 16:16
Sample: 2001Q1 2018Q1
Included observations: 69

Correlation Probability	GOVT_BON...	HL_CPI_CYC	REAL_WAG...	RGDP_CYC	RPC_CYC	RPI_CYC
GOVT_BOND_1Y...	1.000000 -----					
HL_CPI_CYC	0.687204 0.0000	1.000000 -----				
REAL_WAGE_CYC	0.134363 0.2710	0.340238 0.0042	1.000000 -----			
RGDP_CYC	0.217482 0.0726	0.240540 0.0465	0.003125 0.9797	1.000000 -----		
RPC_CYC	0.218555 0.0712	0.160057 0.1889	0.025904 0.8327	0.720238 0.0000	1.000000 -----	
RPI_CYC	0.490877 0.0000	0.454588 0.0001	0.191887 0.1142	0.644726 0.0000	0.740333 0.0000	1.000000 -----

Correlation statistic

Probability; Significant

- Since 2001, what we have seen in the data is that aggregate variables are procyclical.

  - GDP, consumption, investment and price level; move together in the same direction

- Real-wage might be an exception, weakly pro-cyclical (statisitcally acyclical).

- Which underlying shocks have dominantly driven the cycles?

- How fit does the AD-AS model explain the world?

- In order to generate the qualitative pattern, our economy must be predominantly driven by demand factor.

  - Note this does not mean the supply factor is not important; it states that demand factors dominate the supply factors.