

Week 9 **Monetary Theory – Keynesianism vs. Monetarism**

1. **Monetarism: Quantity Theory of Money**

a. Velocity: No. of times per year that an average dollar is spent on goods and

services. *i.e.*)  $Velocity = \frac{Total\ Value\ of\ Monetary\ Transactions}{Total\ Money\ Stock}$

b. Equation of Exchange:  $MV = PY$ , where

$$V = \frac{Total\ Value\ of\ Monetary\ Transactions}{Total\ Money\ Stock} = \frac{Nominal\ Output\ (or\ GDP)}{M} = \frac{PY}{M}$$

If V is constant, Equation of Exchange can be used to determine nominal GDP. (Much simpler than the Keynesian Income-Expenditure model)

c. Log Transform of Equation of Exchange

i) Gross Growth:  $\frac{M_t}{M_{t-1}} \times \frac{V_t}{V_{t-1}} = \frac{P_t}{P_{t-1}} \times \frac{Y_t}{Y_{t-1}}$

$$\ln\left(\frac{M_t}{M_{t-1}} \times \frac{V_t}{V_{t-1}}\right) = \ln\left(\frac{P_t}{P_{t-1}} \times \frac{Y_t}{Y_{t-1}}\right)$$

ii) Take the natural log on both sides:

$$\ln\frac{M_t}{M_{t-1}} + \ln\frac{V_t}{V_{t-1}} = \ln\frac{P_t}{P_{t-1}} + \ln\frac{Y_t}{Y_{t-1}}$$

iii) By the properties of log  $\ln M_t - \ln M_{t-1} + \ln V_t - \ln V_{t-1} = \ln P_t - \ln P_{t-1} + \ln Y_t - \ln Y_{t-1}$   
 $\% \Delta M + \% \Delta V = \% \Delta P + \% \Delta Y$

d. If V is constant, *i.e.*)  $\% \Delta V = 0$ , then Equation of Exchange can be used to determine  $\% \Delta$  in nominal GDP. → How much Ms has to be in/decreased.

$$\% \Delta M + 0 = \% \Delta P + \% \Delta Y$$

e. In reality V is not constant at least in SR.

i)  $V_1$  (V of M1) is not constant in LR.

ii)  $V_2$  (V of M2) is closer to constant, but not always.

∴ V is a variable, not constant.

2. **Determinants of Velocity**

a. Pay Cycle.

i) Monthly payroll:

$$V = \frac{Annual\ Income}{Avg\ Cash\ Balance} = \frac{\$24,000}{(\$2,500 + \$500)/2} = \frac{\$24,000}{\$1,500} = 16$$

assuming min checking balance of \$500 at the end of the pay cycle and \$2,500 on the payday.

ii) Semimonthly payroll:  $V = \frac{Annual\ Income}{Avg\ Cash\ Balance} = \frac{\$24,000}{\$1,000} = 24$

assuming min checking balance of \$500 at the end of the pay cycle and \$15,00 on the payday.

∴ More frequent wage payments → Lower average cash balance needed. → Money circulates faster. →  $V \uparrow$ .

- b. Efficiency of the payments mechanism
  - i) How quickly checks clear banks, the use of credit cards, the use of wire transfer...etc. → requires lower cash balances →  $V \uparrow$ .
  - ii) The incentive to limit cash holdings depends on the ease and speed w/ which people exchange money for interest bearing assets.
- c. *interest rate*
  - i) Money holdings pay no interest. → People minimize money holding and look for alternative assets bearing interest. → The higher the  $i$ , the lower the money holding. →  $V \uparrow$ .
  - ii) However, this undermines the quantity theory of money as a guide for monetary policy b/c expansionary monetary policy ( $\uparrow M$ ) →  $\downarrow i$  →  $V \downarrow$  → (counteracting  $M \uparrow * V \downarrow$ ) mitigated.
- d. *Expected rate of inflation*  
 High  $\pi$  →  $\downarrow$  purchasing power money → ( $\uparrow P \rightarrow \uparrow GDP \rightarrow M_d \uparrow$ ) →  $\downarrow$  money holdings →  $V \uparrow$  can meet  $\uparrow M_d$ , where  $GDP = \text{Nominal } Y$ .

### 3. Quantity Theory of Money Modernized

- a.  $\Delta V$  is predictable.
  - i) Study determinants of money growth and  $\Delta V$  → predict growth rate ( $\Delta$ ) of nominal GDP.
  - ii) Given understanding of  $\Delta V$  and control over  $M_s$  → control over nominal GDP.
- b. Keynesian: Money affects first  $i \rightarrow I \rightarrow AD (C+I+G+X-M) \rightarrow \text{real GDP } (Y)$ .
- c. Monetarist: Money affects  $i \rightarrow M_s \& M_d \rightarrow AD (MV) \rightarrow \text{nominal GDP } (PY)$ .

### 4. Fiscal Policy, Interest Rates, and Velocity

- a. B/c of  $G$  in  $C+I+G+(X-M)$ , Keynesian analysis lends itself naturally to the study of fiscal policy. It also provides for monetary policy w/  $\Delta M_s \rightarrow \Delta i \rightarrow \Delta I \dots$ etc.
- b. Monetarist analysis naturally lends itself to monetary policy. However, since  $MV=PY$  doesn't involve any  $G$ ,  $V$  must explain it. As there's no  $M$  in fiscal policy,  $\uparrow PY \rightarrow \uparrow M_d \rightarrow \uparrow i \rightarrow \uparrow I$ .  
 e.g.)  $\uparrow G \rightarrow \uparrow Y \rightarrow \uparrow P \rightarrow \uparrow GDP (=PY) \rightarrow \uparrow M_d / \text{fixed } M_s \rightarrow \uparrow i \rightarrow V \uparrow$ .
- c. Fiscal policy also affects  $i$ :  $\uparrow G$  from bond sale →  $\uparrow i$  (crowding-out). It is through  $V$  that fiscal policy does its work in the monetarist framework. ( $\because \overline{MV} \uparrow = PY \uparrow$ )

### 5. Stabilization through Fiscal or Monetary Policy?

- a. Question of Timing: Fiscal policies take time to take effect b/c
  - i) Of delays in data collection
  - ii) government takes distressingly long time to decide, to muster necessary political support, and to put its decision into effect
  - iii) the sheer size of the economy makes it react sluggishly to moderate fiscal and monetary prods
- b. Lags in Stabilization Policy: pivotal in the choice btwn fiscal and monetary policy
  - i) Lags in  $C$ : Consumers must learn about the tax change, be convinced that the change is permanent. → HHs need time to adjust their spending habits.

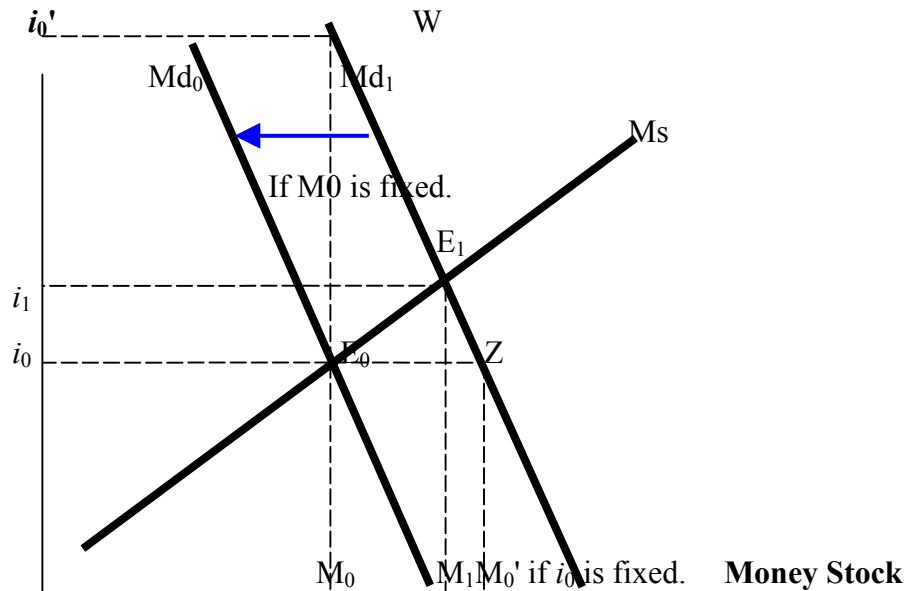
- ii) Lags in I: Capacity expansion takes tediously lengthy procedures and most of these occur before any appreciable amount of money is spent for I. Much of the response of I to  $\Delta i$  or  $\Delta T$  is delayed for several years.
- c. That C responds more quickly than I  $\rightarrow$  most common varieties of fiscal policy either affect AD directly through G or through C w/ a relatively short lag while monetary policy has its major effects on I. However,
  - i) Federal budgeting procedures operate on an annual budget cycle.
  - ii) Congress works slowly often are gummed up by partisan politics.
- d. Policy lags are normally much shorter for monetary policy than for fiscal policy.
  - i) FOMC meets eight times a year.
  - ii) Monetary policy decisions are made more frequently.
  - iii) Fed decisions are executed immediately.

6. **Should Fed Control Ms or  $i$ ?**

- a. Why Fed cannot control both Ms and  $i$  at the same time:
 

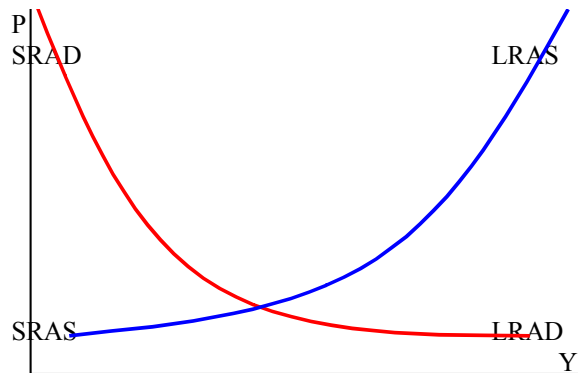
Md doesn't hold still, b/c  $\uparrow/\downarrow Y$  or  $\uparrow/\downarrow P$  (Transaction Md), or simply b/c people want to hold more/less money. If the Fed takes no action,  $\Delta Md \rightarrow \Delta M$  stock &  $i$ .

  - i) If Fed targets at Ms, Fed is unwilling to let  $M \uparrow/\downarrow$ .  $\rightarrow$  It must use contractionary/expansionary OMO to prevent  $M \uparrow/\downarrow$ . But in so doing, it will  $\uparrow/\downarrow i$ . even more
  - ii) If Fed targets  $i$ , Fed will be engaged in expansionary/contractionary OMO to prevent  $\uparrow/\downarrow i$ . But to do this, Fed will have to let the Ms  $\uparrow/\downarrow$ .
- b. What Fed has actually done
  - i) Post WWII period: Stabilize  $i \rightarrow$  Stabilize I.
  - ii) 1960's & 1970's: Stabilize Ms (Monetarism)
  - iii) 1980's: Stabilize  $i \rightarrow$  Especially stabilize  $r$  (real interest rates)



**7. The Shape of AS Curve in Fiscal & Monetary Policy**

- a. If AS curve is flat, expansionary fiscal/monetary policy can buy large gains in real GDP at low cost in terms of inflation. A restrictive stabilization policy serves mainly to reduce real output w/ only a fractional cut in the price level. → ∴ More effective in combating recession than inflation.
- b. If AS curve is steep, expansionary/contractionary fiscal policy will cause a good deal of inflation/deflation w/o adding/sacrificing much to real GDP. → ∴ more effective in combating inflation than recession.
- c. However, supply conditions are different across industries and time.
- d. The consensus is that the AS curve is flat in the SR and steep in the LR.



**8. Techniques of Economic Forecasting**

a. Econometric Modeling

i) Time Series Forecasting (Data Generating Process):

$$Y_t = \beta_0 + \sum_{i=1}^p \beta_i Y_{t-i} + \varepsilon_t \text{ where } \varepsilon_t \text{ is stochastic error or noise.}$$

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \varepsilon_t$$

$$Y_{t-1} = \beta_0 + \beta_1 Y_{t-2} + \varepsilon_{t-1} \quad (1 - \beta_1 L) Y_t = \beta_0 + \varepsilon_t$$

$$Y_t = \beta_0 + \beta_1 [\beta_0 + \beta_1 Y_{t-2} + \varepsilon_{t-1}] + \varepsilon_t \quad \& \text{ If } (1 - \beta_1 L) = 0, \beta_1 = 1 \rightarrow \text{Random Walk}$$

$$= \beta_0 + \beta_0 \beta_1 + \beta_1^2 Y_{t-2} + \beta_1 \varepsilon_{t-1} + \varepsilon_t \quad dp(t) = \mu dt + \alpha dB(t) \rightarrow \text{Brownian Motion}$$

$$= \beta_0 * + \beta_1^i Y_{t-i} + \sum_{j=0}^i \beta_1^j \varepsilon_{t-j}$$

ii) Regression Forecasting (Multivariate Static Analysis):

$$Y = \beta_0 + \sum_{i=1}^k \beta_i X_i + \varepsilon$$

- b. Leading Indicators: more qualitative & vary depending on variable to estimate e.g.) stock market trend, housing start, consumer confidence index, new orders, Conference Board’s composite index of 11 indicators ... etc.
- c. Survey Data, Judgmental Forecasts

**Mathematical Digression**

1. Compounding:  $FV = PV + PV(1+r) + PV(1+r)^2 + \dots + PV(1+r)^n = \sum_{i=0}^n PV(1+r)^i$

If  $P\left(1 + \frac{r}{m}\right)^m$  annually for  $n$  years,  $F_n = P\left(1 + \frac{r}{m}\right)^{mn}$ .

In the limit where  $m \rightarrow \infty$ ,  $\lim_{m \rightarrow \infty} P\left(1 + \frac{r}{m}\right)^{mn}$ , where  $\lim_{m \rightarrow \infty} \left(1 + \frac{1}{m}\right)^m = e$  and  $\log_e X = \ln X$

2. Instantaneous gross growth rate: 
$$\begin{cases} X_t = X_0 e^{gt} \\ \ln X_t = \ln X_0 + gt \\ \ln X_{t-1} = \ln X_0 + g(t-1) \\ \ln \frac{X_t}{X_{t-1}} = \ln X_t - \ln X_{t-1} = g \end{cases}$$

3. Net growth rate: 
$$g = \frac{\Delta X}{X} = \frac{dX(t)}{dt} \times \frac{1}{X} = \dot{X} \times \frac{1}{X} = \frac{dX(t)}{dt} \times \frac{d \log X}{dX} = \frac{d \log X}{dt},$$
  
 where  $\frac{dX(t)}{dt} = \Delta X = X_t - X_{t-1}$