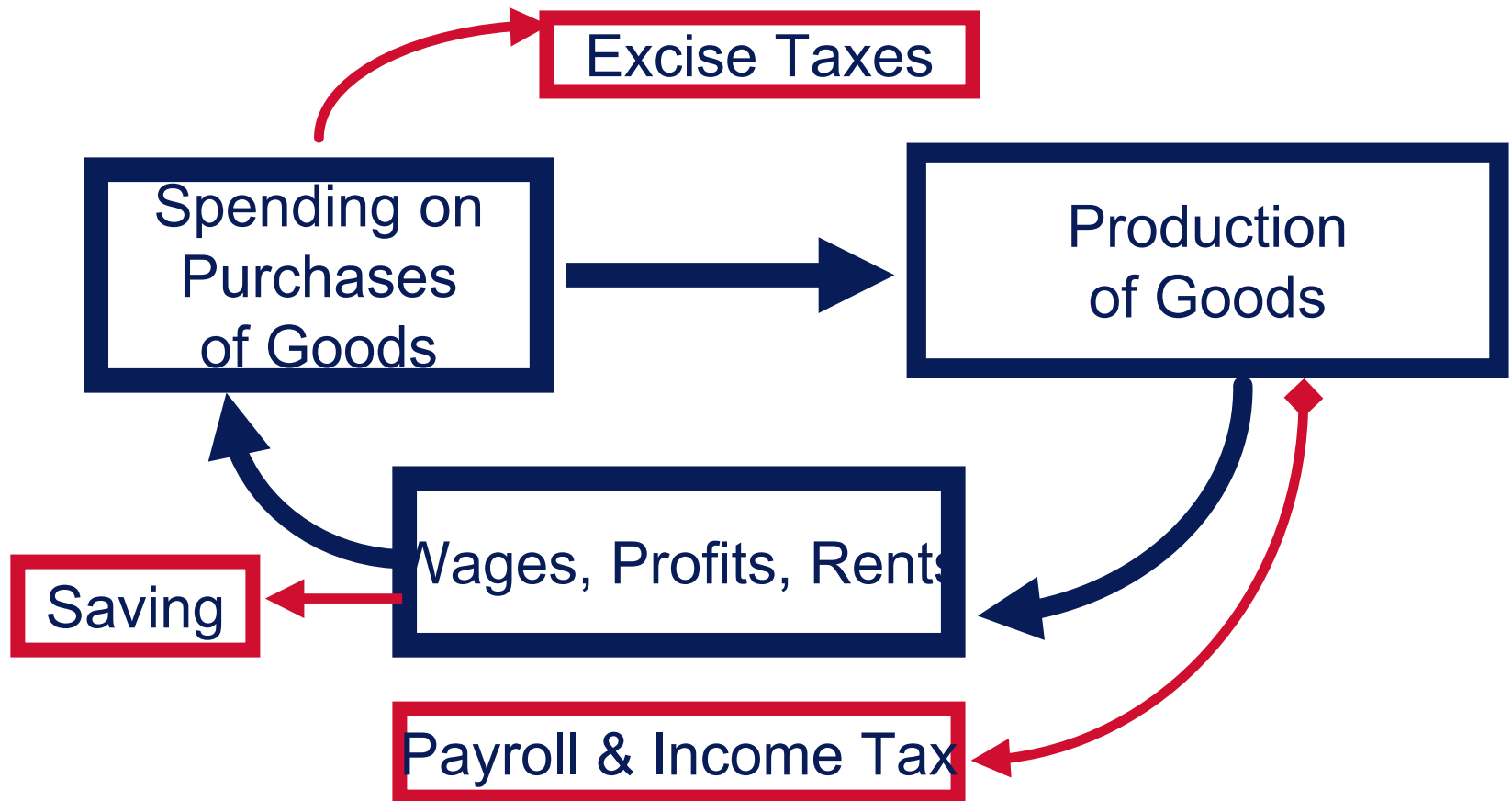# The Circular Flow of Spending and Income, "Multipliers", "IS-LM"
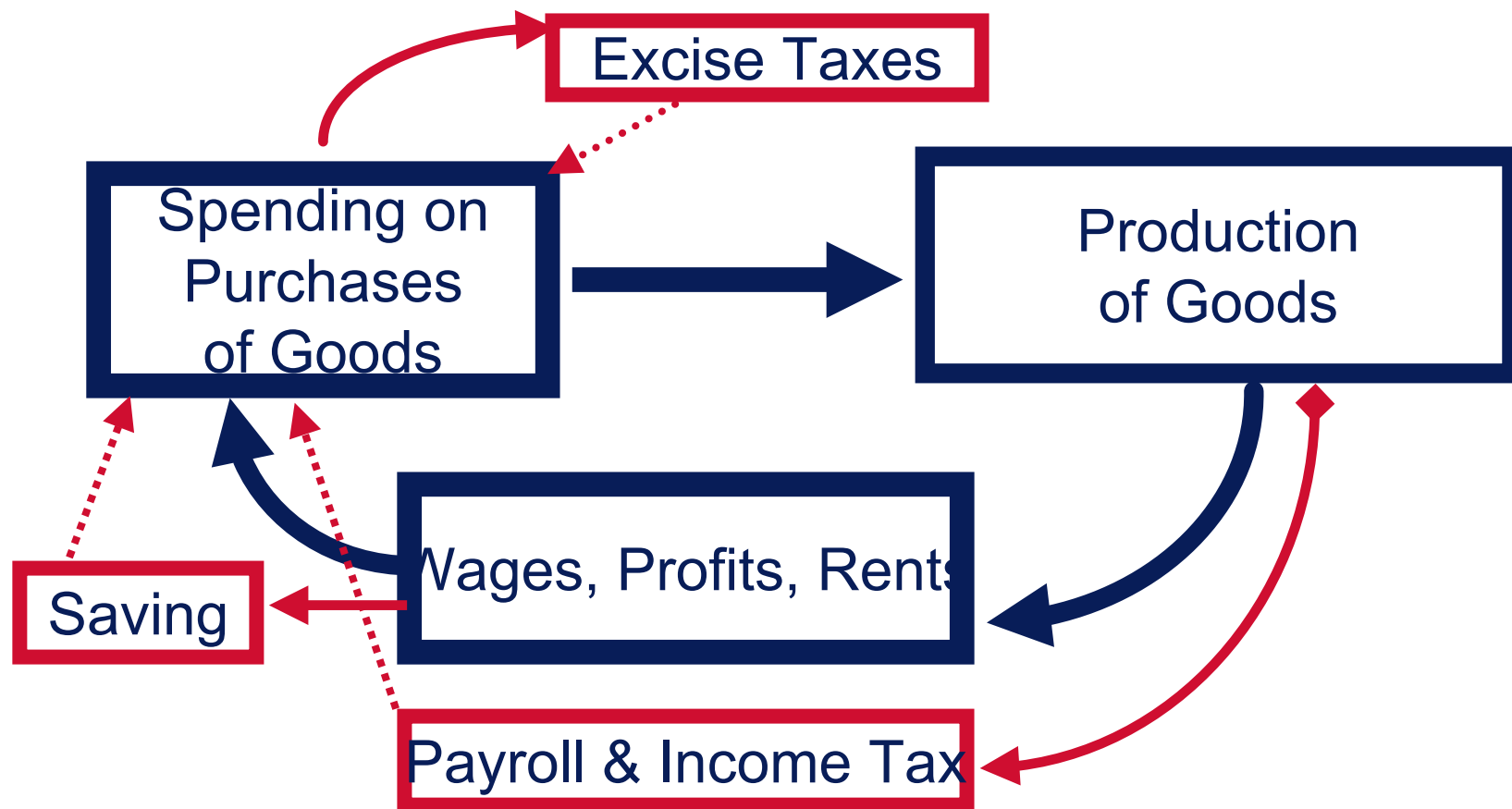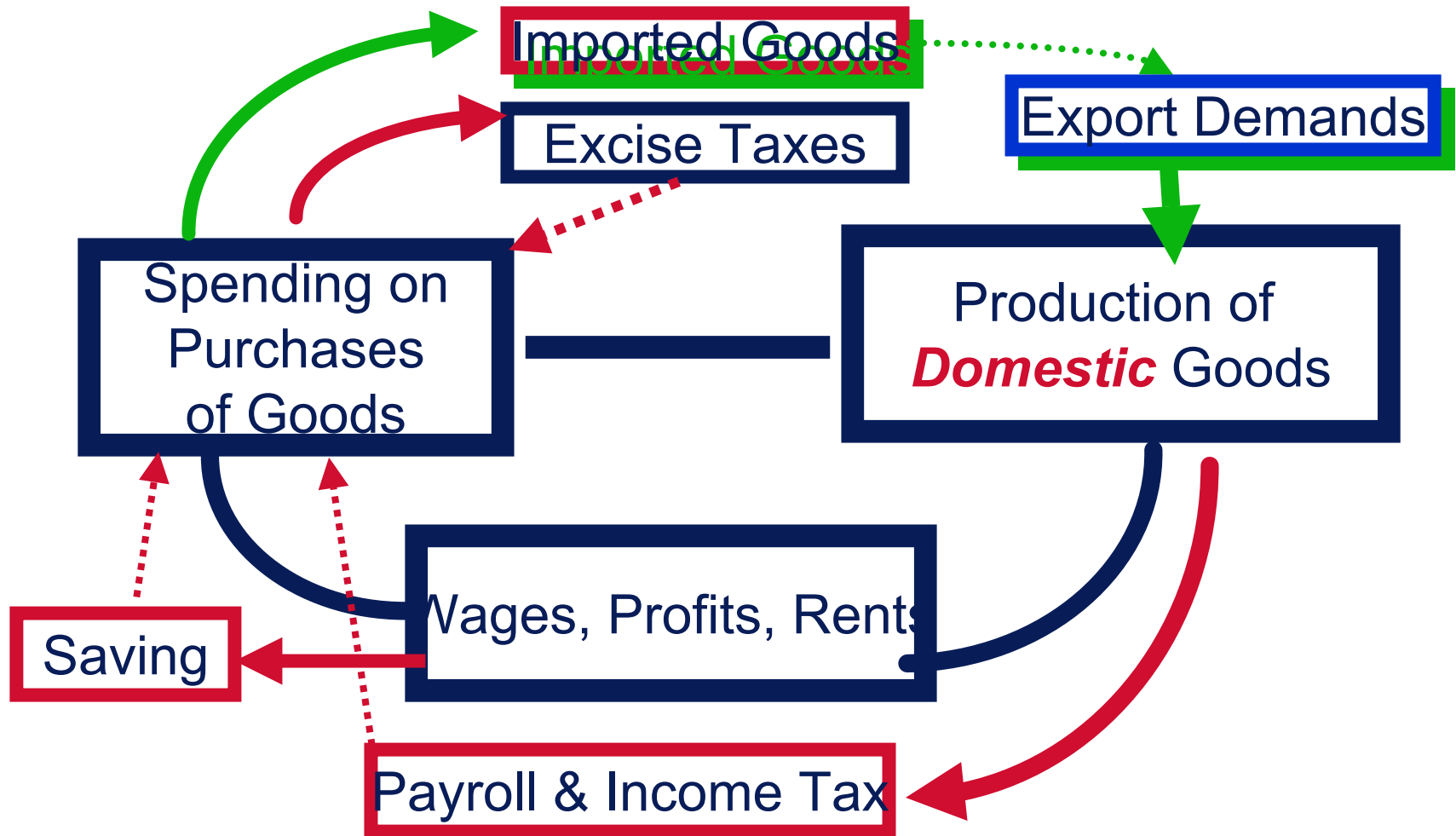
Lecture 8

The Circular Flow--
in a closed economy

The Circular Flow--
in a closed economy

(Solid lines reflect current elements sustaining or diverting (in red boxes) from the circular flow)

Excise Taxes

Spending on Purchases of Goods

Production of Goods

Wages, Profits, Rents

Saving

Payroll & Income Tax

(Dotted lines indicate potential later return to circular flow)

The Circular Flow--
in an open economy

Imported Goods

Export Demands

Excise Taxes

Spending on
Purchases
of Goods

Production of
Domestic Goods

Wages, Profits, Rents

Saving

Payroll & Income Tax

The Multiplier

◆ **The "Multiplier" represents *feedback effects within the circular flow* of a change in a previous assumption**

◆ **Obviously, *feedback effects are greater the less leakage there is* in the circular flow**

The "IS" Curve

◆ **The IS Curve is the name given equilibrium set of points denoting**

– **total spending "GDP" corresponding to each interest rate "r",**

– **for any given fiscal policy and international setting**

◆ **GDP = C+I+X-M +G**

◆ **= GDP (G, T, r, GDPW)**

The "IS" Curve (*I*nvestment & *S*aving)

- **Spending Identity: GDP=C+I+G+X-M (All GDP Output Must be Classified as Some Type of Final Demand)**

- **Income Identity: GDP=C+S +T (All Income that is not Spent on Consumption or paid in Taxes is Saved)**

- **C is common to both, thus I+G+X-M = S + T**

- **or I = S + (T-G) +(M-X) that is, all investment must be financed by personal saving (S), government saving (T-G, the budget surplus), or international borrowing (M-X, also called the international trade or current account deficit)**

- **Assume for simplicity that the last two terms (the government budget and international transactions) are in balance, thus I must = S for the economy to be in balance. The equation summarizing the conditions of income (GDP) and interest rates that will produce such balance is called the IS curve, to reflect the need for I=S, given balance elsewhere.**

Deriving the IS Curve (or "Goods Market Equilibrium") using the Investment / National Saving Identity

In equilibirum, I = S + (T - G) + (M - X)

I = b0 + b1* GNP - b2 r

C= c0 + c1*(YD) - c2* r   (to avoid confusion with "I"=Investment, I'm switching the symbol for interest rates from " i" to "r")
YD=(1-t) * GNP
S= YD - C = (1-t) * GNP - c0 -c1*(1-t)*GNP + c2* r
S= (1-t) * (1-c1) * GNP - c0 + c2* r

G is exogenous
T= t * GNP

M= m1*GNP
X= x1*GNPW

	I =	S	+	(T - G)	+	(M - X)
hence	b0 + b1* GNP - b2 r =	(1-t) * (1-c1) * GNP - c0 + c2* r	+	t * GNP - G	+	m1 *GNP - x1 * GNPW

Solve for GNP as function of r and exogeneous & autonomous values
GNP *((1-t)*(1-c1) + t + m1 - b1) = b0 - b2*r + c0 - c2*r + G + x1*GNPW
GNP *(1 - c1 -t + t*c1 + t + m1 - b1) = b0 - b2*r + c0 - c2*r + G + x1*GNPW
GNP *(1 - c1*(1- t) + m1 - b1) = b0 - b2*r + c0 - c2*r + G + x1*GNPW

Intercept of the IS Curve   *Slope of the IS Curve*   .

GNP=	1 / (1-(c1*(1-t) + b1 - m1))	(c0 + b0 + G + x1*GNPW)	+	1 / (1-(c1*(1-t) + b1 - m1))	*	(- (c2 + b2) * r)

	"the multiplier"	"autonomous and exogenous spending"		"the multiplier"		the reduction of autonomous spending due to interest rates, before multiplier feedback

Deriving the IS Curve as the Reduced form of the Spending Equation Set (or "Goods Market Equilibrium")

C= c0 + c1*(YD) - c2* r	*(to avoid confusion with "I"=Investment, I'm switching the symbol for interest rates from " i" to "r")*		
YD=(1-t) * GNP			
hence C = c0 + c1*(1-t)*GNP - c2*r			
I = b0 + b1* GNP - b2 r			
G is exogenous			
M= m1*GNP			
X= x1*GNPW			
GNP = C + I + G + X - M			
GNP = c0 + c1*(1-t)*GNP - c2*r+ b0 + b1* GNP - b2 r+ G + X - m1*GNP			
GNP= (c1*(1-t) + b1 - m1) * GNP			
+ (c0 + b0 + G + x1*GNPW)			
- (c2 + b2) * r			
Solve for GNP as a function of r and exogenous spending			
GNP = f (r, G , GNPW) produces the "IS Curve"			
	Intercept of the IS Curve	*Slope of the IS Curve*	.
GNP= 1 / (1-(c1*(1-t) + b1 - m1)) *(c0 + b0 + G + x1*GNPW) + 1 / (1-(c1*(1-t) + b1 - m1)) *(- (c2 + b2) * r)			
	"the multiplier" "autonomous and exogenous spending" "the multiplier" the reduction of autonomous spending due to interest rates, before multiplier feedback			

Why Does the IS Equilibrium Curve Slope Down, with High GDP Paired with Low i, and Vice Versa?

◆ **It's traditional to think of I (investment) as being negatively correlated with interest rates and S (personal saving) as being positively correlated with GDP (income). Therefore high levels of GDP will produce high levels of saving . If investment demand is to be strong enough to match the saving, then interest rates must be low. And vice versa.**

◆ **Note from the preceding algebraic derivation that if I (like S) also depends on GDP, and that S (like I) also depends on r, the slope of the IS curve is affected.**

The SIMPLE VERSION :						
S depends only on GNP and not r => c2 = 0				no taxes => t =0		
I depends only on r and not GNP => b1 = 0				no imports => m1 = 0		
	Intercept of the IS Curve			*Slope of the IS Curve*		.
GNP=	1 / (1-c1) *	(c0 + b0 + G + x1*GNPW)	+	1 / (1-c1) *		-b2 * r
	hence the IS Curve is steeper …					
		...the greater is the Investment sensitivity to interest rates.				
		...and the greater is the consumer spending sensitivity to income.				
	If both S and I are sensitive to both GNP and r, the IS curve is steeper…					
		...the greater is the total domestic spending sensitivity to interest rates.				
		...and the greater is the total domestic spending sensitivity to income.				

The "LM" Curve

◆ **Previously, we described interest rates as being a policy decision made by the Federal Reserve in reaction to the level of economy activity : i = f (GDP). How they achieved this by manipulating reserves and money was implicit in the function.**

◆ **We could go behind this to look at private demand for money as a function of interest rates and income : the LM Curve**

The "LM" Curve

- ◆ **Private demand for money as a function of interest rates and income : the LM Curve**

- ◆ **Define "Money" and its portfolio alternatives**

- ◆ **Motivations to hold money**

- ◆ **Motivations to hold bonds, stocks, durable goods**

- ◆ **Combine to motivate demand for money:**
  - **Positively correlated with spending**
  - **Negatively correlated with interest rates**

The "LM" Curve

◆ **Solve M/p=** *L***iquidity = f(i , GDP) for i**

◆ **Plot it in 2 dimensions (i vs GDP) for any given level of M/p**

◆ **This is the "LM" Curve showing points of equilibrium (_L_iquidity Demanded = _M_oney Supply):**

– **For a given M/p, higher GDP encourages money holding, thus equilibrium requires a higher i to discourage/offset the GDP stimulus**

Private Motivation to Hold Money

◆ **Keynes': current transactions, precautionary (possible future transactions), speculative (maximizing return on all assets in uncertain world)**

◆ **Zero sum game: your income *and* accumulated wealth in by the end of each period must be consumed or saved; if saved, a form of saving must be chosen**

◆ **Your choice of "money" as the savings vehicle is a choice against all other options, and is made on the basis of relative tangible and intangible yields and their risks.**

Why Is There Such a Focus on "Money?" Rather Than Other Assets?

◆ 1. Tradition: it was originally distinctive because it paid no tangible yield and was the only "perfectly liquid" asset.

◆ 2. The central bank was thought to have greater control over its supply.

Transactions demand

- ◆ **"Money" is needed to pay for purchases, and this transaction demand tends therefore to rise in proportion to spending**

- ◆ **Be careful about defining the spending measure for private money holding: it's not all of GDP. Why?**

- ◆ **Remember this is only the transactions demand component.**

- ◆ **Note consensus long-run spending elasticity is close to 1.**

Precautionary Demand

◆ **Demand to meet emergencies or other needs for large purchases where liquidity is an advantage?**

◆ **How do you think these would relate to Y, i ?**

Speculative Demand

◆ **A desire to hold money even with a known low nominal return and only the risk of inflation, versus other financial assets that have capital risk(due to changing interest rates) as well, or versus real goods that are illiquid/ expensive to sell to raise funds.**

◆ **Explain capital risk on bonds: why the price varies with the market rate after original issue.**

◆ **Explain risk-return tradeoff.**

◆ **Ask and explain how speculative demand would relate to income, and to interest rates.**

The "LM" Curve

◆ **For a given M/p, higher GDP encourages money holding, thus equilibrium requires a higher i to discourage/offset the GDP stimulus**

**i =
Interest
Rate**

◆**i =L(M/p, GDP)**
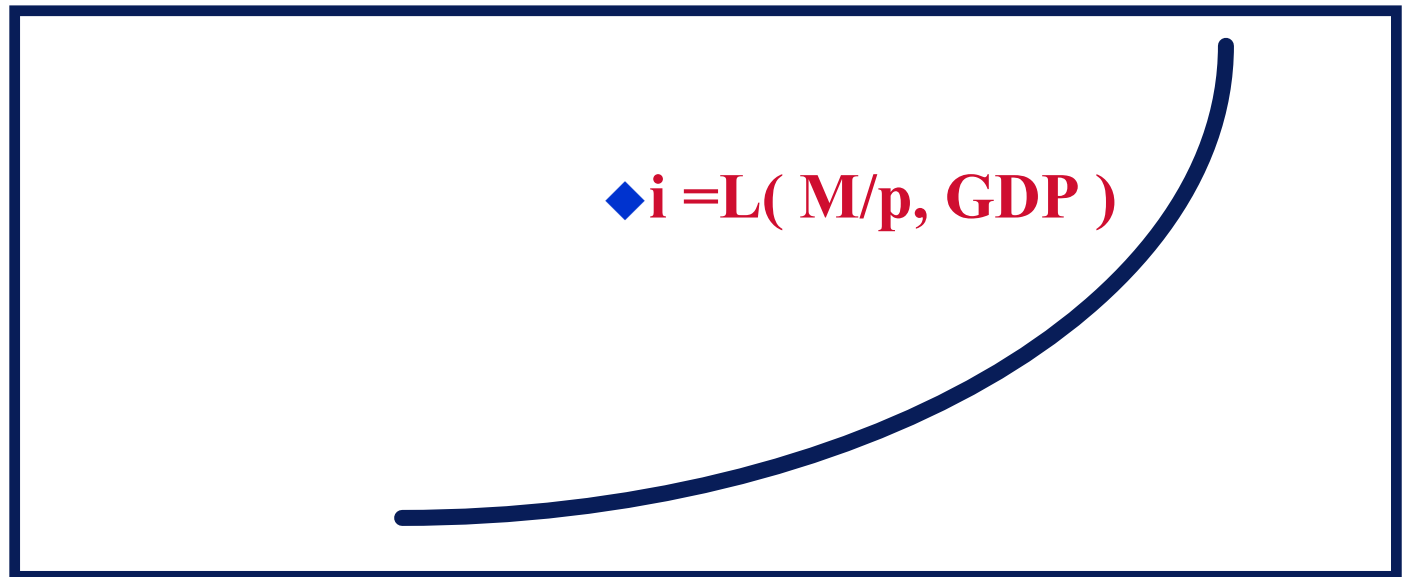
GDP = National Spending or Output

The "LM" Curve is a Hidden Piece of the First Model

◆ **Private Demand for Money**

  – **M/p (real demand) = f (i , GDP)**

  – **or, i = f (M/p , GDP)**

◆ **The Fed Reactions**

  – **Central Bank Supply of Money**

  – **M/p = g (GDP)**

◆ **If Demand=Supply= (M / p)**

◆ **Then, i = f (g(GDP) , GDP) = f (GDP), the Fed reaction function of the First Model**

Elementary Monetarism

◆ **velocity=v=_nominal_ _GDP_/M**

◆ **_nominal GDP_= P * _real_ GDP ("Y")**

◆ **thus v= P * _Y_ / M**

◆ **or M * v = P * Y (or sometimes presented as real transactions), known as the quantity equation, the core of the quantity theory of money, whose key conclusion is P = M *(Y/v) and strict monetarism asserts Y, v are fixed in equilibrium**

◆ **but velocity is not fixed; rather it is sensitive to interest rates**

The Velocity of Money (M1) vs. the Treasury Bill Rate
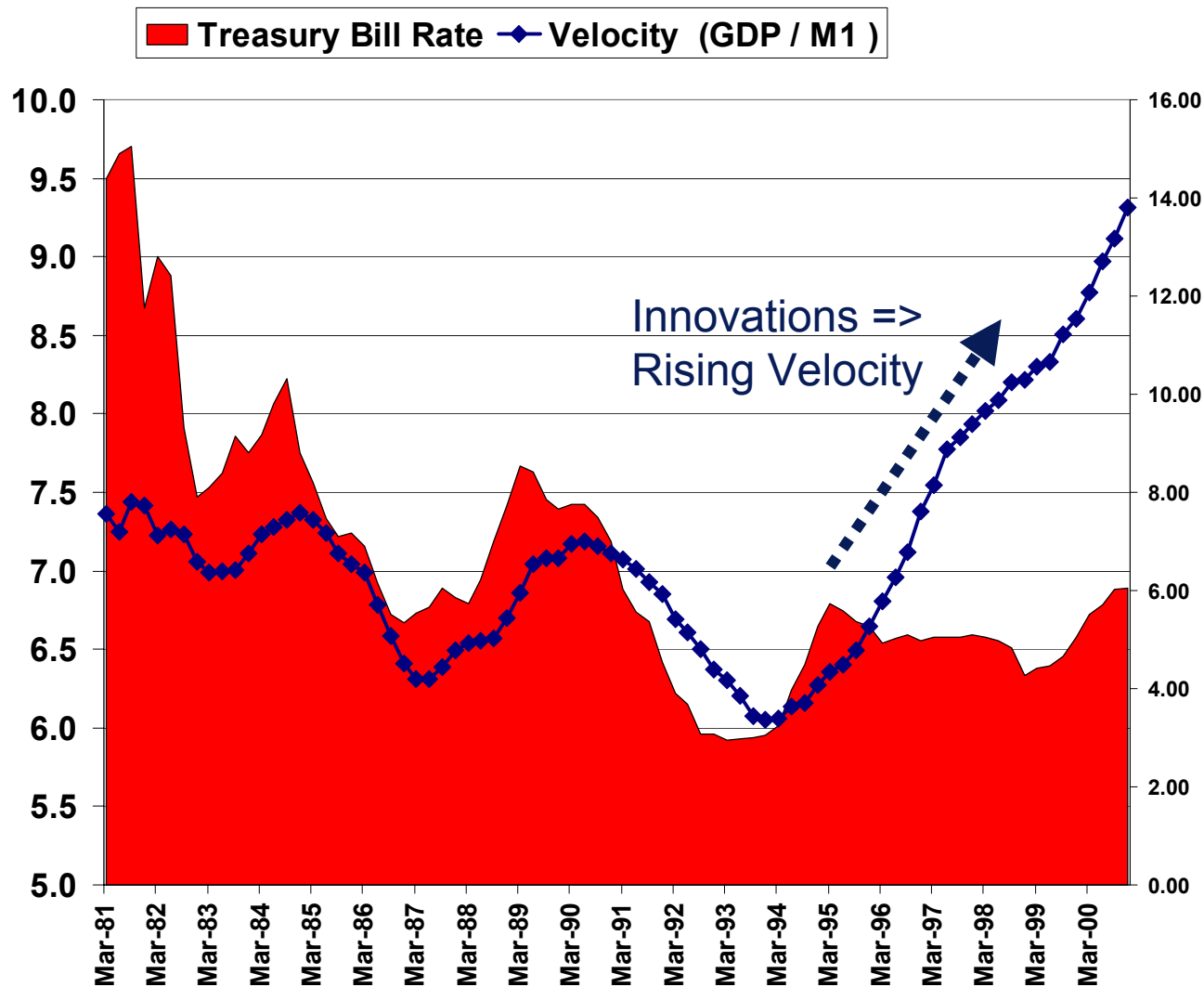
Full Equibrium in both Goods and Money Markets: The "IS-LM" Curves' Intersection

- **LM slopes upward: for a given M/p, higher GDP encourages money holding, thus equilibrium requires a higher i to discourage/offset the GDP stimulus**

- *IS slopes downward: higher GDP encourages higher saving, thus equilibrium requires a lower i to encourage Investment*

i = Interest Rate

$i = L(\ M/p,\ GDP\ )$

$GDP = f(\ i\ ,\ G,\ T\ ,\ GDPW)$

Equil. i

Equil. GDP

GDP = National Spending or Output