A Graphical Exposition of Modern Monetary Theory

This memo provides a primarily non-verbal exposition of Modern Monetary Theory. Modern Monetary Theory (MMT) has been the source of some debate recently. Instead of critiquing the literature, I attempt to illustrate the approaches for "paleo-Keynesians" relying on Wray (2011), Bell (1998), and the interpretations by mainstream macroeconomists Rowe (2011).

The main components of MMT are:
- The interest sensitivity of investment is zero.
- High powered money finances government spending.
- If a government can borrow in its own currency, that is a sovereign currency which will be demanded elastically.
- Below potential output, the price level is fixed; at potential, output is fixed.
- The government will adjust spending to keep output at or below potential.

1. Interpretation in the Neo Classical Synthesis (IS-LM AD-AS)

These components can be interpreted in the IS-LM AD-AS framework thus:
- The IS curve is vertical.
- The LM curve is horizontal.
- The AS curve is horizontal below Y_n, and vertical at Y_n.
- Government spending is endogenously determined, to maintain output below Y_n.
- The central bank and treasury act as single entity, so as to keep the interest rate at target.
- The change in money base demand rises one-for-one with change in wealth, measured as sum of government bonds and money base.

This combination is illustrated in Figure 1; output is initially at $Y_0 < Y_n$, i.e., the economy is experiencing a negative output gap. However, there is no self-correcting mechanism in this economy, as the price level is fixed.

Fiscal policy can shrink the negative output gap, without consequence. An increase in government spending shifts the IS and AD curves out horizontally (blue arrow). There is no crowding out of investment, given (i) the LM curve is horizontal, and (ii) in any case investment is interest insensitive.[1]

Monetary policy is completely ineffective given no exogenous monetary policy is possible (high powered money only increases with government spending). Should interest rates tend to increase for some reason, the central bank-treasury composite will target the interest rate, using open market operations.

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[1] Mitchell (2019) attributes this IS-LM interpretation to Chick's (1973) the extreme Keynesian case.
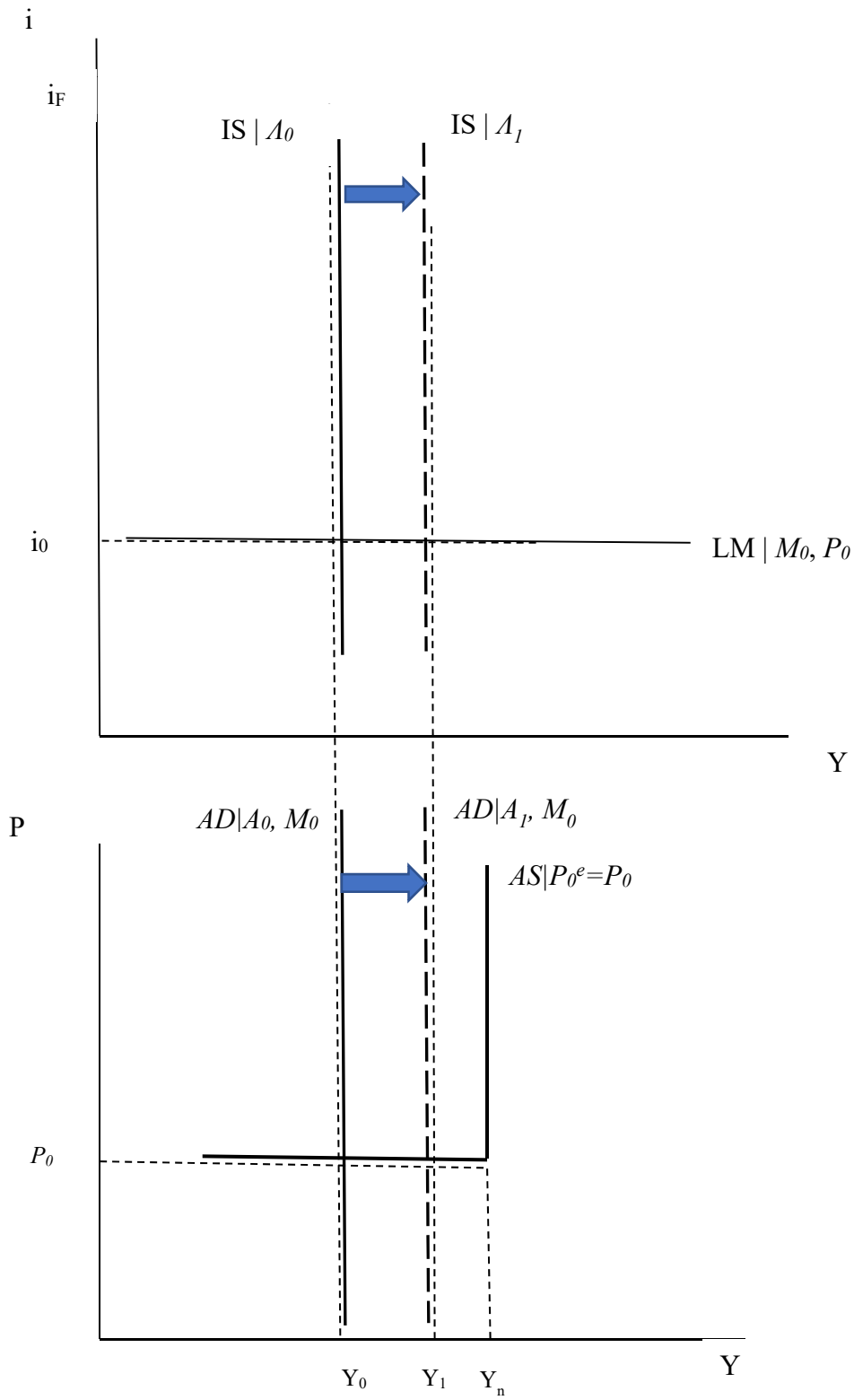
Figure 1: Expansionary fiscal policy, where final output remains below Y_n.

A slightly more complicated outcome results if aggregate demand is increased so as to set Y = Y_n. This is shown in Figure 2.
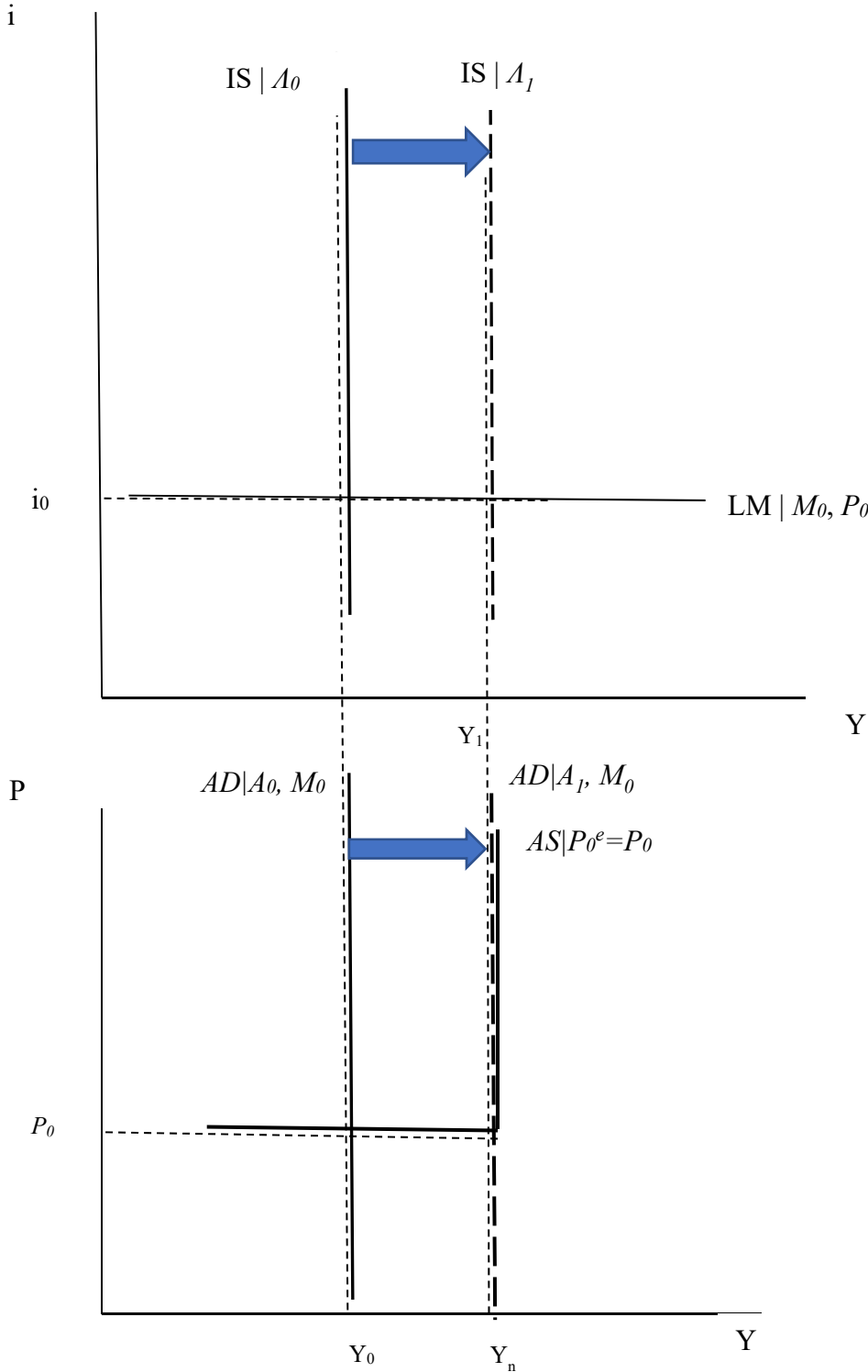

Figure 2: Expansionary fiscal policy, where final output is at Y_n.

Technically, the price level is indeterminate (it could be anywhere at or above P_0). In any case the price level is inconsequential to output, given that the LM curve does not shift with the price level, and even if it did, investment is interest insensitive.

A slightly different result occurs if the AS curve is upward sloping. Incorporating a standard AS curve (as in Blanchard, 2018), where supply equals Y_n such that $P_0=P^e_0$, one obtains Figure 3.
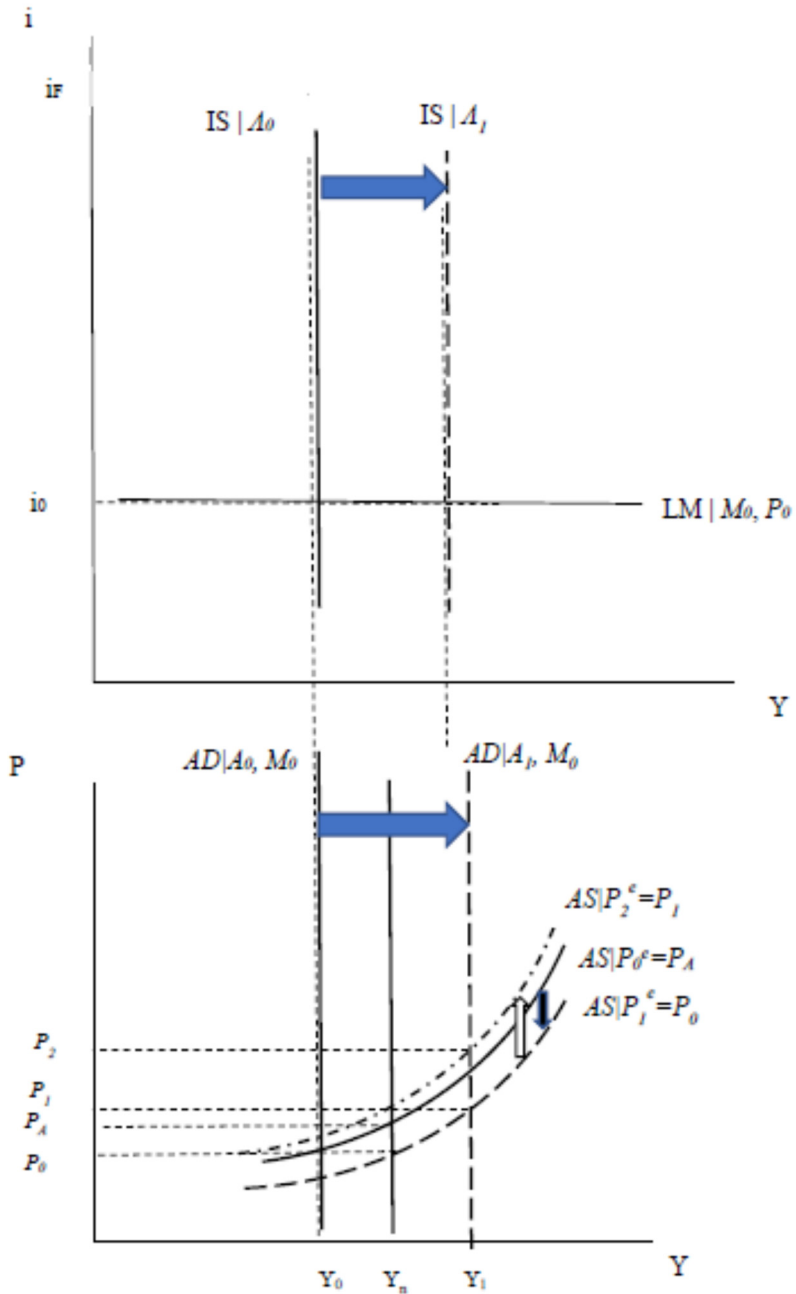

Figure 3: Expansionary fiscal policy, where final output exceeds Y_n

In order to analyze the evolution of macro variables in this case, one needs to define the way in which price expectations are formed. For simplicity, I assume the current expected price level is set to the previous period's price level, *viz.*:

$$P_t^e = P_{t-1}$$

Assuming this price expectations scheme, one can trace out the economy's dynamics. Output begins below Y_n. In period 1, government spending increases shifting out the AD and IS curves (blue arrows). The deficient aggregate demand in period 0 results in a downward shift of the AS curve (black arrow). Output rises to Y_1.

In period 2, output remains above potential output, so the price level rises again (white arrow), and again, and again. This implies that the price level rises continuously.

2. Financing vs. Resource Constraints

The preceding discussion highlights the fact that the government faces no *financing* constraint, although its actions are circumscribed by a resource constraint (the vertical AS curve). Since government spending injects money base, the greater the amount of government spending, the more accommodative monetary policy is. In equations:

$$-P \times (T - G) = \Delta B + \Delta MB$$

Which is the standard government budget constraint. The government will always be able to sell bonds; if not, the central bank will necessarily buy the bonds[2]

Since the central bank/treasury government sector can be treated as a unitary actor, then all bonds can – and will be – purchased by the central bank so:

$$-(T - G) = \Delta \left(\frac{MB^s}{P} \right)$$

Money base demanded elastically because of the requirement that taxes be paid in the national currency (sufficient but not necessary condition). Reductions in quantity demanded are absent since inflation is ruled out (because it is assumed that the government will keep output below Y_n).

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[2] "[I]n that extreme case where nobody wants to buy bonds from the Treasury, the central bank will intervene, or the Treasury will find ways to avoid having no funds in their coffers. They have done so for centuries now due to their privilege in the monetary system. They have done so not only to finance Treasury but also to avoid financial instability that results from a federal government that does not perform its monetary duties properly." Tymoigne and Wray (2013: 27).

3. Math Appendix

Real side:

$$Y = Z$$

$$Z \equiv C + I + G$$

$$C = c_0 + c_1 Y_D$$

$$Y_D \equiv (Y - T)$$

$$T = t_0 + t_1 Y$$

$$I = b_0$$

$$G = GO_0$$

Financial side:
(When private sector fails to buy bonds, which happens whenever bond demand is less than perfectly elastic with respect to interest rate):

$$\Delta \frac{MB^d}{P} = \Delta \frac{MB^s}{P}$$

$$\Delta \frac{MB^d}{P} = \Delta \left(\frac{B + MB}{P} \right)$$

This means that when the stock of outside assets (government bonds and money base) goes up by one billion dollars, money base demand goes up by one billion dollars.

Supply side:

$$P_t = P_t^e \quad \text{for} \ Y_t < Y_n$$

$$P_t^e = P_{t-1}$$

$$Y_t = Y_n \quad \text{for} \ Y_t = Y_n$$

4. References

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