9. Targets and instruments in the conduct of monetary policy

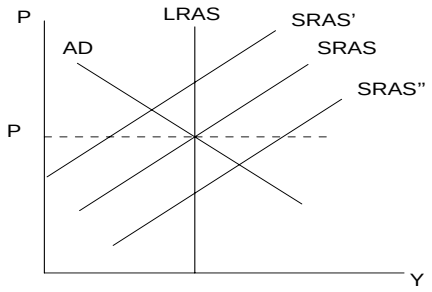
In this lecture we want to discuss:

1. what the objectives of monetary policy are;
2. what is the optimal way (instruments) of achieving them;
3. whether central banks should publicly announce and commit to specific targets.

One can expect the monetary authority to maximize the objective function

$$W_t = -(y_t - \bar{y})^2 - \gamma(\pi_t - \pi^*)^2. \qquad (1)$$

The central bank dislikes deviations of output from its full employment level (this assumes the central bank care about its reputation and does not target a level of output above $\bar{y}$). The monetary authority also dislikes deviations of inflation from a target value π^*. Note that by letting γ vary between zero and infinity the above welfare function can be made consistent with a pure output target ($\gamma = 0$) and a pure inflation target ($\gamma \to \infty$).



One may wonder way the central bank does not target the price level as opposed to inflation. One possible reason is that stabilizing the price level implies higher output variability in the face of supply shocks as can be seen from the above diagram. Shifts in the SRAS imply higher output fluctuations if the price level is kept constant. Higher (lower) prices in the face of negative (positive) SRAS shocks (e.g. an increase (fall) in the price of raw materials) provide an automatic stabilizer as they make firms' profits negatively correlated with

supply shocks.

So, the central bank maximizes equation (1) subject to the SRAS aggregate supply

$$y_t = \bar{y} + a(\pi_t - \pi_t^e) + u_t \tag{2}$$

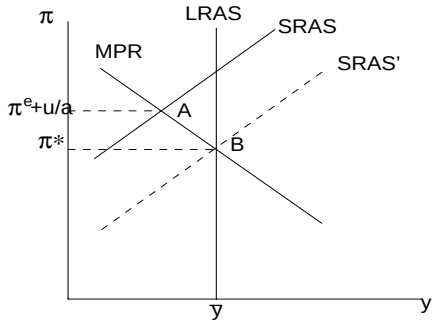
where π_t^e is given by the time monetary policy is set and u_t is a shock with mean zero. The FOC is given by

$$-2(y_t - \bar{y})\frac{\partial y_t}{\partial \pi_t} - 2\gamma(\pi_t - \pi^*) = 0, \tag{3}$$

where the term $\partial y_t/\partial \pi_t = a$ (from equation [2]) indicates that the central bank takes into account that higher inflation increase output for given inflationary expectations. Rearranging (3) then results in the monetary policy reaction function (MPR)

$$(\pi_t - \pi^*) = -\frac{\alpha}{\gamma}(y_t - \bar{y}), \tag{4}$$

that is the combinations of output and inflation that maximize W_t. The objective (*final target*) of monetary policy (from the point of view of the central bank at least) is an output/inflation combination satisfying its optimal trade-off MPR. Note that for given expectations and inflation target the SRAS and MPR fully determine y_t and π_t. If inflationary expectations above the central bank inflation target or a cost-push shock imply that at full employment inflation is higher that π^* (point A) the bank is willing to have output below its full employment level until expectations adjust (point B). Viceversa if inflation is below target at full employment. Note also that the higher is γ - i.e. the higher the relative weight the central bank attaches to inflation stabilization - the further is output away from its natural rate when inflationary expectations differ from the central bank inflation target π^*.



One important thing to notice, though, is that the intersection of the MPR and SRAS curves defines the output/inflation pair that is optimal from the central bank point of view and is consistent with labour market equilibrium (the SRAS curve). The two curves pin down the optimal central bank target, but do not determine how it will be achieved, that is the value of the policy *instruments* (or operational targets) that the central bank can use to achieve ditto target. A related issue is that we have not said anything yet about equilibrium on the goods and asset markets. So the central bank needs to be able to influence aggregate demand in such a way that it takes the optimal (from the CB point of view) value given by the intersection of MPR and SRAS. To do so the central bank can adjust either the quantity of money or the interest rate (in which case it supplies any amount of money that the market demands at the given interest rate).

Let us write the IS and LM equations in a simplified linear form

$$IS\ y_t = \bar{C}_t + c(y_t - \bar{T}_t) + \bar{I}_t - b(i_t - \pi_t^e) + \bar{G}_t \quad (5)$$

$$LM\ \frac{M_t}{P_{t-1}(1+\pi_t)} = ky_t - hi_t + v_t \quad (6)$$

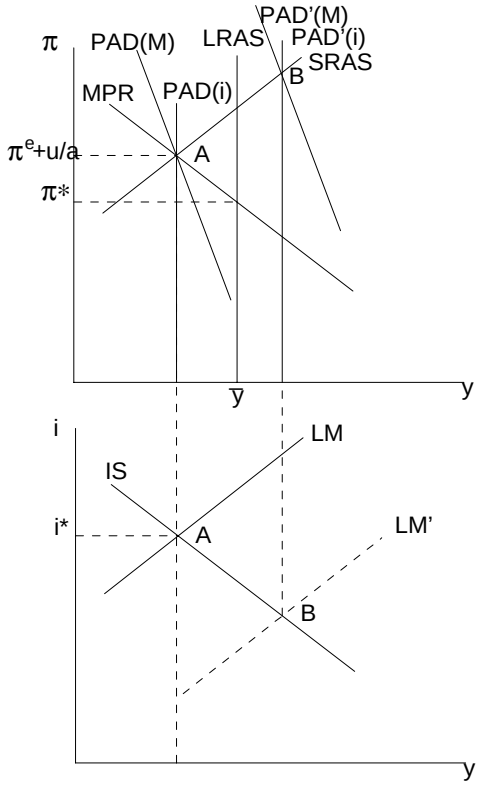
where v_t is a money demand shock and I have replaced for P_t using

$$P_t = P_{t-1}\,(1+\pi_t)\,. \quad (7)$$

If the central bank sets the interest rate aggregate demand is given by the intersection of the IS curve and the $i = i^*$ curve and is independent from the inflation rate. If the central bank sets the money supply an increase in π_t increases P_t (P_{t-1} is predetermined) and

reduces real balances. This increases the equilibrium interest rate and reduces output. So, we can derive a pseudo-aggregate demand curve (PAD) which traces the combinations of output and **inflation** for which both the goods and asset markets are in equilibrium. The PAD is vertical in the inflation/output space under interest rate targeting and downward sloping under money supply targeting. In the figure I denote by PAD(i) the pseudo aggregate supply under inflation targeting and by PAD(M) its counterpart under money supply targeting.

To achieve point A the central bank needs to set the interest rate at i^* which ensures that y it at the desired level or set the money supply M to ensure the same. If the central bank were to set the interest rate lower or the money supply higher (e.g. point B), aggregate demand would be higher than y_d and the central bank would be off the MPR curve with higher inflation and output that it would like[1].



[1]The equilibrium vector has to be consistent with clearing of all markets. So, it is determined by the SRAS and PAD curves. The MPR describes the combination of output and inflation that are optimal from the central bank point of view. But the economy is off the MPR curve if the central bank fails to set its instruments to the appropriate level.

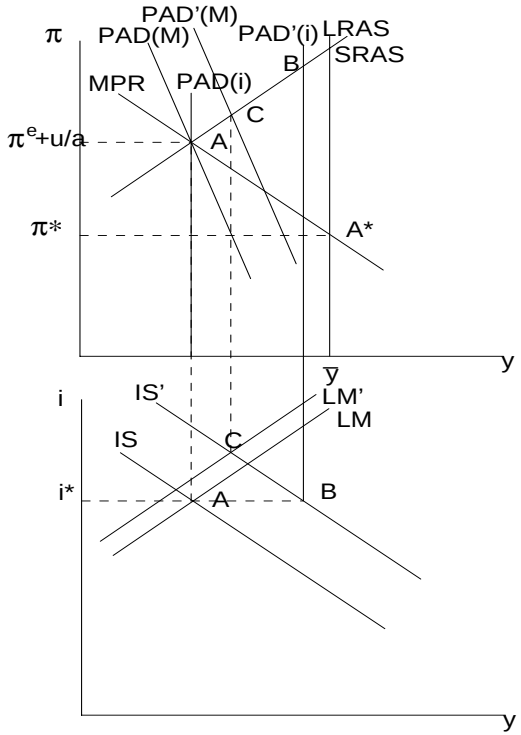
If the central bank could distinguish shocks to the IS and LM curve it would be irrelevant whether it used the money supply M or the interest rate i as its intermediate target. In both cases it would be able to achieve its desired point A.

Things are different, though, because in practice at least over a short time horizon (e.g. one month) central banks can observe interest rates but not output. So they cannot identify whether a change in the interest rate is due to an LM or an IS shock.

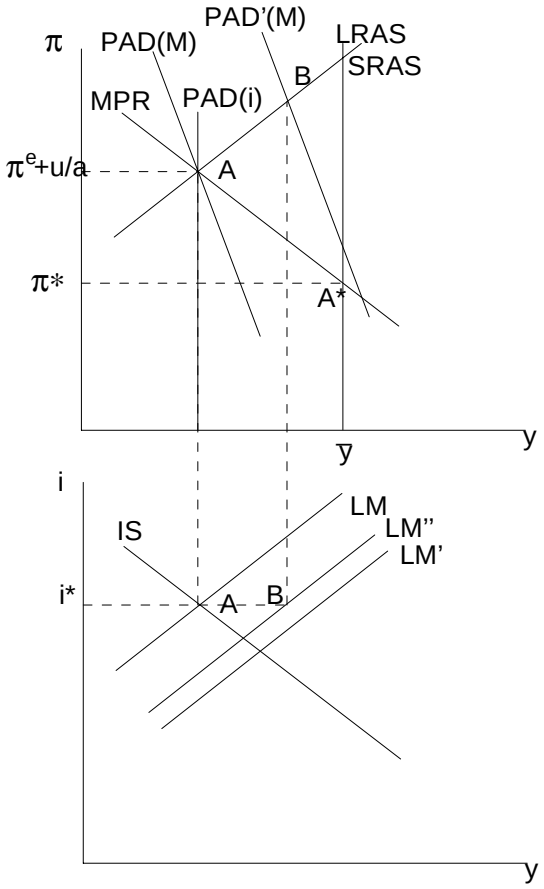
Let us assume for simplicity that the central banks has to set its instrument before shocks (either v_t or changes in the exogenous components of demand) are realized[2]. The instrument is set such that in the absence of any shock the equilibrium will be at point A which is optimal given inflationary expectations.

Consider first a positive shock to the IS curve (IS'). If the central bank has set the interest rate and keeps it constant, output increases and the equilibrium shifts to point B. If instead the central bank has set the money supply and keeps it constant, output increases by less at a given π_t as the increase in the interest rate crowds out private investment and dampens the shock. The equilibrium is at point C, where the LM curve has shifted up to LM' since, at constant M, the increase in inflation reduces real balances. So targeting the money supply implies that, in the face of goods market shocks, the equilibrium is closer (both in terms of output and inflation) to the desired point A than under interest rate targeting.

[2]This is slightly different from assuming that the central banks observes that a shock has taken place but cannot tell whether it is an IS or LM shock.



Consider instead the case of a negative shock v_t that reduces money demand (from LM to LM'). If the central bank has set the interest rate and keeps it constant, aggregate demand is unaffected and the equilibrium stays at point A. If instead it has set the money supply the shift in money demand requires a fall in the interest rate and boosts output at given π_t. The equilibrium moves to point B (the LM shifts partially back to LM" because at constant M the increase in inflation reduces real balances). In the face of asset market shocks using the interest rate as an instrument (or operational target) keeps the equilibrium closer to the optimal one.



So, in the face of uncertainty over the source of shocks the optimal choice of instrument depends on the relative likelihood of goods market versus asset markets shocks. If asset markets shocks are more likely then the interest rate is a better instrument than the money supply. Since assets markets are more volatile than goods markets this explains why most central banks use the interest rate as their operational target.

Note that over a longer horizon, over which additional information enables it to identify the shocks, the central bank would adjust its instrument (whichever) to bring the economy to point A. The central bank can be off its optimal trade-off locus MPR only in the face of unexpected shocks to which it cannot react.

In practice, though, the central bank cannot immediately bring the economy at a point like A since monetary policy affects output and inflation with a substantial and uncertain lag (one to two years). For this reason, Friedman (1959) argued that given these "long and unpredictable lags" monetary policy should adopt an *inter-*

mediate target[3]: the rate of money growth. Furthermore, it should follow a simple rule: keep the rate of money growth constant.

Since the relationship between inflation and the rate of money growth is unstable, the rate of money growth in unlikely to be a reliable intermediate target. As we have seen above, in the face of asset markets shocks would imply that both inflation and output would fluctuate more.

Put it differently, focusing on the intermediate target alone implies overlooking other sources of information. If the relationship between the intermediate and final target is stable, the additional information is redundant. Viceversa, insofar as this information is useful, focusing only on the intermediate target can only be suboptimal.

For this reason, in the long run monetary policy should target the final targets directly.

[3]An intermediate target is a variable which is easier to observe than final targets.

The problem with targeting the final objectives though is that the instrument (e.g. the rate of growth of base money or the nominal interest rate) affect the final target with a lag. So monetary policy cannot target *current* output and inflation. It has to be forward-looking and target the *future* output and inflation. Since future variables are not known, one possibility is targeting the *current forecast* of *future variables*. Future output though is even more difficult to forecast than inflation (inflationary expectations can be recovered from asset prices).

The Bank of England Monetary Policy Committee places great emphasizes on inflation forecasts. It publishes its own, it conducts surveys of private sector forecasts, it uses information in asset prices (yield curve).

Yet, it should be now clear that targeting any intermediate target (in this case the current inflation forecast) without taking into account all available information is unlikely to be optimal.

The morale of this is that replacing an intermediate target with another one is unlikely to be the solution and that the central bank should target the final objective using a structural model of the economy and all useful information available.

This suggests that the current fashion of adopting an inflation target is nothing new: the central bank should use all the information at its disposal to achieve the desired rate of inflation in the long run and an optimal point as long as inflationary expectations have not adjusted. This would be the optimal policy even without an explicit target.

What is new about inflation targeting is that:

1. the target is publicly announced.
2. the target takes the form of a rule. The central bank is publicly committed to it and, in some cases, has to give reasons if the target is not achieved.

The Bank of England has to keep inflation at 2.5% on average. It has to provide explanations to the Treasury if it overshoots or undershoots the target by more than 1%.

The time-inconsistency literature suggests that the above two features are highly desirable. You know that a rigid rule may solve the time-inconsistency problem. On the other hand, it may be too inflexible in the face on unforeseen shocks.

Modern inflation targeting provides a flexible rule. The target has to be achieved on average, allowing for short run stabilization. Yet, the central bank is committed not to deviate systematically from the target. As the target is simple, deviations from it can be more easily identified. This facilitates enforcement of the efficient equilibrium through reputation. Furthermore, unjustified deviations of inflation from the target are costly for the central bank: the cost takes the form of public humiliation or removal of the central banker. You can see this as a form of optimal contract for the central banker.

The contract is neutral if it penalizes equally undershooting or overshooting of the target, as in the case of

the Bank of England target. The contract may induce a deflationary bias if it penalizes overshooting of the target more than undershooting; e.g. the European Central Bank target is keeping inflation below two per cent.

Note also that the central bank cannot do anything to bring the economy to its preferred point A^* unless it is able to affect private agents expectations. So publicly announcing its target may increase the speed to which inflationary expectations converge to π^* and the economy gets to A^*, if the central bank is credible.