10. When monetary policy becomes ineffective: liquidity traps.

A liquidity trap is a situation in which monetary policy becomes ineffective because the policymaker's attempt to influence nominal interest rates in the economy by altering the nominal money supply is frustrated by private agents' willingness to accept any amount of money at the current interest rate.

The traditional theory of the liquidity trap assumed that the LM curve becomes perfectly elastic at some level of the nominal interest. The modern reincarnation of this theory spells out more carefully the conditions that may generate a liquidity trap.

A great deal on the current debate on liquidity traps has been motivated by the prolonged Japanese depression and the apparent inability of the Bank of Japan to do anything about it.

Let us first analyse the transmission mechanism of monetary policy. In our simple IS-LM-AS set up there are only two assets: money and bonds. Money pays a zero (institutionally determined, hence exogenous) nominal interest rate and bonds an endogenous nominal interest rate. For the time being let us consider only the (discrete-time) money market equilibrium condition

$$\frac{M_t}{P_t} = \frac{Y_t}{1+i_t}, \tag{1}$$

which, using Fischer equation, can be rewritten as

$$\frac{M_t}{P_t} = \frac{Y_t}{(1+r_t)}\frac{P_t}{\bar{P}_{t+1}}. \tag{2}$$

Note that I am assuming that individuals have perfect foresight so that $P^e_{t+1} = \bar{P}_{t+1}$ and that, at time t, P_{t+1} which depends on what will happen from $t+1$ onwards is exogenous (i.e. I am not interested in modelling what happens in the future).

Monetary policy (i.e. open market operations) alters the relative supply of money and bonds. Suppose a money expansion policy: the central bank decreases the

supply of bonds and increases the supply of money by exactly the same amount. To induce private agents to reallocate their portfolio from bonds to money the nominal interest rate (the opportunity cost of holding money) has to fall.

Transmission mechanism:

1. Flexible prices (Classical dichotomy holds). $Y_t = Y^*$ and $r_t = r^*$. As the real interest rate is exogenous a fall in the nominal interest rate requires a fall in expected inflation $\bar{P}_{t+1}/P_t$. For given future price expectations, this is achieved by an increase in current prices P_t.

2. Nominal rigidities. If current prices are sticky (assume P_t is fixed throughout the period) and for given future price expectations, expected inflation is fixed. The required fall in the nominal interest rate can only be achieved through a change in the real interest rate r_t.

In the first case the transmission mechanism concerns only goods prices and leaves real (but not nominal) asset returns unchanged. In the second case, the change in the relative supply of assets affects real asset returns and, through this channel, real activity.

The crucial point is: **monetary policy affects the equilibrium if and only if it is able to alter asset returns (be them nominal or real).**

A liquidity trap is a situation in which monetary policy cannot alter asset returns.

If the statutory nominal return on money balances is zero the economy is in a liquidity trap when the nominal interest rate on bonds is zero. The interest rate on bonds cannot fall below zero (otherwise agents would be better off not lending). If the nominal interest rate is zero, agents are indifferent between holding money and bonds and will absorb any increase in the money supply at unchanged asset returns.

In Japan short term interest rates have been very close to zero for a long time.

1 How can a liquidity trap happen?

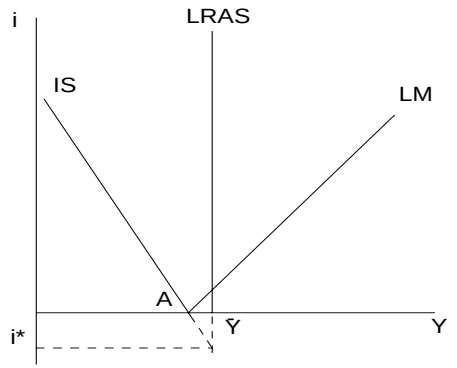
Consider the following (discrete-time) model:

$$LRAS\ \bar{Y} = F(\bar{L}) \tag{3}$$

$$IS\ Y_t = C(Y_t - \bar{T}_t) + I\left((1+i_t)\frac{P_t}{\bar{P}_{t+1}}\right) + \bar{G}_t \tag{4}$$

$$LM\ \frac{M_t}{P_t} = \frac{Y_t}{1+i_t} \tag{5}$$

Equation (3) describes the full employment level of output.



The above figure describes an economy in a liquidity trap (note that the nominal interest rate features on the vertical axis). At given current price level P_t (i.e. at given expected inflation) the demand for goods is "low", in the sense that at zero nominal interest rate it falls short of full-employment output. In other words, saving is too high with respect to investment. At the given level of inflationary expectations $\bar{P}_{t+1}/P_t$, a negative nominal interest rate i^* is required to clear the goods market. A change in the level of the nominal money supply M_t cannot move the economy to the right of point A, where $Y < \bar{Y}$. Monetary policy is ineffective, since increasing the money supply cannot push the nominal interest rate below zero. To the right of point A the money market equilibrium condition (4) is replaced by

$$i_t = 0. \tag{6}$$

The LM coincides with the horizontal axis to the right of point A.

Since we know that it is the real interest rate that clears the goods market, let us consider what happens to the real interest rate.

From Fischer equation

$$1 + i_t = (1 + r_t) \frac{\bar{P}_{t+1}}{P_t}. \tag{7}$$

So if the market-clearing $i^* < 0$, it has to be that either $r^* < 0$ or $\bar{P}_{t+1}/P_t < 1$ or both. For the economy to be in a liquidity trap either the goods market-clearing real interest rate is negative or agents expect a deflation or both.

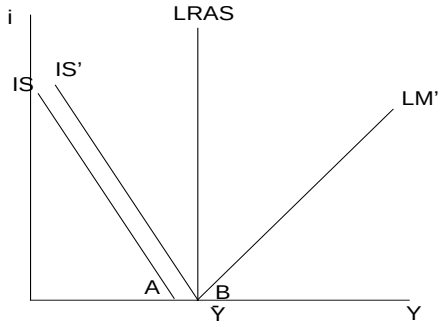
Does the Classical dichotomy fails when the economy is in a liquidity trap, i.e. when the market clearing nominal interest rate is constrained from the zero bound and the money market clearing condition (5) is replaced by (6).

No! Equations (3) and (4) still determine real variable. For given $\bar{P}_{t+1}$, output $\bar{Y}$ and $i_t = 0$, the IS curve still determines the real interest rate. In fact it determines P_t. This pins down expected inflation and, for a given bound on the nominal interest rate $i_t = 0$, the real interest rate. So even if the nominal interest rate hits its lower bound at zero and monetary policy is ineffective, flexible prices ensure that the real interest rate takes whatever value (negative if necessary) it takes for the goods market to be in equilibrium at the full-employment level of output. For example at point A current prices P_t would decrease so that expected inflation is high enough[1] for the real interest rate to fall to the value that is consistent with full employment. The fall in P_t and the increase in expected inflation shift the IS curve to the right until it intersects the LRAS (point B in the figure below).

But what if the current price level P_t is sticky (assume it is fixed)? Expected inflation is fully pinned down and cannot increase to induce the required fall in the real interest rate. At $i_t = 0$, the real interest rate cannot change and the IS curve determines the equilibrium level of output. The economy is stuck at point A at less than

[1] Think about it, the current price *level* has to *fall* for inflation (the *change* in the price level) between today and tomorrow to *increase* to the required level.

full employment until prices fall to reduce the real interest rate. In the meantime the economy is in recession.



Japan is in the most prolonged recession ever seen since the Great Depression. Short term nominal interest rates are virtually zero and prices are falling.

2 How does an economy end up in a liquidity trap?

It has been argued that the fall in wealth associated with the crashing of the 90s asset markets (stocks and land) bubble and the need to save for retirement in the face of a shrinking population have depressed consumption. This coupled with the fall in investment following the asset market crash and fed by the current unwillingness of Japanese banks to lend have shifted the IS curve to the point where the equilibrium real interest rate in Japan is negative. Furthermore, since prices have been falling for some time, expectations of more deflation may also have set in, further preventing the real interest rate from becoming negative.

3 How to get out of a liquidity trap?

The economy needs higher (goods) demand at any level of the interest rate (a rightward shift in the IS curve). If investment demand is to rise (that is ruling out changes in taxes or government expenditure) then the economy needs higher expected inflation for the real interest rate to fall in the face of a zero bound on nominal rates. If current prices cannot fall the real interest rate cannot decrease by the amount necessary to clear markets.

Possible solutions (the IS has to shift):

1. The traditional solution proposed to exit a liquidity

trap is an expansionary fiscal policy to increase aggregate demand at any level of the real interest rate. The necessary increase in fiscal policy depends on the size of the multiplier of government expenditure and/or taxes. Japan has engineered a large fiscal expansion over the past year, yet the result have not been dramatic. We know that if agents are forward looking consumption may not be much affected by fiscal policy as individuals realize that taxes will go up in the future to pay for current expenditure.

Furthermore, these efforts have resulted in a dramatic increase in the level of debt, inducing many people to question the ability of Japan to continue with this policy without becoming insolvent.

2. Note that if there are more than two assets in the economy, monetary policy could still be effective as long as there are assets which yield a positive return (e.g. long term bonds or stocks) which the central bank can use for open-market operations. So a liquidity trap requires that the return on <u>all</u> assets which can be used for such a purpose is zero.
In practice, there may be pretty compelling reasons for not wanting a central bank or the government to conduct open market operations in shares as this would be equivalent to nationalisation of private industry.

3. Alternatively the required increase in expected inflation can be achieved through a higher future price level. This requires a *credible* commitment by the Bank of Japan to create inflation, that is increase the *future* price level P_{t+1}. It has been suggested that the BoJ should therefore adopt an inflation target, that is announce that it wants to keep the rate of inflation at a level high enough to engineer the necessary fall in the real interest rate. The BoJ though has been extremely reluctant to create inflation for fear of blemishing its reputation for independence and inflation aversion (this is a blatant case in which discretion is

better than rules).

4. There is an alternative possibility which involves taxing money. Up to now we have assumed that the exogenous nominal return on money is zero. If a tax on money holdings is introduced, the opportunity cost of holding money would not be the nominal rate on bond i_t but $i_t - i_t^M$ where i_t^M is the statutory fixed nominal return on money balances. The LM curve would then be

$$\frac{M_t}{P_t} = \frac{Y_t}{1 + i_t - i_t^M}. \tag{8}$$

   If i_t^M is negative, the opportunity cost of holding money could still be positive even if i_t were negative. Agents would still respond to an increase in the money supply by switching to bonds pushing their nominal rate of return below zero.

   The problem is that taxing money may be difficult since it is a bearer asset (that is why it is difficult to tax the black economy).

The final message is that getting out of a liquidity trap may be extremely difficult since fiscal multipliers may be small and because expectations may be difficult to alter (credibility). The best advice is to avoid ending up in such a situation to start with.

For this reason it is argued that central banks should not target a zero inflation rate, since by doing so they give up the ability to stabilize the economy if a shock requires a negative market-clearing real interest rate.

Friedman's rule which prescribes to target a rate of inflation resulting in a zero nominal interest rate runs exactly this kind of risk.