ECON 3410/4410
LECTURE 8
Extra slides on the interpretation of the closed economy dynamic AD-AS model

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The IAM book shows evidence from Denmark that confirms a close relationship between private sector demand and the real interest rate over time.

The real interest rate and the private sector savings surplus in Denmark, 1971-2000. Per cent

Source: Erik Haller Pedersen, 'Udvikling i og måling af realrenten', Danmarks Nationalbank, Kvartalsoversigt, 3. kvartal, 2001, Figure 6
IAM: Evidence from the euro area seems to confirm the Taylor rule as a proxy for monetary policy

The 3 month nominal interest rate and an estimated Taylor rate for the euro area, 1999-2003. Per cent

The transmission mechanism: Term structure of interest rates

- The rate of interest $r$ in the aggregate demand function is interpretable as an yield on long term bonds (10 years for example), a so called long interest rates.

- What monetary policy controls (directly or indirectly) is the very short interest rate, the money-market interest rate.

- How can the central bank control the interest rate which is relevant for aggregate demand?

- Answer: When capital markets are operating according to theory a change in the money market rate will be transmitted automatically to the long rates!
The expectations theory of the term structure of interest rates

- Investment decisions depend on the expected cost of capital over the entire life of the asset (easily +10 years)

- To what extend does the short-term policy rate influence long-term interest rates?

\[ (1 + i_t^l)^n = (1 + i_t) \times (1 + i_{t+1}^e) \times (1 + i_{t+2}^e) \times \ldots \times (1 + i_{t+n-1}^e) \]

- If short-term and long-term bonds are perfect substitutes (risk neutral investors) then the following arbitrage condition will hold

\[ i_t^l \approx \frac{1}{n} (i_t + i_{t+1}^e + i_{t+2}^e + \ldots + i_{t+n-1}^e) \]

- Taking logs and using the approximation \( \ln(1 + i) \approx i \)

\[ i_t^l = i_t \quad \text{iff} \quad i_{t+j}^e = i_t \quad \text{for all } j = 1, 2, \ldots, n - 1 \]
However: in 2001, U.S. long-term interest rates kept a steady level even as the short-term policy rate fell: The transmission was weak.

The Federal funds target rate (U.S. policy rate) and the yield on 10 year U.S. government bonds, 2001-2002. Per cent

Source: Danmarks Nationalbank
Policy priorities implied by the Taylor rule coefficients seem to vary across countries

Estimated interest rate reaction functions of four central banks

<table>
<thead>
<tr>
<th></th>
<th>Estimate of</th>
<th>Estimation period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$h$</td>
<td>$b$</td>
</tr>
<tr>
<td>German Bundesbank$^1$</td>
<td>0.31</td>
<td>0.25</td>
</tr>
<tr>
<td>Bank of Japan$^1$</td>
<td>1.04</td>
<td>0.08</td>
</tr>
<tr>
<td>US Federal Reserve Bank$^1$</td>
<td>0.83</td>
<td>0.56</td>
</tr>
<tr>
<td>European Central Bank$^2$</td>
<td>0.74</td>
<td>0.82</td>
</tr>
</tbody>
</table>


\[ i = \bar{r} + \pi + h \cdot (\pi - \pi^*) + b \cdot (y - \bar{y}), \]
The slope of the Aggregate Demand curve that is defined by the model will reflect the priorities of monetary policy.

Illustration of the aggregate demand curve under alternative monetary policy regimes (indicated by the choice of coefficients h and b in the Taylor rule).
Where “is” the money market?

- The Taylor-rule pushes the money market that we know from the IS-LM model “into the background”.
- This is OK in many ways, as long as it does not lead to misunderstanding like
  - “There is no role for money in the model”
- The money market is always “in the model”---only that it is not always explicit.
The money market in a period-to-period equilibrium (i.e. short-run)

Real Money supply

Real money demand $L(Y_t, i_t)$

$(M_t/P_t, i)$
Consider a money targeting regime: In each period the money supply is set by the central bank.

\[
\frac{M_t}{P_t}
\]

Real Money supply in period \( t \)

\[
L(Y_t, i_t)
\]

Real money demand in period \( t \)

Interest rate in period \( t \)
Interest rate function in a money targeting regime

The money graph in previous slide defines:

\[ i_t = i(Y_t, M_t/P_t) \]

where \( Y \) and \( M/P \) are regarded as determined outside the money market, \( M/P \) being the policy instrument.

- If we define a long-run interest rate by inserting the long run values of the arguments in the \( i \)-function and then take the deviation between \( i_t \) and the long-run rate, we obtain a function that is qualitatively similar to the Taylor-rule. With one important difference:
  - In the money targeting regime the derivatives of the \( i \)-function are already given by the properties of the money demand function.
  - In the Taylor-rule the corresponding parameters \( h \) and \( b \) transpires to be “free parameters”, to the chosen by the central bank (see next lecture)

- Note: IAM p 504-506 contains a more detailed comparison/derivation of the two interest rate functions
The money market with a policy determined interest rate

If the coefficients of the Taylor-rule are "free-parameters", reflecting the priories of the central bank that sets the interest rate, the money market operates like this:

Real money supply is then an endogenous variable.
Since the price level is pre-determined in any given period, it is the nominal money stock that adjusts immediately to bring the market into equilibrium. The Central Bank does this by market operations.
The AD-schedule is regime dependent

- Although it is OK for some purposes to use the Taylor-rule as a “catch all” for monetary policy, as IAM does, it is also obscuring the important fact that
  1. The response of aggregate demand (the impact multipliers of you like) to for example an increase in $g$ is dependent on the monetary policy regime.
  2. This point is going to be even more important when we later move to the open economy.
The impression may be that we have simplified so much that dynamics have almost been removed from the demand side.

Still there is one source of dynamics left: the real interest rate is an expectations variable---which is a source of dynamics.

This will be important when we establish the long-run and short-run versions of the AD-AS model.