Loanable funds theory and Keynes’s liquidity preference theory

The Loanable funds theory

Hypotheses:
- Individuals care only about real variables (output gains or losses, purchasing-power gains or losses).
- The marginal productivity of capital assets (MP$_K$) is given and determined by the technical characteristics of the productive assets. It represents the gain, in terms of output, obtained by increasing the capacity of production by one additional capital asset. The higher the MP$_K$, the higher the real interest has to be not to give the incentive to invest.
- The time preference of individuals ($t$) is given by the taste of individuals. It represents the impatience of individuals: what individuals are ready to give up today, in terms of output, in order to consume more in the future. The higher their time preference (people do not like to save), the higher the real interest rate (the reward) must be in order to give the incentive to save.
- Entrepreneurs want to maximize their real profit $\Pi/p = q(K, N) - wN - rK$, with $w$ the real wage and $r$ the real rate of interest. In order to do so, they must determine the amount of $N$ and the amount of $K$ which are given by:
  - $d(\Pi/p)/dN = 0 \Rightarrow q'(N) = w \iff MP_L = w$: demand for labor.
  - $d(\Pi/p)/dK = 0 \Rightarrow q'(K) = r \iff MP_K = r$: demand for capital.
- Individuals want to maximize their utility by arbitraging between present consumption and future consumption (and so saving): $U(C_0, C_1)$. They do so under the constraint of their intertemporal budget constraint: $R_0 + R_1/(1 + r) = C_0 + C_1/(1 + r)$ with $R$ the real income, and $r$ the real rate of interest. The level of $C_0$ and $C_1$ are determined by ($\lambda$ is the factor attached to the budget constraint in the Lagrangian):
  - $dU/dC_0 = 0 \Rightarrow U'(C_0) = \lambda$.
  - $dU/dC_1 = 0 \Rightarrow U'(C_1) \times (1 + r) = \lambda \iff U'(C_0)/U'(C_1) = 1 + r \iff 1 + t = 1 + r$
  - $dU/d\lambda = 0$

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1 The time preference is defined by the marginal rate of substitution between $C_0$ (present consumption) and $C_1$ (future consumption). The MRS is derived by taking the total differential of $U$ and equalizing it to zero:

$$dU = U'(C_0)dC_0 + U'(C_1)dC_1 = 0 \Rightarrow -dC_1/dC_0 = U'(C_0)/U'(C_1) = 1 + t$$

It shows how much more $C_1$ you want to have if $C_0$ decreases by one unit: $dC_0 = -1 \Rightarrow dC_1 = 1 + t$. If $t > 0$, individuals have a preference for the present. Thus if $r < t$, an individual will prefer to consume today.
- To simplify, one assumes that the capital equipment is completely used up after one period: demand for capital assets is equivalent to demand for investment.
- It is assumed that the preceding microeconomic reasoning applies at the macroeconomic level.

In the loanable funds market:
- The supply of loanable funds comes from the individuals who want to save. They are the lenders.
- The demand for loanable funds comes from the entrepreneurs who want to buy capital assets (i.e. to invest). They are the borrowers.
- Negotiations in the loanable market are made in terms of real rate of interest: savers can lend at \( r \), and entrepreneurs have to borrow at \( r \).

Thus for the entrepreneurs:

<table>
<thead>
<tr>
<th>Marginal Gain</th>
<th>Marginal Cost</th>
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<tbody>
<tr>
<td>( MP_K )</td>
<td>( r )</td>
</tr>
<tr>
<td>( MP_K &lt; )</td>
<td>( r )</td>
</tr>
<tr>
<td>( MP_K = )</td>
<td>( r )</td>
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</tbody>
</table>

And for the individuals:

| Marginal Gain | Marginal Cost |   |
|---------------|--------------|
| \( r \)      | \( t \)      | Save more (lend more) |
| \( r \)      | \( t \)      | Consume more (lend less) |
| \( r \)      | \( t \)      | Stay the same            |

The equilibrium in the market is determined by \( r = t = MP_K \). At this equilibrium level, both savers and investors are the happiest possible.

Consequence: An increase in investment *will* increase interest rates automatically.
The simple liquidity preference theory in the General Theory: interest rate on consols determined by the supply and demand for cash

Hypotheses:

- Individuals care about nominal values: capacity to stay liquid and solvent (concerns about inflation are included inside these preoccupations).
- There are only two financial assets, money and bond, and the arbitrage is made in function of the rate of interest. Money does not pay any interest and so keeping money rather than bond has an opportunity cost (interest payments).
- The price of bonds is $p = C/i$, with $i$ the nominal rate of interest. Thus $p'(i) < 0$, and so if individuals expect interest rate to go up they are “bears” (expected decrease in price).
- The demand for a stock of cash depends on four motives: transaction (because of difference between income and expenditures timing), precaution (because of possible future small contingencies), speculation (because of possible capital losses in financial markets), and finance (because of expected future demand). The demand for transaction, precaution, and finance is noted $L_1$, while the demand for speculation is noted $L_2$.
- We have $L_1(Y, E(Y))$ and $L_2(i, E(i))$ with
  - $L_1'(Y) > 0$ (a higher amount of expenditure leads to a need of more money)
  - $L_1'(E(Y)) > 0$ (the higher the expected demand, the higher the production to implement, and so the higher the need of money)
  - $L_2'(i) < 0$ (the higher the interest rate, the higher the cost of staying liquid, and so the lower the desired amount of cash for speculation)
  - $L_2'(E(i)) > 0$ (The more the interest rate is expected to go up, the higher the bearishness, and so the higher the demand for cash for speculation).
- To simplify, the money supply is assumed to be given (which is true at a point of time) even if, actually, its supply is endogenously determined by the needs of economic agents. Because $M$ is given and not determined by individuals, there can be an excess of money or a scarcity of money, depending on the demand for money by individuals.
- Liquidity preference represents the propensity to hoard the existing stock of money $L = \alpha M$, with $\alpha$ the liquidity preference of individuals. If $\alpha = 1$, individuals are perfectly happy with the amount of money existing in this economy: the existing amount of money satisfies all their four needs for cash.
- There is a convention in the bond market about the normal rate of interest. This convention is an anchor for the expectation of future interest rate which is determined in the following way:
\[ E(i) - i = f(i_n - i) \Leftrightarrow E(di) = f(i_n - i) \]

With \( di \) the change in interest rate. Thus, the higher the difference between the normal rate and the current interest rate, the higher the expected change in the interest rate.

Thus we have:

<table>
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<tr>
<th>Money supply</th>
<th>Money demand</th>
<th>Condition</th>
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<tr>
<td>( M ) &gt; ( L )</td>
<td>( L )</td>
<td>Excess of money (( \Delta i &lt; 0 ))</td>
</tr>
<tr>
<td>( M ) &lt; ( L )</td>
<td>( L )</td>
<td>Shortage of Money (( \Delta i &gt; 0 ))</td>
</tr>
<tr>
<td>( M ) = ( L )</td>
<td>( L )</td>
<td>Equilibrium (( \Delta i = 0 ))</td>
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An increase in the money supply leads, given income and expectations, to an excess of money supply. Therefore, some individuals have too much money and they will try to depart from it by increasing their demand for bonds. The price of bond will go up (interest rate will go down). This has two direct effects:

1- Given the normal rate of interest, the proportion of bears will start to rise progressively. In the end, the effect of the increase in the money supply is eliminated when the interest rate has decreased enough to equilibrate the bulls and bears. There is no excess money in the economy.

2- Lower interest rate decreases the opportunity cost of holding money and so encourages to hold more money.
\[ \Delta L_2 > 0 \]
\[ \Delta M > 0 \rightarrow M > L \rightarrow \Delta p > 0 \text{ (i.e. } \Delta i < 0) \rightarrow \Delta(i_n - i) > 0 \rightarrow \Delta E(\Delta i) > 0 \rightarrow \Delta L_2 > 0 \text{ (some individuals become bears: rightward shift in } L) \].

There are also some indirect effects that may contribute to the equilibrium because a decrease in interest may promote investment and so may increase income and so the demand for money for transaction and precaution (and finance if expectation of future demand are affected). This may or may not lead to an increase in interest rate or not.

\[ \Delta i < 0 \Rightarrow \Delta I > 0 \Rightarrow \Delta Y > 0 \Rightarrow \Delta L_1 > 0 \Rightarrow \text{additional shift in } L \Rightarrow \Delta i > 0 \text{ given the money supply and the other needs for cash.} \]
Comparison between loanable funds theory and liquidity preference theory.

<table>
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<th>Hypotheses</th>
<th>Loanable funds theory</th>
<th>Liquidity preference theory</th>
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<tr>
<td>-Agents care about real values.</td>
<td>-The economy is intrinsically a barter economy: money is a veil.</td>
<td>-Agents care about nominal values</td>
</tr>
<tr>
<td>-The economy is intrinsically a barter economy: money is a veil.</td>
<td>$C - M - C' \text{ with } C' &gt; C$</td>
<td>-The economy is a monetary production economy: the economy starts with money (finance) and ends with money (monetary profit)</td>
</tr>
<tr>
<td>-Inflation is a monetary factor.</td>
<td></td>
<td>$M - C - M' \text{ with } M' &gt; M$</td>
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</tbody>
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<tr>
<th>How is the interest rate determined?</th>
<th>Equalization of the supply and demand of loanable funds, i.e. equalization of saving and investment.</th>
<th>Equalization of the stock of cash and the demand for cash.</th>
</tr>
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<tbody>
<tr>
<td>Implications</td>
<td>The interest rate is determined by real factors: $\text{MP}_K, t \rightarrow r$</td>
<td>The interest rate is determined by monetary factors: $\text{LP}, M \rightarrow i$</td>
</tr>
<tr>
<td></td>
<td>$i = r + p^* \text{ (with } p^* \text{ expected inflation)}$</td>
<td>Money is a ‘real’ factor: money can affect the real economy (either via the cost of money (i) or via expectation (mek)).</td>
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<tr>
<th>Effect of an increase in $I$</th>
<th>An increase in investment will automatically increase $r$ (and so $i$).</th>
<th>An increase in investment may or may not increase $i$.</th>
</tr>
</thead>
</table>

-Additional remarks on the full version of the liquidity preference theory. (for graduate students)

Each asset is assumed to have an own-rate of interest:

$$\Gamma_j = q_j - c_j + I_j$$

with $q$, $c$, and $l$ measured in terms of the asset:

- $q$: the quasi rent (explicit rate): the expected rate of profit from the sale of the output, or income, provided by an asset.\(^2\)
- $c$: the carrying cost (explicit rate): cost incurred by holding an asset (wastage, insurance, depreciation, and interest payments)

\(^2\) Note that $q$ does not depend only on the process of production: it involves sales. But the sales are recorded in commodity-terms rather than money-terms. $q$ refers to the sales of output net of wage payments, to the coupon payments on a bonds, to the dividend payment on a shares: all net income received from an assets are included there.
- 1: the liquidity premium (*implicit* rate): subjective gain in terms of confidence and convenience obtained by owning an asset that one knows s/he can depart from easily if s/he needs money.

In order to compare the own-rate of interest, a common standard of measurement has to be defined. Money is usually used as standard so the money-rate of interest of an asset \(j\) is:

\[
R_j = q_j - c_j + l_j + a_j
\]

with \(a_j\) the expected increase/decrease in the money-price of the asset \(j\) (and so the potential capital gains or capital losses), and \(q, c, l,\) and \(a\) measured in monetary terms.

Each asset has different characteristics and so different values for \(q, c, l,\) and \(a:\)

- capital assets (asset 1): \(R_1 = q_1 - c_1 + a_1\) \((l_1 = 0: \text{it is very hard to sell them back unless there is an organized market})\)
- inventories: \(R_2 = a_2 - c_2\) \((q_2 = 0: \text{inventories do not produce anything, } l_2 \to 0)\)
- money: \(R_m = l_m\) \((l_m \text{ is the highest of all } l\text{'s relative to } c, \text{ and } c_m \to 0)\)

All assets have their interest rate that decreases with the quantity of assets available: \(q, c, l, a\) are a function of the quantity of asset \(j\) \((A_j)\). Indeed:

- \(q'(A_j) < 0\): higher production leads to higher supply and so given the demand, the monetary profit decreases because prices decrease (both spot price and expected price)
- \(c'(A_j) > 0\): higher quantity means higher wastage, higher depreciation, higher insurance on inventories.
- \(l'(A_j) < 0\): If there is plenty of an asset, the implicit liquidity premium obtained from an asset decreases because it is not scarce.
- \(a'(A_j) > 0\): higher quantity of an asset means lower its spot price. Given expectation about the future, the spot price decreases relative to the forward price. (More generally, the effect is undetermined if forward prices are affected by the spot prices).

**Hypothesis of Keynes**: Due to the special properties of money, \(R_m\) is the rate that decreases at the lowest pace (because \(l_m\) does not decrease fast with the quantity of money (except in period of hyperinflation)).
Therefore, the money-rate on money “rules the roots” and determine the minimum required interest rate that other assets must fulfilled in order to be produced. For a given state of long-term expectation, the equilibrium is given by the equalization of all the money rates, on all assets:

\[ q_1 - c_1 + a_1 = a_2 - c_2 = l_m \]

Note that the explicit money-rate on money is zero: \( R_m = 0 \). But this does not mean that \( l_m = 0 \) and so the required yield in the market in order to depart from money is not zero.

\( l_m \) does not represent an actual yield, it is only a required yield that other assets than money must reach in order to give an incentive to individuals to depart from money:

- if \( R_j > l_m \): individuals are ready to buy more of an asset or to produce more of it \( \Rightarrow \Delta q - c < 0 \), \( \Delta a < 0 \) \( \Rightarrow \Delta R < 0 \) until equilibrium
- if \( R_j < l_m \): individuals want to sell the asset \( j \) or to produce less \( \Rightarrow \Delta q - c > 0 \), \( \Delta a > 0 \).

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3 If risk premiums were included, as Keynes suggested they should be (Keynes 1936, 240), the equality is true for assets of the same class of risk.