Endogenous Money and the (Real) Rate of Interest. A Comment on Marc Lavoie

Karl Betz

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Endogenous Money and the (Real) Rate of Interest

A Comment on Marc Lavoie

Karl Betz¹

Summary: In contrast to Keynes' theory, the rate of interest is not modelled as a price for parting with cash but as a price required by wealth owners for holding (the national) currency. Thus the equilibrium discount rate of the central bank can be seen as determined by market forces. In consequence involuntary unemployment may occur at positive equilibrium rates of interest and is not limited to the zero lower bound.

Subject(s): Monetary Policy; Discount Rate

JEL: E 43; E520

Hochschulschriften Standort Meschede 4/2015

¹ Karl Betz is a lecturer at the FH SWF.
Contents

The Theory of the Policy Rate ............................................................ 1
The Accounting Part .......................................................................... 4
Preferences (Behavioral Equations) .................................................. 7
Credit and Asset Market .................................................................... 8
Comparative statics and a few consequences .................................... 10
Fiscal policy and Monetary policy .................................................... 11
Conclusion ........................................................................................ 13
References ......................................................................................... 16
Endogenous Money and the (Real) Rate of Interest

A Comment on Marc Lavoie

Karl Betz²

While I subscribe to everything Marc has to say about endogenous money I brutally differ in the explanation of the rate of interest.

But let me even here first note the areas of agreement. Marc correctly argues, that there is not one rate of interest but a vector of interest rates. But that never the less the target rate of the central bank is the anchor to that vector of interest rates. He furthermore explains the structure of interest rates by the liquidity preference of wealth owners.

I would (in fact did: Betz 2001) go a step further here, introducing preferences of borrowers as well, so that the supply of and demand for assets of different maturities can be coordinated through changes in relative interest rates with out any need for the central bank or the government to step in and adjust quantities to demand.

But I judge this to be a minor difference, while the main question is, whether the central bank rate can be explained by recourse to market forces, or whether it has to be taken as exogenous, emanating from some justice consideration of the central bank as Marc basically proposes (Lavoie, p. 237, equation 4.1).

The (Theory of the) Policy Rate

Let me start with a few strategic considerations:

If demand is interest elastic you can raise employment as long as you can lower the rate of interest. In the case of endogenous money the rate of interest is set by the central bank. Therefore unemployment – at least in the medium to long term – can't persist if not

² I would like to thank Marc Lavoie, Martin Ehret and Benedikt Weihmayr for their comments on an earlier version of this paper.
- either we talk of a bunch of misanthropic central bankers
- or the central bank has already hit the zero lower bound
- or if there are market forces, which prohibit a further reduction in its policy rate.³

I would leave the first alternative to political science. The second occurs historically relatively rarely (although it applied recently), leaving us with the third.

While Keynes' aim to explain the possibility of an equilibrium with involuntary unemployment seems very adequate considering decades of mass-unemployment in Europe, one would be relegated to some version of NAIRU⁴, if one couldn't explain a positive central bank rate.

Now, if there is some market force which requires a minimum policy rate, than this can only stem from the demand for money, because credit supply determines a margin above the central bank rate (reflecting the probability of default), but not the CR rate itself.

\[ r_{CR} = r_{CB} + u \quad (1) \]

with \( r_{CB} \) as the policy rate (the cost of refinance), \( u \) some mark up by banks, reflecting the uncertainty of repayment and \( r_{CR} \) as the rate of interest demanded on credit. Here I don't go into the question, whether the supply curve for credit is interest elastic or not.⁵ For the task at hand it is sufficient to point out, that the central bank rate enters the credit supply function of banks as a shift parameter. So we have:

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³ I don't rely on an interest elastic demand for investment. Just as the demand for labour is output divided by labour productivity, the demand for investment in a stationary state equilibrium has to be modelled as output by capital productivity times the rate of depreciation. While productivity may react to the rate of interest, reswitching tells you, that the direction of that reaction is not to be taken for granted. So my argument rests on an interest elastic multiplier: A lower rate of interest implies a higher wage share and therefore a higher (average) marginal propensity to consume.
⁴ Which basically relabels involuntary unemployment full-employment by interpreting involuntary unemployment as voluntary unemployment.
⁵ It might be, if f.i. a higher volume of credit required a higher leverage ratio, or if it required a higher share of bonds in non-bank-portfolios to consolidate credit. But I don't touch these points in this paper.
Please note, that that was NOT the case in Tobin's model (Tobin (1969)). Given a zero rate of interest on currency AND an exogenously determined quantity of money, the structure of interest rates is determined by (nominal) credit demand, as additional credit requires a lower portfolio share of currency. With money being endogenous this strategy no longer works. The central bank accommodates currency demand at its policy rate. So an exogenous policy rate seems to replace an exogenous money supply.

But it is here, where I beg to differ. I will argue instead, that the real rate of interest has to be seen as a price which the public requires for holding money. That it is a compensation for holding money (instead, as with Keynes, a compensation for temporarily parting with it).

Therefore portfolio decisions of (wealth owners) households will have to enter the model.

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6 It didn't work in the first place, because it is the real amount of credit which is decisive, while it is the nominal quantity of currency which is given. Therefore different real rates of interest emerge for different price levels – the infamous "Keynes"-Effect.
The Accounting Part

There is some striking twist in Lavoie's book. In chapter 4.5.3 households hold real assets and money:

“Household portfolios will contain real assets, equities, bonds, treasury bills, money market instruments, bank deposits and cash.” (Lavoie (2014), p. 238)

whereas, when he discusses the rate of interest, real assets are no longer to be found in their balance sheets. This is crucial, because it throws any portfolio decisions out of the bath tub: Households will happily hold any amount of nominal wealth, no matter what.\(^7\)

So let me start with this a bit more slowly.

As everything in an economy is owned by someone - and as those someones are households (HH) – the simplest stock-matrice reads as follows:

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<thead>
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<th>HH</th>
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<tbody>
<tr>
<td>RA</td>
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<tr>
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Now introduce firms (F): In order to produce, firms require real assets (such as land, buildings and raw materials). So real assets have to be subdivided into real assets in the possession of households (RA\(_{HH}\)) and those in the possession of firms (RA\(_F\)).

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\(^7\) In the case of the open economy there would be foreign currency as an alternative asset and the exchange rate as an additional asset price – but again, this would only be enough to determine \(n-1\) central bank interest rates. The central bank of the key currency would be free in its interest rate decision. And, if, as Tobin stated, both the exchange rate and the price level are asset prices (Tobin / de Macedo (1979)) the price level has to show up in the portfolio equation anyhow.
Firms have to lay hand on real assets in the possession of households in order to be able to produce. In the case of (very) small firms the counterpart of this transaction might simply be equity: The peasant, who works his own land with his own tools is an example. I will not discuss this possibility here and suppose instead, that firms acquire their inputs by purchasing them from households. And they do purchase them by the use of banks loans (L).

As now a second asset, money (in the form of deposits L), enters the equation, the price (level) has to be introduced, to be able to sum up the diverse assets to wealth.

<table>
<thead>
<tr>
<th>HH</th>
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<tbody>
<tr>
<td>RA_{HH}</td>
<td>RA_{F}</td>
<td>RA</td>
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<tr>
<td>Σ</td>
<td>RA</td>
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<table>
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<tr>
<th>HH</th>
<th>F</th>
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<th>Σ</th>
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<tbody>
<tr>
<td>p \cdot RA_{HH}</td>
<td>p \cdot RA_{F}</td>
<td>p \cdot RA</td>
<td>p \cdot RA</td>
</tr>
<tr>
<td>L</td>
<td>−L</td>
<td>L</td>
<td>0</td>
</tr>
<tr>
<td>Σ</td>
<td>p \cdot RA</td>
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Further more, households may wish to hold some currency for transaction purposes and / or banks may be required to hold central bank money (H) as reserves on their liabilities. I assume the liabilities to be short term, so that they trade at par with currency. Thus the extended the balance sheet matrix reads:
The important point for my argument here is, that the share \( \alpha \) of nominal assets in the portfolio of households determines the amount of real assets which can be used in the production processes. 

\[
\alpha = \frac{L + H_{HH}}{p \cdot RA_{HH} + L + H_{HH}} 
\]

with \( p \) as the price of real assets.

The equation implies, that the real and not just the nominal volume of credit has to expand in order to increase production (i.e. the amount of real assets, which firms use as input goods). A mere expansion of nominal credit with no change in \( \alpha \) can be warded off by households by increasing the price of real assets:

\[
p = \frac{1 - \alpha}{\alpha} \cdot \frac{L + H_{HH}}{RA_{HH}} 
\]

For an expansion of credit not to be inflated away, \( \alpha \) has to rise in step, as

\[
RA_F = \alpha \cdot RA 
\]

So the next step is to discuss what determines \( \alpha \).
Preferences (Behavioral Equations)

There are three motives given in literature:

The transactions motive. This more or less is a demand for currency, which depends (positively) on income (transaction requirements) and negatively on the (nominal) rate of interest. In what follows, I will assume that the central bank accommodates any transactions demand, allowing the public to hold as much of their nominal balances in cash as they may wish. In that case the demand for currency influences the amount of high powered money, but not the rate of interest.

The income motive. Monetary assets earn interest. They, however, have the disadvantage of being susceptible to inflation. So the real rate of interest can be seen as a compensation for undergoing an inflation risk. The demand for nominal balances therefore will be a (positive) function of the real rate of interest on monetary assets and it will be decreasing in the perceived inflation risk $\sigma_\pi$. In this part of the paper I will consider only deposits as nominal assets, so I shall denominate the real rate of interest in the portfolio of households as $r_L$.

The precautionary motive. With liabilities denominated in money, there is the risk of illiquidity, in case you're unable to meet your obligations out of current cash flow (see Whalen (1966)). The holding of money insures against such losses, so that the demand for money is a positive function of the perceived risk of liquidity denoted by its probability $p_{ill}$ (which in turn decreases in net wealth), its variance $\sigma_{ill}$ and the expected cost of illiquidity $-k_{ill}$. It is here, that the modern tax imposing state enters the equation: By imposing taxes payable in its

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8 The speculative motive can not be included here, as nominal assets of a longer duration are not included in this basic version of the model.
9 Let me note however, that this begs the question, why money is used in transactions at all, i.e. why anybody would might prepared to part with goods in exchange for intrinsically worthless pieces of paper. Of course you can argue (as Heinsohn and Steiger do) that firms have to part with goods in exchange for money, because they are indebted. While this is true, it still doesn't explain, why firms were got indebted in the first place, i.e. why they were able to find households prepared to part with real assets in exchange for money. While you can answer to that question, that you talk about a monetary economy and therefore take that for granted, it doesn't explain, how a monetary economy came about.
money, it establishes a motive for holding money in order to meet tax obligations. This in turn generates an offer of real assets against money, which is the point of departure for both the transactions demand and the income motive, because otherwise it would be unclear, why goods are offered for money in the first place, so that money can be used in transactions and interest on money constitutes real income.

Summing up the two aforementioned motives, the demand for nominal assets can be written as:

\[ L_D = \alpha \cdot (r_L, \sigma_\pi, p_{ill}, \sigma_{ill}, k_{ill}) \cdot RA \]  

(Credit and Asset Market)

So household demand for nominal assets is upward sloping in \( r_L \) (with \( \sigma_\pi, \sigma_{ill}, k_{ill}, \) and \( RA \) as shift parameters).

The central bank rate in turn influences two rates of interest:

(a) the marginal rate of refinance enters the credit supply function of banks as a shift parameter. This has been already stated in (1).

(b) For the individual bank refinancing via deposits provides an alternative to refinancing through the money market, so, in the absence of transaction costs (and abstracting from the effect of minimum reserve requirements), the bank will be prepared to pay as much interest on deposits as it would have to pay on central bank loans. This leaves us with:

\[ r_L = r_{CB}. \]

So the refinancing rate of the central bank influences both the credit supply and deposit demand. It enters the credit supply function as a shift parameter and demand for deposits as a slope parameter. Furthermore the accounting framework tells us, that deposits are generated via the extension of credit. These considerations allow to integrate the markets for credit and for deposits in a combined graph.

The upper quadrant describes the credit market. The credit supply function has already been discussed. Credit demand relates to effective demand. Firms want to lay hand on the amount of input goods, which they need to produce the amount of output, which they expect to be
able to sell. As effective demand is downward sloping in $r$, so is credit demand.\(^{10}\)

Furthermore, as credit is used to buy goods, credit demand has to be thought of as real credit (the amount of input goods, firms need to acquire for their planned production).

10 Just to avoid any misunderstanding: Please note, that the slope of $Cr^D$ is derived from interest elastic demand and not from some marginal productivity of capital story. As the choice of technique depends on $r$, the causation works the other way round: If the production function is substitutional, profit maximizing entrepreneurs choose a technique for which the marginal product of the input good is equal to $r$. 
Credit generates deposits. Therefore the real supply of deposits, $L^S$, in the lower (asset market) graph is equal to the amount of credit. $L^D$ is the (real) demand for deposits, which households want to include in their portfolio. As already discussed, it has to be upward sloping in $r_L$.

Now suppose the central bank lowers the (real) rate of interest. This would shift $Cr^S$ downward and $L^S$ to the right. At the same time we would move down the demand curve, leaving us with the supply of (real) deposits outstripping demand. According to (3) households adjust the portfolio share of deposits by inflating the surplus supply away. As, on the other hand, $Cr^D$ is a demand for a real volume of credit, we are talking here about an inflation process: As long as $L^D$ is smaller than $Cr^*$, the supply of nominal deposits will rise and the inflation process will continue.

Suppose instead that the central bank increases the money market rate. In this case the supply of deposits will be too small, so that households will try to adjust their portfolios by bidding down prices for RA. Here a deflationary process ensues.

So it's back to Wicksell (1898): To keep inflation in check, the central bank has to set the rate of interest, which equates (the planned real volume of) credit with the (real) demand for assets denominated in its money. And keeping inflation in check is not an end in itself: If $r_{CB} < r_{*CB}$, $L^D (=RA^F_S)$ is the short side of the market, which rations inputs and thereby production. If $r_{CB} > r_{*CB}$, the rationing occurs from the side of $Cr^D$. For given demand plans and a given stock of real assets at the beginning of the period, $r_{*CB}$ maximizes the inputs available for production and therefore – given demand plans – output and employment.

**Comparative statics and a few consequences**

$Cr^D$ – Exogenous shifts in demand (say a change in government spending, in taxes, in autonomous consumption or in the marginal rate of consumption) induce shifts of $Cr^D$. As this implies an increase in $L^S$, a higher level of demand requires an increase in $r_{CB}$ (in order to increase $r_L$).

$RA$ – An increase in the endowment with RA shifts $L^D$ to the right, reducing $r_{*CB}$ and increasing the real volume of credit, output and employment.
σπ - An increase in the (expected) volatility of inflation shifts \( L^D \) to the left, increasing \( r^*_{CB} \) and reducing credit, employment and income.

\( p_{ill}, \sigma_{ill}, k_{ill} \) – The threat of illiquidity shifts \( L^D \) to the right, reducing \( L^S \) and \( r^*_{L} \) and therefore the required \( r^*_{CB} \).

\( u \) – An increase in the risk premium of banks shifts \( L^S \) to the left, inducing a disequilibrium on the asset market which (being deflationary) requires a compensating reduction in \( r_{CB} \).

**Fiscal policy and Monetary policy**

**Government debt.** In this simple framework the government can only borrow from banks. So government debt is an addition to \( L \). In order to place it, the portfolio share \( \alpha \) has to increase. In case you subscribe to Barro (1974) there is some relief, in that expected future (tax) obligations rise, but the rise in precautionary demand is smaller than the increase in \( L \) (see again Whalen (1966)). The difference will have to be made up by an increase of \( r_{CB} \), inducing a rise in \( r_{L} \) and at the same time crowding out some private credit demand.

That the only source of government finance is \( L \) is due to the fact that I abstract from currency. If you introduce it, the government may borrow from the central bank and use \( H \) to purchase real assets. But this is only the first step. Households now face an excess supply in \( H \), hand it over to banks and these deposit it with the central bank. So, at the end of the day, the central bank instead of the government is indebted to the banks, while nothing has changed concerning the composition of the portfolios of households.

What, however, has changed is the power of the central bank to make its policy rate effective. As soon as its liabilities exceed \( H_{HH} + H^*_{B} \) – the transactions demand of households plus the reserve requirements of banks – its lending rate ceases to be effective and it must use its deposit rate for monetary policy.

This weakens the central bank in several respects.

First. The position of a creditor is more powerful than that of a debtor. The Central bank as a creditor can force banks into the discount window. Being a debtor, it has to lure them into the deposit facility.

Second. The central bank as a creditor extracts a profit, whereas as a debtor it works at a loss. This has to be covered by a fiscal surplus, making the supply of money dependent on the finance ministry:
Money no longer is endogenous if the ministry of finance decides to monetize interest payments. In this case H grows along with the interest payments and the central bank has to mop it up by increasing $r_{CB}$ further.

Third. While both credit and deposit facilities are short term, the use of the credit facility carries an illiquidity risk for banks, where as the deposit facility doesn't. So (a) the same amount of H goes together with a lower precautionary demand in the case of the central bank being a debtor. And (b) the central bank no longer can use its provisions to vary the amount of means of debt repayment it injects into the economy via dividend payouts to the government.

The ability of the central bank to defend the price level therefore is substantially weakened – which in turn should increase the perceived $\sigma$, and, again, shift $L^D$ to the left.

On the other hand, fiscal policy can perform monetary functions, if it is implemented with a view to monetary objectives. In the case of Singapore for example, the fiscal surplus is used to complement the policy instruments of the monetary authority, which on its own can't force the banks into the discount window, because, as a result of current account surpluses, its assets consist of reserves in foreign currency. Here budget surpluses impose refinancing needs on the private sector and they are distributed to funds with different asset structures, in order to defend the exchange-rate or to fight inflation (or they are returned as tax refunds in situations which require monetary easing).

Nevertheless, this can only complement, not replace monetary policy, because fiscal policy in practise is much too blunt an instrument for fine tuning.

**Quantitative easing.** Basically quantitative easing implies a weakening of the central banks balance sheet. While there is no problem involved with the expansion of the balance sheet (as (long as)

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11 For money to be endogenous it is not sufficient that it can be created at the stroke of a pen. It also has to be possible to destroy it the same way.

12 This explains, why in some cases an increase in the nominal bank rate (without increasing the real rate) is sufficient to lower the inflation rate: Seeing the central bank reacting to inflation leads to an expectation of further tightening of credit conditions. This increases illiquidity risk, shifting $L^D$ to the right.
the additional H reflects an increase in demand for currency on the part of households and/or banks), the problem is the deterioration of the central bank's balance sheet.

Bagehot advised the lender of last resort to lend freely against good security at high interest rates. QE basically consists of buying toxic assets above market prices. Thus the central bank takes illiquid paper in its portfolio (which reduces its flexibility in intervention) and risks losses (which threaten its lender position).

This is not to say that nothing should have been done during the crisis or that the central bank should not have performed its rôle as lender of last resort. But the advisable way would have been, first to recapitalize the banks brutally by bail-ins so that the central bank could have stuck to the Bagehot rule instead of orientating its monetary measures at the aim of recapitalizing a wailing banking sector. Or, in short, to follow the example of Sweden instead of Japan.

**Conclusion**

It has been argued, that the central bank rate can be determined endogenously. Credit creates money (Schularik/Taylor (2009)). Additional money requires a higher share of nominal assets in the portfolio of households. And this in turn requires a higher rate of interest.

In order to avoid inflation or deflation the central bank has to set the central bank rate, which establishes a simultaneous equilibrium in the credit market and in the asset market. This basically is Wicksell's natural rate of interest, although with a different rationalisation and with the rate of profit adjusting to the real rate of interest instead of the other way around.

With the inclusion of the credit market and the asset market, the extended IS-MP model can be depicted as follows:
The central bank, by varying $r_{CB}$ establishes the simultaneous equilibrium of the asset and credit market. $r_{CB}^*$ together with the risk premium $u$ of banks determine the equilibrium rate of profit $r^*$.

As inflation may be generated in the asset market (as well as in the labour market), the central bank may be forced to raise its policy rate well before the economy reaches a state of full-employment.

The equilibrium rate of profit is fed into the factor price frontier to determine the equilibrium real wage rate. This at the same time gives the equilibrium price vector via the (Sraffian) production price system. As MP-curve it determines equilibrium income ($Y^*$) together with IS.

Equilibrium income inserted into the (inverse of the) production function\(^{13}\) determines the amount of employment ($A^*$) demanded for that level of output. The difference between labour supply $A^S(w/P)^*$ and labour demand $A^D(Y^*, Y/A)$ is the level of involuntary unemployment in equilibrium ($U^*$).

Please note, that this describes a stock-flow equilibrium position. In contrast to the original intention of IS-MP, what is derived here is a long run, not a short run, equilibrium.

\(^{13}\) Strictly speaking, $Y(A)$ is a partial production function only. But the model determines a long run equilibrium, so that both $A$ and $K$ vary in response to a variation in $Y^*$. Thus $Y(A)$ actually represents a scale variation and we are therefore on the production function itself.
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