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Koutsobinas, Theodore

University of Western Greece

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Thodoris Koutsobinas
University of Western Greece
Agrinio, Greece
koutsobinas@yahoo.com

Abstract

The utilization of a real-interest rate rule in Romer's new-Keynesian IS-MP approach, which is consistent with new synthesis intertemporal baseline macroeconomic models, provides a contemporary alternative to the standard old-Keynesian IS-LM model and moves back the emphasis on general accounts of the macroeconomic process. Despite its merits, the IS-MP approach neglects completely the influence of the liquidity-preference typically associated in pure Keynes framework with the impact of confidence and animal spirits. In the present article, we show how the macroeconomic process takes place in terms of both a real interest-rate rule and liquidity-preference through the yield curve. This new synthesis, which is shown to be consistent with standard intertemporal analysis, proves to be useful not only because it maintains the illustrative advantages of either the old-Keynesian model with respect to liquidity-preference or the new-Keynesian model with respect to the interest-rate rule but also because it can be utilized as an effective communicative tool among different strands of economic thought.

JEL Classification: E41, E43, E52, E58, E64

1. Introduction

During the last years, economic policy has been dominated by the adoption of Taylor's policy rule in the place of the exercise of discrete monetary policy. According to Taylor (1993), the central bank can control the short-term interest rate following a real interest rate rule. A by-product of the "Taylor rule" is that the quantity approach to money and the monetarist warnings on the role of monetary aggregates are abandoned. This rule was utilized in various alternative standard contemporary macroeconomic frameworks including the so-called "new synthesis" approach associated with various works such as those of Meyer (2001), McCallum (2001) and Clarida, Galí, and Gertler (1999), the "new neoclassical synthesis" proposed by Goodfriend and King (1997) and the IS-MP model proposed by Romer (2000). Those alternative approaches exhibit a sense of convergence in contemporary macroeconomics (Woodford, 2009).

A common feature of those standard contemporary approaches is the neglect of the impact of pure Keynesian liquidity-preference typically associated in the pure Keynes framework with the impact of confidence and animal spirits. The latter was prominent in earlier standard models such as the IS-LM model. In the present article, we seek to reinstate the importance of liquidity-preference for macroeconomic analysis in the presence of Taylor's rule. This objective will be achieved by conducting the analysis in reference to Romer's IS-MP approach for a number of reasons. First, due to its simplicity and like the IS-LM model, the IS-MP model has substantive pedantic value for textbook Keynesian macroeconomics. Secondly, through the IS-MP model, it is feasible to compare easily the theoretical axioms associated with pre-war Keynesian orthodoxy, the post-war neoclassical synthesis and the contemporary discussion on new consensus or, "new synthesis" macroeconomics. More specifically, the IS-MP can be used for comparative purposes since it is actually constructed comparatively with regard to the IS-LM model. The latter had the capacity for representing changes in liquidity-preference, a focal element for the purposes of the present paper.

This comparative objective can be analyzed also by utilizing representative models of the new synthesis approach as a benchmark. However, in this context, it is necessary to address various complexities and concerns regarding the building of new synthesis models. For lack of space, this task falls for now outside our present analysis and the scope of the present article. Thus, we commence our analysis in the present article by building a framework of micro-foundations that make possible the incorporation of the effect of a liquidity-premium dependent yield curve in much simpler accounts such as the IS-MP model in order to be able to draw instructive and compelling conclusions with regard to macroeconomic processes and modifications of the intertemporal mechanics. The re-consideration of the latter appears to be the standard practice today, as Woodford (2010) follows by utilizing the IS-MP model to analyze possible modifications for the new generation DSGE versions of the new synthesis approach. It is envisaged that our framework could be potentially helpful in the analysis of more complex DSGE models relative to those representing the new synthesis approach.

In recent times, we experience the dramatic consequences of the 2007-2009 international financial crisis that followed the US subprime housing meltdown and that was associated with bankruptcies of financial conglomerates, sharp, fast output decline and excessive job losses and of the current Euro-crisis in which high bond spreads feature pre-eminently. These episodes stand by themselves as the toughest responses to contemporary theoretical developments, which neglect the impact of severe portfolio choice reversals associated with liquidity-preference. As a result and following an emerging and growing interest in behavioural macroeconomics (Akerlof, 2002) and its relation to pure Keynesian foundations, the mainstream literature features now prominently the role of expectations in the 2007-2009 international financial crisis since it emphasizes excessive psychological reactions (Shiller, 2009) and the role of animal spirits (Akerlof and Shiller, 2009; De Grauwe, 2010). In such a historical context, it is an advantageous opportunity to reinstate two critical aspects of this crisis in macroeconomic modelling, that is, the role of liquidity-preference for market expectations and the subsequent insufficiency of central banking to tame them always. In addition, Farmer (2012) argued that there may be a continuum of steady-state unemployment rates and that the beliefs of investors in financial markets do exert an independent impact on the real economy and determine an equilibrium. While in Farmer's paradigm beliefs about the stock market are introduced in a general fashion capturing the role of psychology, there is no implication for the evolution of beliefs for the behaviour of all the endogenous variables. In the present paper, we concentrate on the behaviour of the liquidity-preference and portfolio allocation reversals. This is a fundamental and critical process because it manifests that beliefs about financial assets imply base interest rates that are different from the interest rate rule and, in this manner, highlights the ineffectiveness of monetary policy. For this reason, we advance a behavioural theory of liquidity-preference in the following sections.

It must be noted that the presence of liquidity-preference and the ineffectiveness of monetary policy were features which were present to a large extent in old-Keynesian models such the IS-LM model, which occupied a central role in macroeconomic analysis and policy of earlier generations for over half a century. Although the IS-LM model explained better some economic environments and issues than others, it remained a powerful framework in standard macroeconomic teaching up until now. For a long-time, another tool that could combine better simplicity of exposition did not replace the IS-LM and the understanding of most complexities associated with macroeconomic fluctuations.

Romer (2000) offered a concrete New Keynesian alternative to the IS-LM model that omits the LM curve by replacing money supply targeting with the assumption that the central bank follows a real interest rule. This idea is consistent with developments in central bank policy formation that took place in the past decade according to which monetary aggregates are not attributed anymore the same importance as in the past.[1] The latter policy development is consistent with theoretical accounts of endogenous money analysis.[2]

As we will see in detail below, a particular difficulty is that despite labelling his approach as "Keynesian Macroeconomics," Romer overlooks completely in his analysis the role of the liquidity-preference. Yet, in view of Keynes's emphasis on liquidity preference and on the speculative motive in the *General Theory,* we cannot really consider a macroeconomic analysis without a role for liquidity-preference as purely Keynesian in nature. In addition, another difficulty is situated in the absence of the influence of financial markets on the demand for goods, an issue that Romer accepts as a source of complication for the IS-LM model or for the alternative that he offers, that is, the IS-MP model (Romer, 2000, p. 168). Although there is a growing interest to develop macro-finance models (see for example, Diebold, Piazzesi and Rudebusch (2005) and Rudebusch and Wu (2008)), the impact of liquidity-premium theory of term structure and speculation on finance and on the real economy is overlooked in those approaches. Moreover, earlier generation asset-allocation approaches with behavioural implications (see for example, Tobin (1982)) have not been developed further on the basis of contemporary methodology.

The objective of this paper is to overcome these difficulties and to develop a framework, which on the one hand utilizes Romer's basic intuition that central banks use a real interest rule but on the other hand allows also for the influence of liquidity-preference and financial assets on the demand for goods. It is also shown in the final sections of the present paper that this macroeconomic framework is consistent with intertemporal microecononomic foundations to fulfil contemporary recommendations on modelling (see Woodford, p. 269, 2009). In this context, there are implications about the inefficiency of monetary authorities to achieve levels of output that are consistent with full-employment, a basic proposition that was supported in Keynes's *General Theory* but is not discussed at all by Romer. These implications are also consistent with the evidence from the 2007-2009 international financial crisis.

The present paper consists of two parts. In the first section, we discuss the implications of such a framework in terms of an enhanced IS-MP model through the development of an alternative model, the IS-LR-MP for the purpose of drawing insights for possible modifications of intertemporal mechanics. As we will see below, the IS-LR-MP constitutes a coherent alternative to the IS-MP model. This alternative allows for the expression of innovative ideas and possibilities regarding the influence of liquidity-preference and financial markets on causing underemployment output, an area that, it must be repeated, remains absent in Romer's model. The most special feature of this model is the manifestation of the link between the goods markets and the financial markets via the yield curve that is associated with the term structure of interest rates in a manner however, that is consistent with the exercise of a real interest rule by monetary authorities. In the second part, we introduce certain pure Keynesian micro-foundations as proposed by Keynes (1936) to demonstrate the macroeconomic effects of the liquidity-premium yield curve in an optimizing intertemporal context.

2. Revisiting Microfoundations: Liquidity-Preference in the Presence of Taylor's Rule

2.1 The Two-Pronged IS-LM-MP model

It is apparent therefore according to Romer's analysis that the IS-MP model can accommodate the presence of the LM curve. But the existence of the latter is largely undermined by the implicit assumption that there is no substantive reaction in the financial markets that could be attributed to the influence of liquidity-preference that would render difficult and eventually prevent the adjustment of the LM curve to these levels of output and real interest rate that are associated with the MP curve. Thus, the IS-MP model is in essence a special case of a broader framework since it is implicitly assumed in its discussion that the liquidity-preference is absent. On the other hand, although it appears paradoxical, it is possible for both the MP curve and the LM curve to co-exist in a two-tier general IS-LM-MP model. For example, Tobin's regime distinction between a situation of normal economic conditions when there is self-adjustment and a situation of major effective demand shocks when there is a need for active stabilization policies is useful in this connection (see Tobin, 1997, p. 20) because it provides a foundation for this two-pronged framework. Thus, under normal economic conditions, the LM curve adjusts (in terms of both money supply and liquidity-preference) to the levels of the real interest rate and output associated with equilibrium between the MP curve and the IS curve. Thus, in this case, the economy behaves in terms of the IS-MP model. However, during abnormal periods of severe demand shocks when there are adverse financial conditions and a significant flight (demand) to money in aggregate portfolio allocation due to the effect of liquidity-preference, the LM curve may be downward sticky to adjust to the level of real interest rate and output that are associated with the MP curve. This latter possibility reflects Keynes's view that monetary policy becomes essentially effective only in the special case in which the propensity towards liquidity does not change and, more precisely, does not increase (Keynes, 1936, p. 234).

This case can be represented in an enhanced IS-LM-MP context as illustrated in fig. 1. The intersection of the IS and the MP in graph 1 of fig. 1 determines a level of interest rate, which is equal to r_1 and a level of output, which is equal to Y_1. Confining the analysis to this case only neglects the possibility of shifts in the IS-LM framework, due to shifts in portfolio choice with consequences for the demand for money as a result of the influence of the liquidity-preference.[4] On the contrary, there is a case in which the downward stickiness of the LM curve due to a shift in the demand for money upwards attributed to the influence of liquidity-preference to be consistent with a level of interest rate that is equal to r_2, as it is shown in graph 2 of fig. 1. This new interest rate is greater than r_1, the level set as a target by monetary policy. The process involving the downward stickiness of the LM curve can be viewed as a shift of the LM curve upwards from the level that is consistent with the MP curve.

Thus, as opposed to the IS-MP part of this enhanced model, the IS-LM prong that is discussed here highlights the possibility of a massive flight to money during a financial crisis due to the effective impact of the liquidity-preference and determines a different interest rate than the short-term (i.e., one-year) interest rate that is consistent with the nominal discount rate targeted by central banks that follows a real interest rate rule. The mere existence of the difference between the two annualized rates, that is, between the one that is consistent with monetary policy and the rate that is determined by market forces influenced by liquidity-preference eventually sets up an arbitrage process. The outcome will depend on the joint effect of the monetary policy that attempts to follow a real interest rate rule and the influence of the liquidity-preference.

In general, the assumption that the central bank effectively controls the short-term interest rate undermines the influence of the liquidity-preference along the short-end of the curve. However, this is not the case when we turn our attention to the consideration of the long-end of the yield curve where the influence of central bank, as Romer admits, is uncertain (Romer, 2000, p. 168). This consideration highlights the limits of both the IS-MP and the IS-LM approaches as essentially being alternative versions of a two-asset framework and shows that the application of a multi-asset approach in a macroeconomic context can be more sound and insightful with respect to the efficacy of the real interest rate rule. Thus, it is more useful to turn our attention to the role of the "all-important" long-term interest rate in a multi-asset approach. The emphasis in the long-term interest rate is supported by the majority of theoretical strands in the Keynesian and post-Keynesian economic thought.[5] In a multi-asset approach, there is room to express the liquidity-preference through the demand for more liquid financial assets (i.e., government bonds) in a yield curve context that is representative of the term structure conditions. As this approach will unfold below, it will become obvious that it covers the vacuum of IS-MP (and, IS-LM) analysis regarding the influence of the financial markets on the macroeconomic process and more precisely, regarding the influence of many interest rates corresponding to assets of variable time-horizons and other asset-specificities rather than "the" interest rate.

2.2 The IS-LR-MP Model in Financial Markets

2.2.1 Liquidity-Preference, the Yield Curve and Monetary Policy

Following the broadly accepted view now among economists that central banks control the very shortest interest rate but they cannot control the yield curve, the key feature of the approach followed in the present article is that it retains liquidity-preference but utilizes also a real interest rate rule such as the IS-MP model. In this context, the yield curve on government bonds is not necessarily consistent with the interest rate rule and this implies a demand for government bonds as well as a demand for money that are not consistent with the interest rate set up by the central banks. The yield curve is an increasing curve of the time-horizon of bonds. One explanation is provided by the Expectations Theory (ET). According to this view, the long-term interest rates are the average of expected future short-term rates. Thus, if today's one year rate is 4%, and next year one year is expected to be 5%, the two-year rate today should be 4.5%. It follows then that expectations of increases in short-term rates will cause the yield curve to be upward sloping, while long-term rates will be proportionately higher than short-term rates. Conversely, expectations of a decline in short-term rates will result in the downward sloping yield curve, while the long-term rates will be proportionately lower than short-term rates.

Another theory is the Liquidity Preference Theory (LPT), which provides a robust explanation for the upward sloping yield curve.[6] According to the LPT, people demand a longer premium for longer maturities over the short-term maturities to compensate for the uncertainty that involves holding long-term maturity assets. Hence, the longer the maturity, the greater is the uncertainty of not getting back the initial outlay. For simplicity and in order to focus solely on the impact of liquidity-premia considerations arising in more complex accounts with regard to market segmentation and preferred habitat are ignored.

The presence of variable liquidity-premia for assets with different maturities and the difference between nominal and real interest implies the decomposition of nominal interest rates to three parts: the real interest rate, the level of inflation and the liquidity-premium. Thus, the effective nominal interest rate is given by:

$$r = i + \pi + l \qquad (1)$$

where, r is the nominal interest rate, i is the real interest rate, π is the inflation rate and l is the liquidity-premium that is specific to the asset. For the purposes of the present paper, the liquidity-premium of financial assets is considered as independent and behaviourally determined. This reflects Keynes's view that it is different from the risk premium (Keynes, 1936, pp. 240-241). In contemporary accounts, the liquidity-premium of long-term government bonds can be viewed as a seemingly extraneous factor (Azariadis, 1981) or as an independent behavioural variable in the sense that it is driven by some form of non-rational (behavioural expectations that generate or break down a bubble (Buiter, 2007).

A special standard sub-category of the general specification above omits the behavioural liquidity-premium so that the nominal rate is neutral of liquidity-preference considerations and, therefore, consists solely of the real interest rate and inflation. Thus, (1) is expressed as $r = i + \pi$. Nevertheless, assuming implicit liquidity-premia in this latter expression to express observed discrepancies implies for given inflation an alternative specification, that is, $r' = i' + \pi$, which is useful for comparative purposes between the standard and the liquidity-premium approach as we will see below.

2.3 An Intertemporal Framework for the Liquidity-Preference Dependent Yield Curve

2.3.1 An Ex-Ante Behavioural Theory of Fundamental Uncertainty and Liquidity-Preference

Kahn (1972) proposed a framework with respect to the possibility of increasing illiquidity of less liquid assets relatively to more liquid assets. According to this framework, it has been recently shown that an increase in the state of uncertainty (the state of bearishness) makes less liquid assets further less convenient than more liquid assets (Koutsobinas, 2011). In what follows, a formulation of this principle will be presented in order to establish microfoundations for the liquidity-premium, as a representation of animal spirits which will be utilized in the following sections in intertemporal analytics. We assume that Φ(H) is the function of specific degree of perceived uncertainty, which is attribute-dependent (i.e., to a vector of attributes H). Many attributes of financial assets can cause imperfect substitutability across them such the nature of the market they are traded, the maturity they involve, the identity of the issuers and so on.

The liquidity-premium of an asset to compensate for strong uncertainty can be represented in a general form as follows:

$$l_j = l(\Phi_j) \qquad (2)$$

$$\frac{\partial\, l_j}{\partial\, \Phi_j} > 0$$

with $\Phi_j = \Phi(H_j)$

For example, let's consider T, that is, the time involved till the maturity of assets as a component of H. More specifically, for different asset-holders perceived uncertainty is a strictly increasing function of time involved until the maturity of assets because holding assets, which have a greater term to maturity involve a greater degree of uncertainty because the predictability of future events decreases as the term to maturity increases.

The partial derivative of perceived uncertainty with respect to time to maturity is:

$$\frac{\vartheta \Phi(T)}{\vartheta T} > 0 \tag{3}$$

Let l(Φ(T)) the function of liquid-assets. Let B and L two different values of perceived uncertainty for short-term bonds and long-term bonds respectively with B<L then:

$$l_B < l_L \tag{4}$$

Where $B=\Phi(T_1)$ and $L=\Phi(T_2)$ and $T_1 < T_2$ because Φ is a strictly increasing function of time. This can also be written as:

$$l(\Phi(T_1)) < l(\Phi(T_2)) \quad \text{or} \quad l_B(\Phi(T)) < l_L(\Phi(T)) \Rightarrow l_B(\Phi(T)) - l_L(\Phi(T)) < 0$$

(5)

The principle that an increase in the state of uncertainty (the state of bearishness) makes less liquid assets further less convenient than more liquid assets implies that:

$$\frac{\vartheta l_L}{\vartheta \Phi_L} - \frac{\vartheta l_B}{\vartheta \Phi_B} > 0 \tag{6}$$

Or, for simplicity, keeping other attributes constant and allowing for variations of one specific attribute of assets such as time that:

$$\frac{\vartheta l_L(\Phi(T))}{\vartheta T} - \frac{\vartheta l_B(\Phi(T))}{\vartheta T} > 0 \tag{7}$$

Using the Chain Rule as presented by Spivak (1994), we know that:

$$\frac{\vartheta l_L(\Phi(T))}{\vartheta T} - \frac{\vartheta l_B(\Phi(T))}{\vartheta T} = \frac{\vartheta l_L(\Phi(T))}{\vartheta \Phi}\frac{\vartheta \Phi(T)}{\vartheta T} - \frac{\vartheta l_B(\Phi(T))}{\vartheta \Phi}\frac{\vartheta \Phi(T)}{\vartheta T} =$$

$$\left(\frac{\vartheta l_L(\Phi(T))}{\vartheta \Phi} - \frac{\vartheta l_B(\Phi(T))}{\vartheta \Phi}\right)\frac{\vartheta \Phi(T)}{\vartheta T} = \left(\frac{\vartheta (l_L(\Phi(T)) - l_B(\Phi(T)))}{\vartheta \Phi}\right)\frac{\vartheta \Phi(T)}{\vartheta T}$$

(8)

But (8) is a product of positive factors because of (3) and (5) and that proves (6) and (7).

The above principle manifests the variation of the degree of liquidity-premium of assets to compensate for strong uncertainty with respect to time to maturity. As such, the liquidity-premium expresses beliefs and it will be introduced in a continuous time in the next section to relate it with the determination of the yield curve. As it was mentioned, this approach can be extended to a vector form to include also the effect of other specific variables that influence the perceived uncertainty of different liquid assets. In this context, the illiquidity-premium represents a specific degree of uncertainty associated with a given asset beyond the general degree of uncertainty that is common to all assets. As such, holders of different assets are heterogeneous in the sense that they are exposed to different degrees of uncertainty.

2.3.2 Intertemporal Analysis

It is now time to introduce the long-term interest rate. This is assumed to pay a constant coupon of unity. Denoting the price of the coupon by P and the yield by

R, we have *R* = *1*/*P*. Following the intertemporal framework proposed by Fisher and Turnovsky (1992) and the usual arbitrage condition between the short-term and the long-term interest rate which gives

$$r = \frac{1 + \dot{P}}{P} = R - \frac{\dot{R}}{R} \tag{8}$$

From (8), the long-term interest rate, *R* at time *t* for *S* periods of maturity is expressed in terms of the short-term (instantaneous) interest rate, r in the form

$$R(t) = \frac{1}{\int_t^S e^{-\int_t^S r(t')dt'} ds} \tag{9}$$

Relation (9) expresses the long-term interest rate in terms of future (expected) short-term rates, which themselves depend upon monetary policy. Thus, for every exogenous short-term interest rate set by monetary policy, $r_{MP(t)}$, there is an equivalent long-term interest rate $R_{MP}(t)$. However, one notable difference in the present article from the framework of Fisher and Turnovsky is that the relationship between the long-term and the short-term interest rate is expressed in nominal terms.

Most central banks use the nominal interbank rate as their short-term instrument and therefore for the very short run, a nominal rate rule provides a better description of central banks' behaviour than a real rate rule. Of course, in deciding whether to change their target level of the nominal rate, central banks take changes in expected inflation into account and, therefore, they effectively decide how to set the real rate. However, in the presence of liquidity-preference considerations, the situation becomes more complicated because while central banks manipulate money supply to follow its real rate rule market forces impose a demand obstacle to its effective application. Technically, if we assume that nominal long-term rates influenced by liquidity-premia are adjusted for expected inflation so that their equivalent long-term real rates are computed, the analysis can be easily conducted in output-real rate space as in Romer's framework. Since this is in reality a complicating procedure for central banks that is rarely followed, the analysis in the present article is conducted in an output-nominal rate space.

As it was mentioned above, according to the LPT, there is a greater premium for longer maturities over the short-term maturities to compensate investors for strong uncertainty in their portfolio choices. This implies that in practice the observed long-term interest rate *R'(t)* is greater than the long-term interest rate, which corresponds to the short-term interest rate set by monetary policy and expressed by MP.

Since this implies that:

$$R'(t) > R_{MP}(t) \qquad (10)$$

Then, in this case, we have:

$$R'(t) = \frac{1}{\int_t^S e^{-\int_t^S r_{MP}(t')dt'} ds \int_t^S e^{-\int_t^S l(t')dt'} ds} \qquad (11)$$

and, expression (11) manifests the substantive difference that exists between ET and LPT.

From (9) and (11), we have analogously:

$$\frac{R'(t)}{R(t)} = \frac{1}{\int_t^S e^{-\int_t^S l(t')dt'} ds} \qquad (12)$$

By replacing $L(t) = R'(t)/R(t)$ in (10) we get

$$L(t) = \frac{1}{\int_t^S e^{-\int_t^S l(t')dt'} ds} \qquad (13)$$

which expresses the liquidity-premium of the long-term bonds in continuous time and is similar to (9).

To solve l(t′) to R′(t), we follow a certain procedure. From (9), and fixing a constant $\tau \in$ (s, t), we have:

$$1 = R'(t)\int_t^S e^{-\int_t^S r(t')dt'} ds = -R'(t)e^{-\int_\tau^t r(t')dt'}\int_S^t e^{-\int_\tau^S r(t')dt'} ds \quad (14)$$

Differentiating the above, we have:

$$0 = R'(t)e^{-\int_\tau^t r(t')dt'}\int_S^t e^{-\int_\tau^S r(t')dt'} ds - R'(t)r(t)e^{-\int_\tau^t r(t')dt'}\int_S^t e^{-\int_\tau^S r(t')dt'} ds - R'(t)e^{-\int_\tau^t r(t')dt'} e^{-\int_t^\tau r(t')dt'} \quad (15)$$

Or,

$$0 = \frac{\dot{R}'(t)}{R'(t)} - r'(t) - R'(t)$$

(16)

Therefore, we have the familiar expression:

$$r'(t) = \frac{\dot{R}'(t)}{R'(t)} - R'(t) \quad (17)$$

which is similar with (8).

Treating analogously, we obtain

$$l(t) = L(t) - \frac{\dot{L}(t)}{L(t)} = \frac{\dot{R}'(t)}{R'(t)} - \frac{\left(\frac{\dot{R}'(t)}{R'(t)}\right)'}{\frac{\dot{R}'(t)}{R'(t)}} = \frac{\dot{R}'(t)}{R'(t)} - \frac{\dot{R}'(t)\ddot{R}'(t) - (\dot{R}'(t))2}{\dot{R}'(t)R'(t)}$$

(18)

The above analysis of the conditions governing the yield curve in the presence of liquidity-premia in portfolio choices is useful for looking at the macroeconomic process in the presence of liquidity-preference and, more precisely, at how the liquidity-preference driven financial mechanics influence the real economy. This analysis is autonomous and can be incorporated in a variety of models such as, for example, the traditional IS-LM/IS-MP frameworks and more contemporary intertemporal general-equilibrium models. For the purposes of the present paper, we focus on the first set of models. However, in the second section of the present paper it is shown that this analysis is consistent with intertemporal optimization. More precisely, an intertemporal framework is presented that closes the model with the analysis of the impact of the yield curve on the real economy. The full implications of such an analysis for alternative conceptions of models of intertemporal structure constitute an interesting objective for further research.

2.3.3 The Yield Curve and the Macroeconomic Process in the Presence of Liquidity-Preference

It is time now to turn our attention on the relationship between the yield curve and the macroeconomic process. This is described in fig. 2 that contains two graphs, one representing the macroeconomic process while the other expressing the financial markets, through the movements of the yield curve. Graph 1 is designed on a nominal interest rate-output space while graph 2 is drawn on a nominal interest rate-maturity space. Thus, both graphs are linked through the vertical axis that refers to nominal interest rates. The nominal interest rate r_1 that corresponds to the MP line in fig. 1 is present also in the graphs contained in fig. 2. A yield curve, which is upwards sloping with respect to term to maturity, corresponds to this neutral from liquidity-preference considerations base nominal interest rate (i.e., the liquidity-preference or, equivalently, the liquidity-premium free interest rate). Thus, one can draw a liquidity-premium free or neutral yield curve, which expresses in essence the expectations theory of the term structure of interest rates. For the purpose of brevity, this neutral yield curve is denoted as NC. When term to maturity is zero (and, therefore the underlying asset is money) the corresponding point of the yield curve is always equal to the liquidity-premium free or neutral base nominal interest rate, r_{MP} that is consistent with MP. Any level of interest rate along the neutral yield curve can be discounted for the number of time-periods that correspond to the term of maturity of a bond in the absence of liquidity-preference considerations. This discounting process yields *always* the neutral base nominal interest rate that is set by monetary policy and is compatible with the MP schedule. The neutral yield curve that is derived from the base nominal interest rate, which is associated with MP, is compatible also with equilibrium and no-arbitrage across all bonds for different terms to maturity. For example, the yield on a two-year bond will be the same to the yield from rolling over two one-year bonds and the market will therefore be in equilibrium because investors will not have any portfolio choice incentive to shift their preference across bonds of different term to maturity.

On the other hand, according to expression (11), the slope of the yield curve that is influenced by variable liquidity-premia with respect to term to maturity (i.e., the LC that stands for liquidity-preference or liquidity-premium dependent yield curve) is greater than the neutral yield curve with respect to the term to maturity, NC. Likewise, with the process of discounting the NC, the liquidity-premium dependent yield curve can also be discounted for the number of time-periods that correspond to the maturity of an asset. However, this process has to discount also the liquidity-premia across assets that influence the levels of interest rates along the LC This process corresponds to a no-arbitrage liquidity-premium dependent equivalent base nominal interest rate $r'(t)$ as manifested in equation (17).

Since the levels along the liquidity-premium dependent yield curve are greater than those that associated with the neutral yield curve for the same maturities, the process of discounting of yield levels along the liquidity-premium dependent yield curve generates no-arbitrage equivalent base nominal interest rates that are greater than the level associated with the MP schedule, that is, the neutral base nominal interest rate. The range of the no-arbitrage equivalent base nominal interest rates that discount any level of the liquidity-premium dependent yield curve is expressed by the curve ELC (i.e., which stands for equivalent of the liquidity-premium dependent yield curve). Thus, the base nominal interest rates that are consistent with equilibrium between assets of different term to maturity for different levels of the liquidity-premium dependent yield curve fall along ELC. In this context, there is equilibrium between the market of a long-term bond and the markets for shorter maturities as well as and the money market. For example, the yield of a 10-year bond that is influenced by a liquidity premium is equal to the yield of ten 1-year bonds. The latter is the annualized rate that is consistent with an equivalent base nominal interest rate r_2. As we see in graph 1 of fig. 2, the base nominal interest rate r_1 that is set by monetary policy and is compatible with MP is smaller than the liquidity-preference dependent no-arbitrage equivalent base nominal interest rate r_2 on ELC that is consistent with equilibrium across assets up to 10-year maturity in the presence of increasing liquidity-premia. Thus, the equilibrium in the money market will not be at r_1 but at r_2. The existence of this discrepancy can be analyzed, as we will see in two ways: one involving a modified LM schedule while another introducing a behavioural reaction function of the public, the LR (i.e., a liquidity-premium reaction schedule).

Alternatively, one can replace the modified LM curve with a behavioural price reaction function of the public, the LR. Thus, under the assumption of a liquidity-premium dependent yield curve, each no-arbitrage equivalent base nominal interest rate on ELC that is greater than the base nominal interest rate set by MP corresponds to an equivalent LR that stands above the MP schedule. For example, for the 10-year bond and to the liquidity-preference dependent no-arbitrage equivalent base nominal interest rate r_2 corresponds to the LR schedule that stands above the MP. This LR schedule crosses the IS at r_2 which is greater than r_1, the level associated with equilibrium between MP and IS. The same procedure can be followed for bonds of greater maturity, which involve a greater liquidity-premium such as the 20-year bond.

With respect to the actual shape of the yield curve, an apparent consideration refers to the case in which the equivalent of the observed yield curve that is influenced by liquidity-preference considerations, that is, the ELC is entirely above the MP curve. In this case, the LR is certainly above MP as well**.** However, the degree of its shift upwards cannot be determined precisely because in practice the existence of different no-arbitrage equivalent base nominal interest rates that are associated with different levels of a liquidity-premium dependent yield curve exerts a combined influence on the LR curve. The question, which arises, is in what manner these different no-arbitrage equivalent base nominal interest rates are associated with the LR curve. This issue can be addressed technically in two ways. One approach involves the utilization of one representative long-term interest rate (i.e., a 10-year interest rate), as it was assumed in the present paper since in practice it has become the most frequently quote when discussing the performance of the U.S. government-bond market and is used to convey the market's take on longer-term macroeconomic expectations, while another method is to utilize a weighted average as a representative interest rate. The latter can be viewed as representing in essence a composite government bond index.

Lastly, it must be noted that the existence of a liquidity-premium dependent yield curve is a manifestation for Keynes's theory of monetary production economics (Keynes, 1936). In this alternative framework, the equilibrium interest rate is different from the real interest rate as determined by the marginal productivity of capital. Assuming nil inflation for expositional purposes and setting this insight in our familiar intertemporal framework of Fisher and Turnovsky (1992), this insight implies that

$$\int_t^S e^{-\int_t^S r'_{MP}(t')dt'} ds \# \int_t^S e^{-\int_t^S F_K[K, m(\lambda, K)](t')dt'} ds \tag{19}$$

Thus, the difficulty of monetary policy to control the long-term interest rate due to the impact of behavioural financial forces such as the liquidity-preference is equivalent to a monetary production explanation of the economic process.

One implication of the analysis is that the arbitrage condition between the long-term and the short-term interest rate in the presence of liquidity premia implies (assuming ceteris paribus nil inflation) that

$$r + l = (R - \frac{\dot{R}}{R}) + (L - \frac{\dot{L}}{L}) \tag{20}$$

One last thought is that it is quite evident that in the IS-LR-MP, the impact of the liquidity-premium takes place as part of a price adjustment rather than of a quantity adjustment as the one characterized by shifts in the LM. In the IS-MP approach, the LM is considered absent or useless. It is implicitly assumed that the LM crosses passively any level at which the MP intersects the IS. However, this assumption is founded on the further assumption that the impact of behavioural considerations in financial markets are absent and, thus, that there is no influence of the relative liquidity-premia across financial assets on their demand.

In the IS-LR-MP context, the impact of price adjustment substitutes the quantity adjustment and the LM appears to be superfluous. Still, one may think shifts in the LR associated with ELC in terms of LM mechanics. With regard to the latter, money supply is considered to be fixed (while in practice under a real interest rate rule it may be manipulated by open-market operations but not to a great extent as it is the case with exogenous money). However, even with more or less fixed money supply, shifts in the demand of money cause shifts in the LM. Thus, the replacement of the LM curve by the MP schedule is founded on the assumption that the demand for money adjusts in such a way that the intersection of the modified LM with the IS takes place to the level of interest rate given by MP. This is clearly not the case when behavioural considerations on portfolio choice such as on the impact of liquidity-preference in ELC are considered[7]. In this case, one may consider r_2 as being consistent with LM_2 as it is shown in graph 1 of fig. 3. When the implicit assumption of the non-relevance of behavioural considerations such as the liquidity-preference is removed, the existence of equilibrium in financial markets and the absence of arbitrage imply that the money market is also in equilibrium and, thus, that for each term to maturity there is an equivalent LM curve which is consistent with the equilibrium across bonds of different maturities.

Thus, under the assumption of a liquidity-premium dependent yield curve, each no-arbitrage equivalent base nominal interest rate that is greater than the base nominal interest rate set by MP corresponds to an equivalent LM that stands to the left of the LM curve that crosses the MP curve at the point at which the latter intersects the IS curve. For example, for the 10-year bond and to the no-arbitrage equivalent base nominal interest rate of r_2 corresponds the equivalent LM_2 that stands to the right of LM_1 which crosses the intersection of MP and IS at r_1. This equivalent LM_2 crosses the IS at r_2 which is greater than r_1. The same procedure can be followed for bonds of greater maturity, which involve a greater liquidity-premium.

3. Intertemporal Macroeconomic Analysis and the Liquidity-Preference Dependent Long-Term Interest Rate

We move now to the second, and more important section of the present paper. The intertemporal framework proposed by Fisher and Turnovsky (1992) was one of the first and few attempts in standard analysis to associate macroeconomic analysis with the yield curve in an optimizing intertemporal context based on a worker-enterpreneur agent. This analysis is confined by the neoclassical assumptions of capital theory, perfect capital markets and perfect foresight. Although the yield curve is introduced in the analysis, the long-term interest rate is essentially considered in this approach as a by-product of the technologically determined current and future short-term interest rates.

In what follows, it is demonstrated how the liquidity-premium dependent yield curve is also relevant because it is consistent with a broad set of macroeconomic forces in an optimizing intertemporal framework. To conduct this task successfully, the analysis introduces certain pure Keynesian assumptions as proposed by Keynes (1936) in the place of standard neoclassical assumptions while in a few occasions it takes place under certain *ceteris paribus* conditions. For comparative purposes, most of the mechanics represented in the equations of the framework proposed by Fisher and Turnovsky are retained. With few exceptions, notation remains also similar.

More precisely, the assumptions that are introduced in our analytical framework are as follows: (a) The representative worker-entrepreneur-financier agent: To introduce behavioural assumptions that impact capital markets, we modify this intertemporal optimizing framework by assuming instead a representative worker-entrepreneur-financier agent; (b) As it was mentioned above, the liquidity-premium of financial assets such as of long-term government bonds can be viewed as a seemingly extraneous factor (Azariadis, 1981) or as an independent behavioural variable in the sense that it is driven by some form of non-rational (behavioural) expectations that generate or break down a bubble (Buiter, 2007). However, it is also the necessary variable that motivates shifts in portfolio allocation and in the demand for liquidity in the broad sense (that is, including Keynes's speculative demand for money) that cannot be explained by mean-variance theory (Buiter, 2003). For the moment and following the analysis of observed liquidity-premium dependent yield curve above in the main text, it is simply assumed to be a strictly increasing positive function with respect to term to maturity without additional implications being made with regard to the exact nature of this behavioural function, which is potentially a special area of study in the burgeoning literature of modern behavioural economics and finance; (c)The existence of pure Keynesian analytics inherent in Keynes (1936) such as the marginal efficiency of capital is re-introduced as a monotonically decreasing scarcity demand for investment projects (Davidson, 1994) under the *ceteris paribus* assumption that the long-proved complexities of the capital controversy do not have an impact on the macroeconomic process; (d) Inflation is assumed exogenous in order to conduct the analysis as simple as possible across nominal and real values. This is in line with the acknowledgment by Romer (2000) that standard presentations of IS-LM take expected inflation as exogenous; (e) We exclude also for the moment complexities arising from the preferences of the agent as a consumer in order to focus solely on the impact of liquidity-preference and financial assets on the macroeconomic process leaving them for later research; (f) For convenience also, we exclude wealth effects leaving their impact to be considered analytically in future research.

We assume two sectors: the finance sector, which concerns financial decisions and the real sector, which concerns the labour supply and entrepreneurial decisions of the representative agent. These two sectors correspond roughly to the LM and IS respectively. With respect to the finance sector, the representative agent chooses finance according to the asset closure arbitrage condition between short-term and long-term government bonds influenced by liquidity-premia as shown in the analysis of the liquidity-premium dependent yield curve above in (8):

$$r' = R' - \frac{\dot{R}'}{R'} \tag{21}$$

Where

$$R' = R'(L) \tag{22}$$

where r' and R′ are the nominal liquidity-premium dependent short-term and long-term interest rates respectively and L is the liquidity-premium of the long-term government bonds. Given an exogenous inflation rate π, we obtain the market determined real short-term interest rate, i' as from equation (1):

$$i' = r' - \pi \tag{23}$$

We re-introduce Keynes's notion of marginal efficiency of capital as the rate of discount which would make the present value of the series of annuities given by the returns expected from the capital asset during its life just equal its given supply price

$$\rho = \rho(Q, i') \quad \rho_Q > 0, \quad \rho_{i'} < 0$$

(24)

Where ρ is the marginal efficiency of capital or the real expected rate of return on investment projects, *Q* is the expected real returns and *i′* the real short-term interest rate implied by the equivalent liquidity-premium dependent nominal short-term interest rate, r′. As *i′* increases, the marginal efficiency of capital falls.

Given the observed *i′* and ρ, the representative agent chooses in the real sector consumption *c*, labour supply *ℓ*, capital stock *K*, and the stock of short-term government bonds *b* impacted by the arbitrage condition between the short-term and the long-term interest rate above, in order to maximize

$$W = \int_0^{\infty} U(c, \ell) e^{-\hat{a}t} dt \quad U_c > 0, \quad U_\ell < 0, \quad U_{cc} < 0, \quad U_{\ell\ell} < 0$$

(25)

Subject to the budget constraint

$$c + \dot{K} + \dot{b} = F'(K, \ell) + i'b - \tau$$

(26)

Where $F'(K, \ell)$ is the finance-constrained equivalent production function that is consistent with the antiderivative of the prevailing marginal efficiency of capital ρ and the assumed values of labour supply *ℓ* in the production function $F(K, \ell)$. The intertemporal optimisation of expected lifetime utility that reflects optimal consumption smoothing subject to a budget constraint (see, for example, Blanchard and Fischer, 1989, Ch. 2) can be usefully viewed as the analog, in an intertemporal equilibrium model, of the Hicksian IS curve (Woodford, 2003, ch. 4). In our treatment with its emphasis on the speculative demand for liquidity in portfolio choice, the liquidity-premium influences the equilibrium conditions via the interest rate of government bonds that enter the model in the budget constraint. Lately, Canzoneri et. al. (2008) place government bonds directly into household utility to reflect a precautionary demand for liquidity in the absence of financial institutions and of portfolio choice considerations.

A special case arises in the absence of liquidity-preference and of a liquidity-premium dependent yield curve, that is, when the liquidity-premium equivalent nominal short-term *r′* becomes equal to the nominal short-term interest rate *r* that is consistent with the technological real interest rate rule. In this case, the marginal efficiency of capital or the real expected rate of return on investment becomes equal to the marginal product of capital and the market determined short-term interest rate becomes equal to the marginal product of capital and, therefore, to the technologically determined short-term interest rate

$$i' = i = \rho = F_K(K, \ell) \quad \text{wh en,} \quad r' = r \tag{27}$$

so that (26) is transformed as a special case in the following neoclassical budget constraint proposed by Fisher and Turnovsky (1992):

$$c + \dot{K} + \dot{b} = F(K, \ell) + ib - \tau \tag{28}$$

where τ expresses real lump-sum taxes and β is the rate of consumer time preference, taken to be constant. Moving on, the initial conditions are:

$$b(0) = b_0, \quad K(0) = K_0 \tag{29}$$

The instantaneous utility function U is postulated to be strictly concave in consumption and leisure, which are both assumed as normal goods. It is postulated that the marginal efficiency of capital is positive but diminishing to mirror by a shift parameter as we will see below the standard neoclassical properties of positive, but diminishing, marginal physical products and homogeneity of degree one. Adjustment costs are assumed nil so investment changes continuously.

We obtain the first-order optimality conditions, the necessary transversality conditions, the product market equilibrium, the basic macroeconomic structure equilibrium conditions as well as the conditions describing the steady state of the economy in a similar fashion to the framework proposed by Fisher and Turnovsky. However, the impact of liquidity-premium on the real interest rate and the imposition of liquidity-premium driven financial constraints on production yield strikingly different results from their model. Thus, when the representative agent takes τ, β, and i' as given during the utility maximization decisions the first-order optimality conditions are:

$$U_c(c, \ell) = \lambda \tag{30}$$

$$U_\ell(c, \ell) = -F'_\ell(K, \ell)\lambda \tag{31}$$

$$\lambda\rho = -\dot{\lambda} + \lambda\beta \tag{32}$$

$$\lambda i' = -\dot{\lambda} + \lambda\beta \tag{33}$$

Where *λ(t),* the costate variable is the marginal utility of wealth associated with the budget constraint. As *t* approaches ∞, the necessary transversality conditions are:

$$\lim \quad K\lambda e^{-\hat{a}t} = 0$$

(34)

$$\lim \quad b\lambda e^{-\hat{a}t} = 0$$

(35)

With g denoting real government expenditure, the government's expenditure, taxation and financing decisions are related by its budget constraint

$$\dot{b} = g + i'b - \tau$$

(36)

The product market equilibrium as a combination of the previous equation with the private sector budget constraint in (26) is

$$F'(K, \ell) = c + \dot{K} + g$$

(37)

The basic macroeconomic structure is derived from equations (30) and (31) that can be solved for c and ℓ

$$c = c(\lambda, K) \qquad c_\lambda < 0, \quad c_K < 0$$

(38)

$$\ell = \ell(\lambda, K) \qquad \ell_\lambda > 0, \qquad \ell_K > 0 \tag{39}$$

It is postulated that the extent by which the marginal efficiency of capital differs from the marginal product of capital is associated with the value of the shift parameter, γ so that

$$\rho = \gamma F_K(K, \ell) \tag{40}$$

Substituting equations (38), (39) in the product market equilibrium (37) and the optimality condition (32) yields

$$\dot{K} = \mathrm{F}'(K, \ell(\lambda, K)) - c(\lambda, K) - g \tag{41}$$

$$\dot{\lambda} = \lambda[\beta - \gamma \mathrm{F}_K(K, \ell(\lambda, K)] \tag{42}$$

Obviously in (26) when the interest rate is greater than warranted and the marginal efficiency of capital is low, the budget constraint reduces the rate of capital change and consumption. Given finance decisions and the marginal efficiency of capital (40), (41) and (42) reverse the recursive process from finance to production for the representative agent who needs to be financed in order to move on with his entrepreneurial decisions.

The steady state of the economy, reached when $\dot{K} = \dot{\lambda} = 0$, is obtained from the equations below

$$F'(\tilde{K}, \ell(\tilde{\lambda}, \tilde{K})) = c(\tilde{\lambda}, \tilde{K}) + g \tag{43}$$

$$F_K(\tilde{K}, \ell(\tilde{\lambda}, \tilde{K})] = \beta / \gamma \tag{44}$$

These last two equations show that since the technologically determined short-term interest rate is not equal to the consumer rate of time preference it is not independent of fiscal policy intervention.

The above analysis demonstrated the macroeconomic effects of the liquidity-premium yield curve in a simple optimizing intertemporal context. In the presence of diverging views with respect to real vs. monetary (production) economics, rational vs. behavioural economics, capital theory and of *ceteris paribus* assumptions with respect to consumption, wealth effects etc. the analysis above should be viewed more as a valuable technical framework that exhibits important macro- and micro-economic mechanics rather than as a prelude to a general theoretical context. Still, the merits of this approach are recognizable. At the macroeconomic level, the similarities with the pure Keynesian framework and the IS-LM mechanics are obvious. At the microeconomic level, the advantages associated with the optimization of the representative agent are also present especially with respect to finance-constrained choices. It is accepted that for many economists accustomed to real magnitude economics, either orthodox or heterodox, this form of analysis that is based on the spirit of the psychological propensities inherent in Keynes's monetary production economics appears highly eclectic. Yet, it still serves as a proof that the pure Keynesian framework can be grounded on an analysis of intertemporal process and of integral space and that the latter can be utilized, potentially, as a valuable channel for those who wish to consider very important issues in economic theory (such as those related to the 2008-2009 international financial crisis) beyond methodological and perhaps rhetorical barriers. Finally, the pedantic value of the IS-LR-MP model is also substantive if one considers the growing dissatisfaction with mainstream economics among students in the aftermath of the recent great recession (Shiller, 2010).

In figures 4 and 5, there are comparisons of the dollar value of the S&P 500 and the unemployment rate during two different historical periods in which economic downturns were severe downturns, the one during the Great Depression and the other during the Great Recession, 2007-2009. In both figures, the unemployment rate is graphed on the right axis on an inverted scale and the S&P is graphed as an index number on the left scale. In those figures, shaded areas represent NBER recessions. The close correlation between the value of representative stock market indexes and unemployment during major recessions has been considered as being suggestive that the hypothesis that crashes in financial markets cause severe downturns in economic activity such as the Great Depression and the Great Recession and that economic theories, which support this causal link require further investigation (Farmer, 2012). However, one major difference between these two historical periods is the fact that contrary to the depression years, the sentiment of financial investors has taken a more central place as an empirical determinant of financial market evaluations following the progress in survey methods. In this vein, factors such as the state of confidence and sentiment are approximated today by various sentiment survey measures of market participants (i.e., fund managers, traders, individual investors etc.). Global financial institutions utilize extensively a broad range of sentiment surveys such as, for example, on international institutional investor flows and on attitudes of fund managers. Thus, in figure 6, the value of S&P 500 is graphed as an index number on the left scale and the US stock market confidence index is graphed on the right axis. The latter is represented in the present article by the crash confidence index produced by the International Center for Finance of the Yale School of Management. This index represents the percentage of respondents who attach a low probability, less than 10%, at the prospect of a stock market crash in the next-six months. The state of confidence as it is represented by the crash confidence index has a very strong correlation with the value of the stock market and in certain slumps it precipitates them. Again, such evidence suggests that theories of the transmission of the impact of the state of confidence via financial markets to the real economy require further consideration. The model proposed here on the basis of pure Keynes behavioural axioms is, among other alternative approaches, such a theory.

4. Concluding Remarks

The IS-MP approach is a contemporary attempt to provide a superior alternative to the IS-LM model for Keynesian macroeconomics today. This approach incorporates as the New Synthesis macroeconomics the assumption that central banks follow a real interest rule, which is consistent with contemporary practice by central bankers. The introduction of the assumption of the interest rate rule takes place in the IS-MP context in an attempt to provide a concrete alternative to the IS-LM model that avoids some of the weaknesses of the latter without facing other greater difficulties. However, while the new-Keynesian IS-MP approach provides a simpler and easier analysis of monetary policy than the old-Keynesian IS-LM model it runs into greater problems. One major difficulty is associated with the influence of liquidity-preference, a central consideration in the analysis of Keynes (that was incorporated by Hicks in the IS-LM) on the macroeconomic process, which is vanished completely in the IS-MP framework.

Although the IS-MP and the IS-LM models were presented by Romer as two mutually exclusive cases, it was shown initially in the present paper that the mutual exclusiveness between these two models is erroneous and that the IS-LM model could effectively accommodate the assumption of the real effective rule under certain assumptions made about the short-run economic conditions. Thus, in the context of a two-asset model, an enhanced two-tier general IS-LM-MP model was presented. In this general model, the IS-LM approach is operative under regime conditions of great uncertainty, financial distress and flight to money due to the influence of liquidity-preference, which may lead to prolonged recession while the IS-MP approach takes rather place under more stable economic conditions, which are associated with periods of less uncertainty.

The development of a macroeconomic framework that retains certain micro-foundations associated with the LM curve while it allows for a real interest rate effect is a realistic approach that is purely Keynesian in the sense that it is more true to the spirit of Keynes and his emphasis on psychological propensities. The IS-LM model was essentially an analytical construction by Hicks in his attempt to express fundamental forces in Keynes's theory such as the marginal efficiency of capital, the consumption function and liquidity-preference. Thus, for those economists who like Keynes and Hicks put over the years an emphasis on the operation of liquidity-preference due to the working of the speculative motive and on the discounted expected monetary streams associated with the marginal efficiency of capital, the traditional IS-LM has been a very useful and enduring construct. On the contrary, in the IS-MP approach, the influence of liquidity-preference disappears completely to an extent that the very same term is not quoted at all. In addition, the effect of the discounted monetary streams associated with the notion of the marginal efficiency of capital is completely overlooked. This factor is important in the case in which liquidity-preference is operative and the equilibrium interest rate becomes greater than the level associated with the natural interest rate.

The most important advantage of the pure Keynes IS-LR-MP model that was advanced in the present article on the basis of an intertemporal framework that incorporates a liquidity-premium dependent yield curve or term structure approach is that while it represents the fundamental forces of Keynes's economic analysis it can nevertheless incorporate assumptions associated with the contemporary practice of monetary policy such as the real interest rule. In this sense, it serves as a more powerful and general theoretical benchmark for the analysis of diverse views that emphasize different aspects of the macroeconomic process such as the liquidity-preference, the marginal efficiency of capital and the application of the real interest rule. Not only this, but it is also a useful construct because it serves as a venue of theoretical exchange between the different strands of Keynesian economic thought. For example, different policy effects can easily be recognised within the old-Keynesian IS-LM apparatus.[9] The same advantage holds true in the IS-LR-MP model. This option is missed when one resorts to rather narrow representations of the macroeconomic process, as it is the case with the IS-MP model. An extension of this argument is that in retrospection, building and sticking to a multi-regime IS-LM model is more useful than simpler alternatives to it because it can be utilized as a communicative tool among different strands of economic thought that encompasses the classical school, monetarists, new Keynesians, so-called "old" Keynesians or post-Keynesians.

With respect to a multi-asset framework, the key question is whether the existence of multiple interest rates that correspond to bonds of variable term to maturity can be always compatible with the application of a real interest rule. The facts that the influence of monetary policy on long-term interest rates is weak and that on the contrary the impact of the liquidity-preference on them due to the impact of human psychology forces and of the speculative motive is more powerful in certain critical cases point out to the existence of practical difficulties in the application of a real interest rate rule. The IS-LR-MP model that was developed in a multi-asset framework demonstrated that there is only one yield curve that is consistent with the application of a real interest rule. In practice however, it is possible that a different form of yield curve prevails that rises faster and stands above the yield curve that is consistent with the real interest rate. This happens because in practice the yield curve embodies increasing liquidity premia with term to maturity due to the operation of liquidity-preference influenced by animal spirits and by the speculative motive. In the case in which the yield curve that embodies increasing liquidity-premia is consistent with equilibrium in the financial markets so that there is no arbitrage across bonds of different term to maturity, then the combined influence of variThous interest rates along this yield curve is consistent with a base market interest rate that is greater than the level associated with the real interest rate rule. In this context, this process renders monetary policy ineffective. This process enhances our understanding of severe large recessions. This inconsistency between the yield curve and the real interest rule is central to the model in the present paper which supports the view the world economy in 2008 moved to a high unemployment equilibrium caused by a loss of confidence in the value of financial assets and the panic in global financial markets.

ENDNOTES

[1] See Clarida and Gertler (1997), Bernanke and Mihov (1997) and Laubach and Posen (1997) on this.

[2] See for example, Moore (1988)); in terms of the endogenous money approach the LM curve is also undermined or rejected (see Rochon, 2007). However, this approach seems to reject the LM construct solely based on the non-relevance of money supply without providing an analytical channel for the behavioural nature of the demand for money.

[3] For an exposition of the mechanics of this rule, see Taylor (1998).

[4] See Tobin (1980).

[5] Hicks (1983) accepted the role of the long-term interest rate as it was emphasized by Kahn (1972); also, Tobin (1980), Davidson (1994), Leijonhufvud (1968).

[6] On theories of the term structure of interest, see Shiller, (1990).

[7] Howells and Biefang-Frisancho Mariscal, (2006) suggest alternatively that the *LM* curve will be horizontal but not necessarily at the rate set by the central bank due to opportunity cost considerations of holding money.

[8] For the use of sequential analysis in terms of IS-LM and associated with equilibrium as a situation of rest see Tobin, pp. 16-17, 1997.

[9] On this particular functional advantage, see Solow, 1984, p.14.

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FIGURES

Figure 1

Graph 1 **Graph 2**

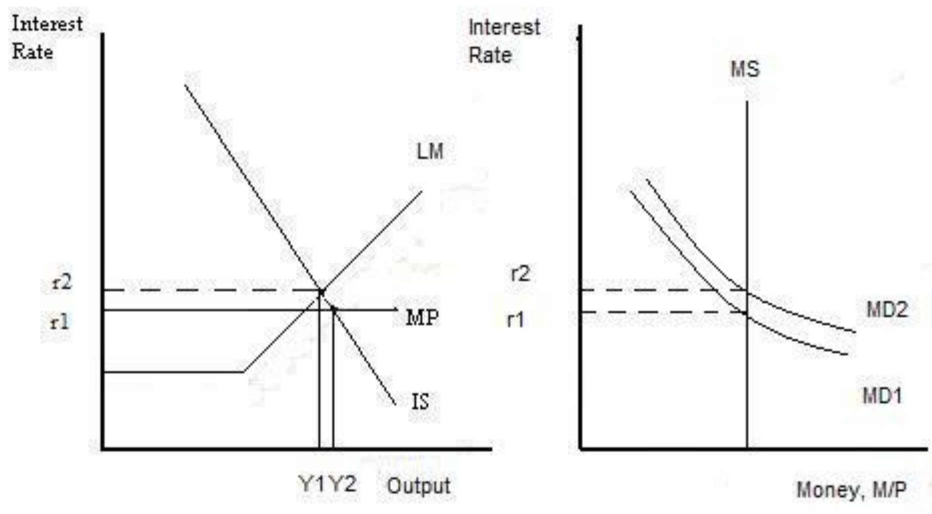

Figure 2

Graph 1 **Graph 2**

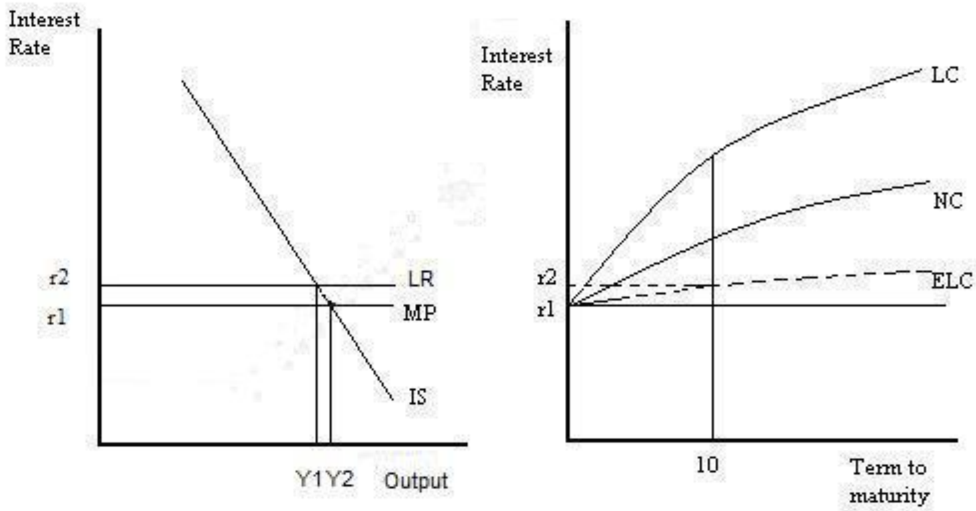

Figure 3

Graph 1 **Graph 2**

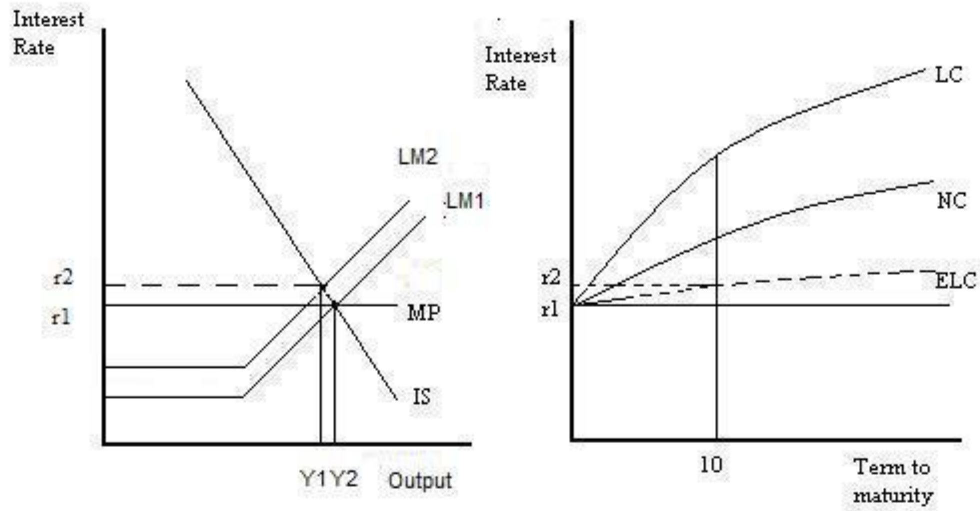

Figure 4 The Stock Market and Unemployment during the Great Depression

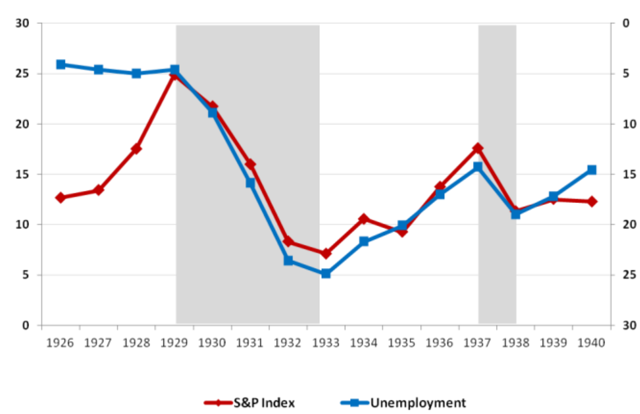

Figure 5 The Stock Market and Unemployment during the Great Recession

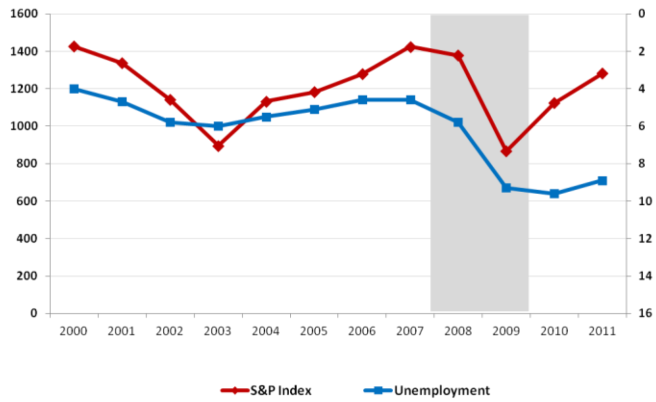

Figure 6 The Stock Market and the State of Confidence