A New Interpretation of the Mechanism for the Determination of Interest Rate and Its Policy Implications

Huang, Wenge and Zhang, Jinsong

30 June 2015

A New Interpretation of the Mechanism for the Determination of Interest Rate and Its Policy Implications

This paper first indicates that saving equals to the liquidity preference plus the supply of loanable funds and the liquidity preference is just opposite to the supply of loanable funds. Meanwhile, the paper proposes a new model in which **interest rate is determined by the investment demand curve and the symmetrical curve of the liquidity preference curve about Y axis.** On such basis, the paper notes that the existence of liquidity preference makes effective demand always deficient. **Thus market failure becomes the norm** and the government is obliged to take aim at the interest rate which is determined by the desired investment and desired saving. So far the paper has thoroughly clarified how interest rate is determined and constructed a new and compact macroeconomic analytical framework. Further, the paper attempts to discuss the new model's inspiration to Taylor rule and other deductions brought by the new model.

Keywords: liquidity preference, supply of loanable funds, saving, determination of interest rate, insufficient effective demand

JEL classifications: E12, E43, E52

1. Introduction

The divergent interpretations of the mechanism for the determination of interest rate have been an essential problem that is most confusing and controversial in economics.

The classical theory of interest, also known as the real theory of interest, holds that interest rate is determined by investments and saving, which is the traditional theory of interest in western economics. According to the classical theory, interest rate can automatically regulate economy to equilibrium. When the interest rate is higher than equilibrium level, saving is greater than investment, and the oversupply will lead to the decrease of interest rate that results in less saving and more investment until a equilibrium achieved, and vice versa.

J. M. Keynes (1936), however, criticizes the classical theory of interest and proposes a new theory of liquidity preference in *The General Theory of Employment, Interest and Money*. Keynes holds that interest rate is determined not by investment and saving but by the demand for and supply of money. Demand for money, or liquidity preference in a broad sense, is composed of transactions motive, precautionary motive and speculative motive, within which the transactions motive and the precautionary motive are primarily connected to income, while the speculative motive, or liquidity preference in a narrow sense, is related to interest rate. Supply of money is a volume of money decided by money authority. Interest rate is a kind of price that equals the demand for money held by the public to the monetary aggregate. In other words, Keynes regards interest rate as a sheer monetary phenomenon.

The liquidity preference theory raised plenty of controversies once it was published. The Neo-Classical economists D.H. Robertson (1936, 1937, 1940) and B. Ohlin (1937A, 1937B)

admitted that Keynes was reasonable in pointing out the influence from money to interest rate, but incorrect in completely denying the physical elements. Therefore, they proposed loanable funds theory, attempting to take both physical and monetary elements into consideration in interest rate determination. They hold that interest rate is determined by the demand for and supply of loanable funds in which the demand is composed of the demand for investment and demand for hoarding money, and the supply is formed of planned saving, dishoarding and money created by the banks. But the loanable funds theory is just partial equilibrium analysis and equilibrium in loanable funds market cannot guarantee that in physical and monetary markets.

J.R. Hicks (1937) took the lead in proposing the prototype of IS-LM model in his paper *Mr Keynes and the Classics: A suggested interpretation* to solve the problems in Keynes' liquidity preference theory and fill the gaps in the loanable funds theory. But the popularity of IS-LM model as a model of interest rate determination should attribute to A. Hansen's efforts. In his book *A Guide to Keynes*, Hansen (1953) pointed out that interest rate is indeterminate in Keynes' theory. Hansen's criticism can be summarized as: interest rate is determined by the general money supply and demand of which the transactions motive is influenced by income that in return is determined by investment whose determinants include interest rate and marginal efficiency of capital, and thus both interest rate and income are uncertain. In response to the need of the general equilibrium method to avoid the circular reasoning, Hansen came up with IS-LM model after which the IS-LM model developed from a model of interest rate determination to a dominant macro-economic model of Neo-Classical Synthesis for many decades.

However, IS-LM model has also been criticized by many economists. For example, L. Pasinetti (1974) has argued that Keynes.s theory should not be analyzed simultaneously but

sequentially. That is, Keynes's theory ought to be considered as a sequence of alternating decisions in monetary sector and real sector. Even Hicks (1980), the founder of IS-LM model, also pointed out the great defect of the model that the stock analysis of LM curve is inconsistent with the flow analysis of IS curve. V. Chick (1982) also attacks IS-LM model on the basis of its internal logic.

It is clear that although *The General Theory of Employment, Interest and Money* has been published for almost 80 years, there are still many confusions and questions rather than consensus in the theory of interest rate determination. Is interest rate determined by physical elements or monetary elements or both of them? Why do different theories of interest stick to their own argument? Is it possible to compromise these theories? And what on earth determines interest rate?

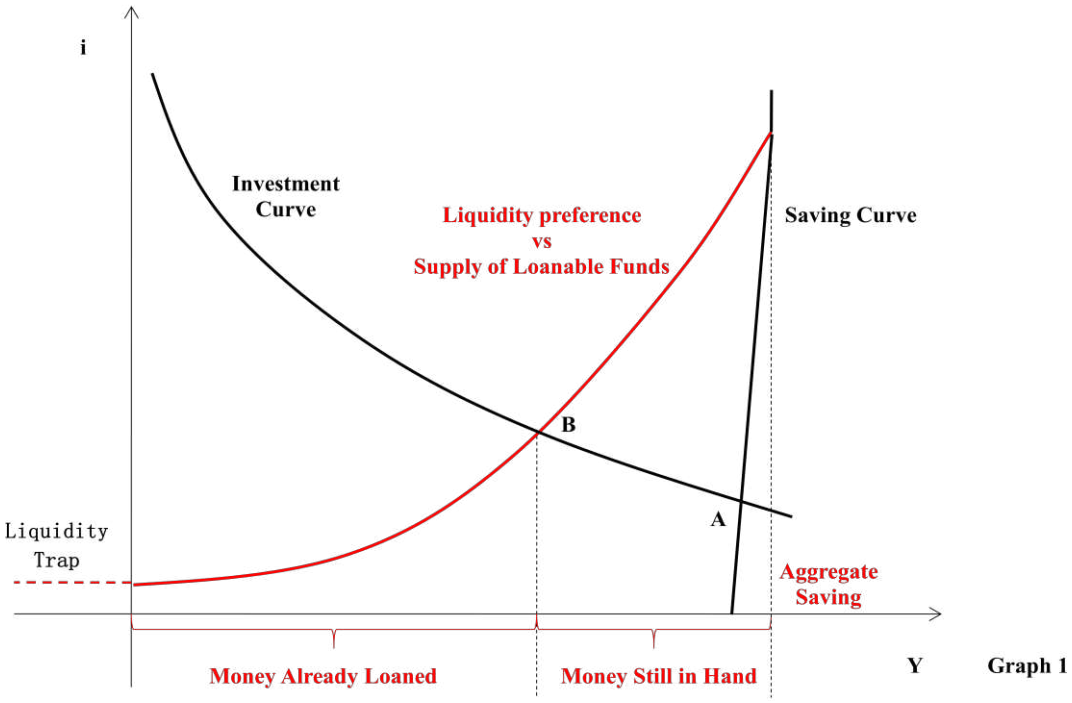
This paper attempts to solve the questions listed above.

2. Liquidity Preference and Supply of Loanable Funds

Let's refute the classical theory of interest first. The classical theory of interest holds that interest rate is determined by investment and saving, or in actuality, interests are the compensation for waiting or postponing consumption. In our view, however, propensity to save or consume is loosely related to interest rate. Without interests, people still tend to save but just not lend money to others. In other words, saving or not is one thing, while lending or not is another.

We hold that the propensity to save is mainly affected by the elements such as the degree of polarization between the rich and the poor and perfection of social security system, etc. The basic cause of saving lies in the surplus of consumption and some people's preparation for future.

Therefore, interest rate is the motive of lending rather than compensation for waiting or postponing consumption. As Keynes' view, interest rate can be understood as the reward to the sacrifice of liquidity.



The graph above shows that **the interest rate elasticity of saving is quite low and saving equals to the liquidity preference plus the supply of loanable funds**. With fixed desired saving, interest rate determines the quantity of holding money (due to liquidity preference) and that of lending money (as the supply of loanable funds). The higher interest rate, the less liquidity preference and the more supply of loanable funds, and vice versa. That is to say, **liquidity preference is just opposite to the supply of loanable funds**.

Obviously, **interest rate is not determined by the investment curve and saving curve, but by the investment curve and the symmetrical curve of liquidity preference curve about Y axis.** In the gragh, the investment curve is equivalent to the demand curve of loanable funds, and

the symetrcal curve of liquidity prefernce curve about Y axis is equivalent to the supply curve of loanable funds.

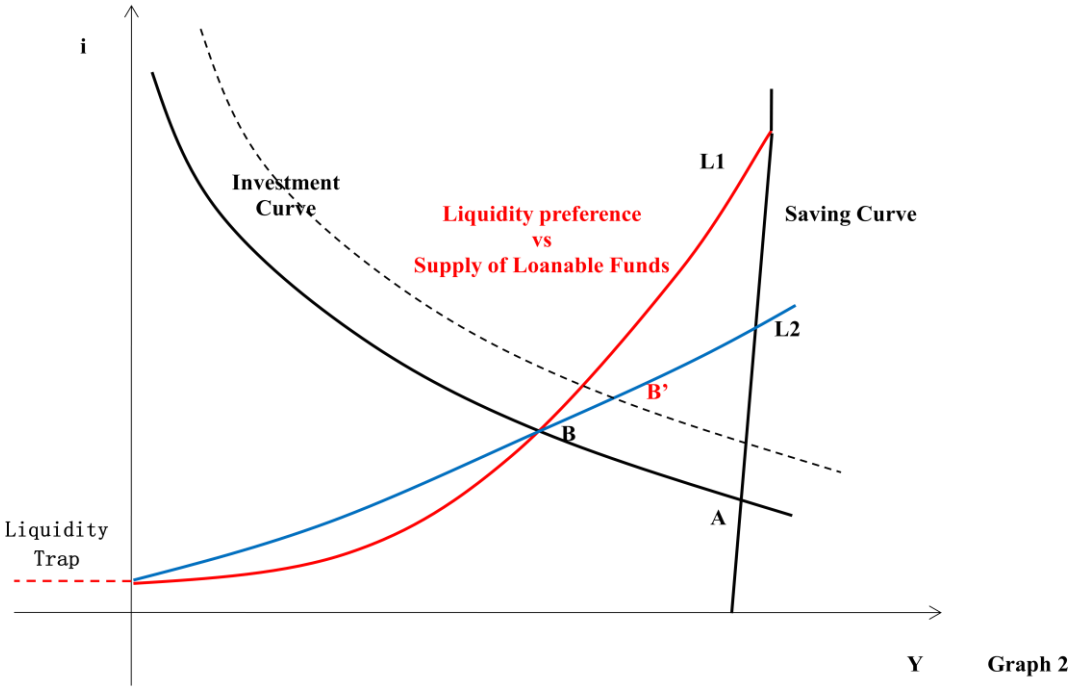
But our new moedel is distinct in nature from the Neo-Classical theory of lonable funds because the loanable funds theory just simply adds liquidity prefernce theory to the classical theory of interest without considering the fact that the partial conversion from planned saving to supply of loanable funds, furthermore, **liquidity prefernce and supply of loanable funds are two sides of a same matter**. Our new model essentially combines the liquidity prefernce theory and the loanable funds theory together.

We know, however, that Keynes' liquidity preference theory is a stock analysis model while ours is a flow analysis model. But there is no controdiction between them because t**he new one exactly reveals the reasons and nature of Keynes' liquidity preference (stock demand for money) which is the accumulation of "leakage" of saving (the saved but not loaned money).** It is clear that Keynes accurately put forward liquidity prefernce but failed to reveal its nature, resulting in plenty of confusions and disputes.

Actually, the liquidity preference we discuss in the paper mainly indicates the money demand correspondent to Keynes' speculative motive. Keynes just emphasizes the relevancy between speculative money demand and interest rate in his liquidity preference theory, but speculative motive is also related to income. If we compare an economic entity with GDP of 1 trillion US dollars with that of 0.1 trillion US dollars, the speculative money demand of the former is clearly much higher than the latter.

Obviously, since the introduction of stock liquidity preference, the interest rate of a year is not simply determined by the desired investment and the supply of loanable funds brought by desired

saving of that year, but closely related to the stock demand for money (the accumulated liquidity for years). We adjust the new model to be as follow.



Graph 2

A rising of investment curve will lead to a rising of interest rate. But according to the graph, with the rising of interest rate, the real economy will attract not only more liquidity of that year, but also more stock liquidity, and vice versa. This situation leads that the interest rate elasticity of the general liquidity preference (curve L2) is higher than that of that year (curve L1), which is the root cause of Keynes' repetitive emphasis on the high interest rate elasticity of liquidity preference in his theory.

Therefore, interest rate is determined by the intersection of investment curve and curve L2 in the above graph rather than the intersection of investment curve and curve L1.

3. Liquidity Preference and Insufficient Effective Demand

The new model reveals the mechanism for the determination of interest rate in the situation of economic liberalism, however, comes to an important conclusion that **the existence of liquidity preference makes effective demand always deficient.**

Without liquidity preference, the desired saving will be totally transformed into the desired investment, ensuring that economy can be operated in the maximum potential output. But since there is liquidity preference, some people prefer holding money to lending out, which results in the fact that the desired investment is always less than the desired saving, and thus effective demand is always insufficient.

We know that the principle of effective demand, the core of Keynes' theory, is based on three basic psychological rules including the law of diminishing marginal propensity to consume, the law of diminishing marginal efficiency of capital and liquidity preference. Although Keynes has made great efforts to prove insufficient effective demand, the result is far from satisfactory.

About the law of diminishing marginal propensity to consume: Keynes holds that the increase of consumption is usually left behind by that of income, which leads to insufficient effective demand. But in our opinion, the declining consumption does not necessarily result in insufficiency of effective demand, because if all the desired saving (not consuming) can be transformed into investment, the aggregate effective demand will not decrease.

About the law of diminishing marginal efficiency of capital: Keynes thinks that with the increase of social and individual investment, the investment confidence of the whole society will collapse suddenly in due time. At that time, the investment demand will sharply decline to insufficiency and result in seriously insufficient effective demand. In our view, such crisis happens

when the investment curve falls too much and without intersection with saving curve, just as what Keynes says the collapse of marginal efficiency of capital.

About liquidity preference: Keynes's demonstration is not clear about how does liquidity preference lead to insufficient effective demand. Some attribute to the high interest rate brought by too strong liquidity preference sometimes, while others attribute to the liquidity trap. But Keynes fails to realize that once there is liquidity preference whether strong or not, the desired loan is inevitably less than the desired saving and this situation will naturally lead to insufficient effective demand, which is exactly one of the root reasons of insufficient effective demand.

We always believe that market is a good mechanism for organizing economic activities and market failure is quite rare. But the liquidity preference normalizes the insufficient effective demand even if the propensity to consume and investment willingness are constant. And thus, the new classical economics' belief that supply and demand of the market can automatically achieve full employment collapses of itself.

This deduction makes it necessary for government's intervention in economy. In order to solve the insufficient effective demand resulted from liquidity preference, government must focus on interest rate and use monetary approach to locate interest rate in the equilibrium point A determined by investment curve and saving curve in graph 2 where desired saving are transformed into investment completely. Obviously, the interest rate here is effective interest rate instead of nominal interest rate.

But in the actual situation, whether the open market operation or the discount rate operation, the monetary authority ought to simultaneously influence interest rate and bank reserves to solve the insufficient effective demand led by liquidity preference.

The money released to cut interest rate by the monetary authority, on the one hand, will flow into real economy due to the increasing investment demand resulted from the decrease of interest rate. And on the other hand, a large amount of money will be absorbed due to the increasing liquidity preference led by the declining of interest rate, and vice versa. That is, in order to reach the goal, the quantity of money released or taken back by the monetary authority is much more than that flows into or flows out real economy since the interest rate elasticity of liquidity preference is much more than that of investment demand.

When the interest rate rises, the liquidity preference of the public falls and people will lend out more money. When the interest falls, the liquidity preference of the public rises and people will take back their loans. Considering the restricts and limitations of taking back the loan, the influences of increasing and decreasing interest rate to liquidity preference from monetary authority should be asymmetrical.

Now let's look at the nature of above monetary policy.

Government taking aim at the interest rate makes that monetary authority's injection of bank reserves has replaced saving the source of investment. In the situation of economic liberalism, investment is supported by the supply of loanable funds brought by saving. The monetary policy discussed above disconnects the desired investment from desired saving to a great extent, although the target rate of interest is determined by desired investment and desired saving.

Similarly, above monetary policy makes that the change of liquidity preference (such as because of the stock market booming) does not influence the determination of interest rate anymore because the monetary authority will take reverse operation to counteract the influence from the changes of liquidity preference to interest rate.

4. What on Earth Determines Interest Rate

We criticize the classical theory of interest from the beginning of the paper, but now we hold that interest rate is determined by desired investment and desired saving, which seems a little paradoxical but actually quite different in nature.

The classical theory of interest holds that interest rate can adjust automatically, which equals desired investment to desired saving in order to achieve full employment. But market itself cannot make it because the existence of liquidity preference makes that interest rate just adjusts automatically to equal desired investment to the opposite of liquidity preference. But the equilibrium interest rate is higher than that equals desired investment to desired saving, which will hinder investment.

In order to ensure economy of being in the situation of maximum potential output, government must use monetary approach to focus on the target rate of interest that is the equilibrium point where desired investment is equal to desired saving.

Therefore, superficially, interest rate is determined by the monetary authority, but since the monetary authority cannot make random determination for interest rate, its goal is determined by physical elements (investment and saving). In other words, interest rate is determined by physical elements in modern society. But considering inflation's influence on effective interest rate, interest rate will be affected by monetary elements in this sense.

Obviously, the target interest rate determined by investment and saving here is similar to the natural interest rate proposed by K. Wicksell (1898) who creatively divides interest rate into

monetary interest rate and natural interest rate. But due to his lack of the knowledge of the monetary mechanism for the determination of interest rate at that time, his theory of interest has long been ignored.

Next, we will make use of our new understanding about the mechanism for determination of interest rate to comment on the viewpoints about interest rate in the mainstream economics textbooks. We take N.G. Mankiw's *Principles of Economics* as an example:

"Supply and demand of loanable funds" (p.565): According to Mankiw's definition, the supply of loanable funds indicates that people decide to save and lend out all their income except for consumption, which means saving is equal to the supply of loanable funds, and interest rate is determined by investment and saving. Therefore the theory in Mankiw's book is not the real loanable funds theory but the classical theory of interest. And based on our previous analysis, Mankiw is wrong in his view that interest rate can adjust automatically to achieve equilibrium between the demand (investment) for and supply (saving in that book) of loanable funds.

"Long-term interest rate and short-term interest rate" (p.762): Mankiw holds that the physical element is the long-term element for interest rate determination, and monetary element is the short-term element. But in our logic, since government has to take aim at the interest rate, so physical element is the final determinant of the target interest rate, while the monetary element is just the approach to achieve the target interest rate. In our point of view, there is no difference between long-term determinant and short-term determinant of interest rate. But if considering inflation's influence on effective interest rate, Mankiw's conclusion is reasonable to some extent.

"Supply and demand of loanable funds market and foreign exchange market" (p.697): The effective interest rate of a country influences the net capital outflow and then the real exchange

rate of open economy. But as what mentioned before, the change of effective interest rate here is not based on self-adjustment but government's monetary approach.

5. New Model's Inspiration to Taylor Rule

Since 1993, Taylor rule that focuses on effective interest rate has been the theoretical foundation for monetary policy operation of Federal Reserve, European Central Bank, Bank of England and Bank of Canada.

The new mechanism for the determination of interest rate in this paper lays a theoretical basis for Taylor's adding output gap as a variable in Taylor rule. Besides, the new mechanism provides new theoretical foundation for Federal Reserve's shift from target of money supply to target of effective interest rate, in addition to the weak correlation between money supply and real economy, and monetary authority's disability to control money supply accurately since late 20th century.

Let's introduce Taylor rule first:

$$i_t = r^* + \pi_t + \alpha(\pi_t - \pi^*) + \beta(y_t - y^*)$$

i_t is the short-term nominal interest rate that is the short-term interest rate used as a tool or policy objective by central banks, or federal funds rate in America. r^* is the equilibrium real interest rate that enables a country to reach the potential output level and deducts the influence of inflation. π_t is the inflation rate that is the average inflation rate of the past four seasons. π^* is the target inflation rate established by central bank. $\pi_t - \pi^*$ shows the inflation gap. y_t is the actual gross output. y^* is the potential output that indicates the maximum output in the situation of taking full advantage of all the resources for production in an economic system. $y_t - y^*$ is the gross output gap. α and β represent the coefficients of nominal interest rate to

the inflation gap and output gap respectively.

Based on the previous theoretical research achievements and considering to simplify the formula, Taylor defines both α and β as 0.5. Besides, he sets r^* as 2% and the target inflation rate as 2%. And thus, Taylor's formula is changed to:

$$i_t = 2 + \pi_t + 0.5(\pi_t - 2) + 0.5(y_t - y^*)$$

Taylor finds that the interest rates predicted with this rule matches with the past actual federal funds rates very well.

Actually, Taylor rule provides a monetary policy mechanism with the open market operation as the tool, the short-term interest rate as the operational target, the effective interest rate as the intermediate target, the low inflation rate and economic stability as the policy target, and reverse operation as basic principle.

But there are many uncertainties in the practical application of Taylor rule, such as the choice of equilibrium real interest rate, the choice of coefficients of inflation gap and output gap, the calculation of potential output, the determination of target inflation rate, and the choice of current value or predictive value, etc.

Now let's see the inspiration from the new model to Taylor rule:

First, the target rate of interest determined by desired investment and desired saving is exactly the equilibrium real interest rate in Taylor rule. Since the choice of equilibrium real interest rate has great influence on the measure and calculation result, our model shows the possible direction for choosing equilibrium real interest rate correctly.

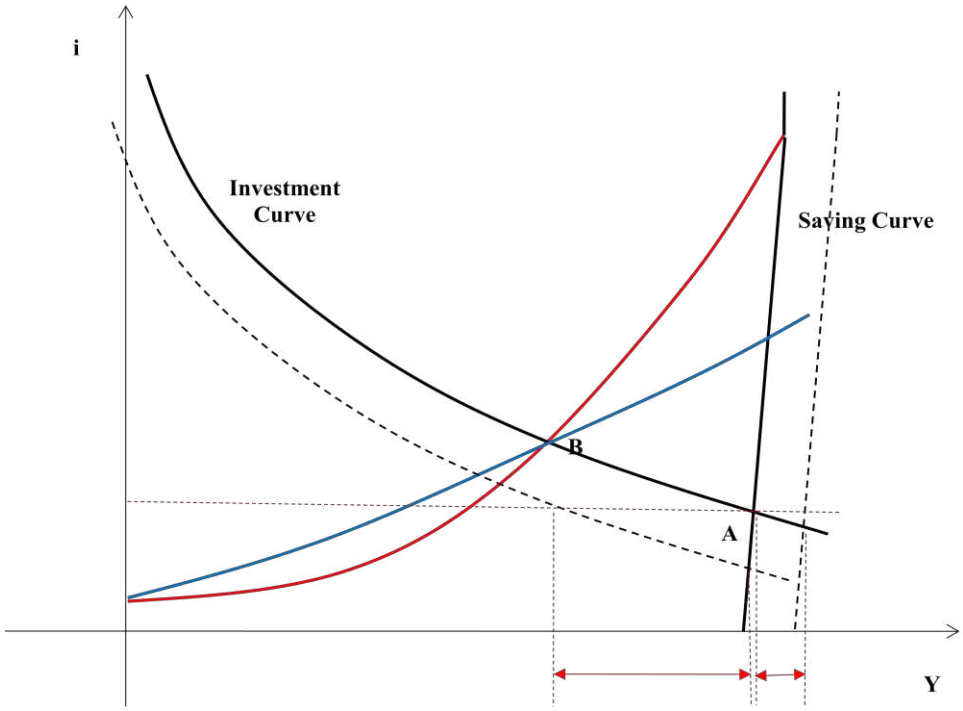
Second, the output gap resulted from the change of investment demand is wider than it is thought due to the low interest rate elasticity of saving. But the interest rate elasticity of investment demand is comparatively high, so we can come to the primary conclusion that the coefficients of both output gap and inflation gap should be relatively small.

Besides, Taylor holds that equilibrium real interest rate should be fixed as 2%. But according to our analysis, equilibrium real interest rate is not constant.

6. New Model and Other Deductions

Let's look at one deduction from the new model first:

The fact that **interest rate elasticity of saving is much lower than that of investment demand** leads to the greater influence from fluctuation of investment willingness than from the changes of consumption propensity to output (see graph below). In other words, economic fluctuation is mainly caused by the changes of investment willingness.



Graph 3

This deduction has well explained why investment only takes up one seventh of GDP on

average but results in about two thirds of GDP decline during recession in America (Mankiw, 2012, *Principles of Economics* p.723).

Now let's look at another deduction from the new model:

In terms of American economy, interest rate effect is the most important reason of the aggregate demand curve's fall. When the price drops, money stock comparatively increases, which, according to liquidity preference theory, will lead to the decrease of interest rate. And the declining interest rate will stimulate investment and then increase aggregate demand.

As our previous analysis, the fact that **the interest rate elasticity of liquidity preference is much greater than that of investment** leads the slope of the aggregate demand curve to be greater than 1.

7. Conclusion

This paper firstly points out that the interest rate elasticity of saving is quite low and interest rate is mainly related to liquidity preference; moreover, saving equals to the liquidity preference plus the supply of loanable funds and the liquidity preference is just opposite to the supply of loanable funds. Meanwhile, the paper proposes a new model in which interest rate is determined by the investment demand curve and the symmetrical curve of the liquidity preference curve about Y axis. However, the new mechanism for the determination of interest rate comes to a crucial deduction that liquidity preference leads to the insufficiency of effective demand all the time. Thus the market regulation cannot automatically reach full employment and market failure becomes the norm. Therefore, the government is obliged to take aim at interest rate and locate the interest rate

in the equilibrium point that is determined by investment curve and saving curve. So far the paper has thoroughly solved the essencial problem in economics that what on earth determines interest rate, which has long been disputed, and constructed a new and compact macro-economic analytical framework. Further, the paper attempts to discuss the new model's inspiration to Taylor rule and the other deductions brought by the new model.

Essetially speaking, all the analysis of this paper centrees on the comparison of the interest rate elasticity of liquidity preference, saving and investment.

It is obvious that there are still a lot of susequent research after the paper's new interpretation of the mechanism for the determination of interest rate, such as the other possible deductions from the new model, the related empirical research and mathematical modeling, and the furthur discussion about the inspiration from the new model to monetary policy and Taylor rule.

Bibliography

Chick, V. 1983. *Macroeconomics After Keynes: A Reconsideration of the General Theory*, Philip Allan

Chick, V. 1992. *On Money, Method and Keynes: Selected Essays*, London, Macmillan

Hansen, A. 1953. *A Guide to Keynes*, New York, McGraw Hill

Hicks, J.R. 1937. Mr Keynes and the Classics: a Suggested Interpretation, *Econometrica*, vol. 5, 147-59

Hicks, J.R. 1980. IS-LM: an Explanation, *Journal of Post-Keynesian Economics*, vol. 3, 139-54

Keynes, J.M. 1936. *The General Theory of Employment, Interest and Money*, vol. 7 of JMK, London, Macmillan

Keynes, J.M. [1937A] 1973. The General Theory of Employment, *The Quarterly Journal of Economics*, vol. 51, reprinted in *JMK*, vol. 14, 109-23

Keynes, J.M. [1937B] 1973. Alternative Theories of the Rate of Interest, *Economic Journal*, vol. 47, reprinted in *JMK*, vol. 14, 201-15

Keynes, J.M. [1937C] 1973. The 'ex ante' Theory of the Rate of Interest, *Economic Journal*, vol. 47, reprinted in *JMK*, vol. 14, 215-23

Keynes, J.M. [1938] 1973. Mr Keynes 'Finance', *Economic Journal*, vol. 48, reprinted in *JMK*, vol. 14, 229-33

Mankiw, N.G. 2012. *Principles of Exonomics (sixth edition*), South-Western

Ohlin, B. 1937A. Some Notes on the Stockholm Theory of Saving and Investment, *Economic Journal*, vol. 47, 53-69

Ohlin, B. 1937B. Alternative Theories of the Rate of Interest: Rejoinder, *Economic* Journal, 47, 423-27

Pasinetti, L. 1974. *Growth and Income Distribution*, Cambridge, Cambridge University Press

Patinkin, D. 1958. Liquidity Preference and Loanable Funds: Stock and Flow Analysis, *Economica,* NS 25, 300-18

Robertson, D.H. 1936. Some Notes on Mr. Keynes' General Theory of Employment, *Quarterly Journal of Economics*, vol. 51, 168-91

Robertson, D.H. 1937. Rejoinder to 'Alternative Theories of the Rate of Interest', *Economic Journal*, vol. 47, 428-436

Robertson, D.H. 1940. Mr Keynes and the Rate of Interest, in *Essays in Monetary Theory*, London, Staples Press

Wicksell, K. 2007. *Interest and Prices*, Ludwig von Mises Institute