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**RESEARCH ARTICLE**

# A Note on Robertson and Tsiang versus Keynes

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## ABSTRACT

This paper examines the Robertson/Tsiang explanation of the Savings-Investment/Loanable-Funds theory of interest that is used by mainstream economists to justify the use of this theory to analyze, predict, or explain economic behavior. It is demonstrated that, contrary to what is generally assumed, Tsiang does not reconcile the Robertson/Keynes controversy in Robertson's favor in that Tsiang was confused as to what Keynes actually said with regard to this controversy. It is further demonstrated that Tsiang did not understand the nature of his own model in that the Loanable-Funds theory as specified by Tsiang implies that the rate of interest is a purely monetary phenomenon, determined directly by the supply and demand for the stock of money in his model, not by the flow of loanable funds or the flow of savings and investment. It is argued that the fundamental difference between Robertson and Keynes that led to the confusion that exists to this day is that Robertson's method of analysis was comparative static while Keynes' method of analysis was causal and dynamic. It is further argued that while comparative static analysis has proven to be an extremely valuable analytic tool in economics when it is used in conjunction with the kind of causal/dynamic analysis employed by Keynes to explain how and why the static equilibrium values are obtained, when it is not used in this way the result is the kind of arguments employed by those who defend the loanable-funds theory, namely, arguments that are, at best, semantic and, at worst, border on ideological sophistry.

***Keywords:*** theory of interest; macroeconomic theory; monetary theory; methodology; causality; Keynes; Robertson; Tsiang

## 1. Introduction

In his attempted reconciliation of the controversy surrounding John M. Keynes' Liquidity-Preference (LP) theory of interest and Dennis H. Robertson's Loanable Funds (LF) theory, Sho-Chieh Tsiang argued that:

*In the post-General Theory writings of Keynes, he had already made an important concession to traditional monetary theory, which, if carried to its logical conclusion, would completely erode away his original revolutionary stand. Unfortunately, few people managed to press this concession to its logical conclusion. As a result, certain mistaken ideas have been retained in the Keynesian theory that has come to be firmly established in most postwar textbooks and classrooms. On the other hand, traditional monetary*

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*theory, as expounded by Robertson in particular, who more than anybody else correctly perceived the wrong turn taken by Keynes, and who had strenuously tried to call attention to it, was practically banished from all textbooks and classrooms in the United Kingdom as well as in the United States.*[1]

According to Tsiang:

*The crucial concession made* by *Keynes to the critics of his liquidity preference theory of interest rate is his acknowledgment of the so-called "finance" demand for liquidity, or the demand for "finance" for planned investment yet to be carried out.* [1]

As a result of Tsiang's efforts to discredit Keynes in favor of Robertson in this controversy, and with the help of Axel Leijonhufvud [2], Meir Kohn [3], Belton Fleisher and Kenneth Kopecky [4], Ming-Yih Liang[5], Paul Samuelson and William Nordhaus [6], Robert Stauffer [7], Gregory Mankiw [8], and innumerable others, the LF theory is no longer banished from textbooks and classrooms. And, yet, this controversy has never been resolved [9-16]. The fact that Robertson approved of Tsiang's 1956 [17] analysis of the Robertson/Keynes controversy [18] suggests that by examining Tsiang's understanding of this controversy it may be possible to gain a better understanding of the issues that separated Robertson and Keynes, and, by extension, to clarify the issues for those who do not have a clear understanding of these issues today.

It is demonstrated below, through simple algebra, that Tsiang's analysis does not reconcile the differences between Robertson and Keynes in Robertson's favor in that the determination of the rate of interest in Tsiang's model is a purely monetary phenomena—that is, that the rate of interest is determined by the supply and demand for stocks of money in Tsiang's model—and that flows of saving or investment play no role in this regard. It is further demonstrated that Tsiang seriously misinterpreted the nature of Keynes' "so-called 'finance' demand for liquidity" and that when Keynes' money demand function is appropriately specified it is perfectly consistent with everything Keynes had to say about this function. Finally, it is argued that the fundamental difference between Keynes and Robertson is that Keynes' method of analysis is causal and dynamic in that Keynes identified those factors that in themselves determine each variable at each point in time in terms of the behavior of those decision-making units that actually have the power to determine each variable at each point in time [19-21] while Robertson's analysis is descriptive and static in that the static equilibrium values in his intraperiod analysis just suddenly appear out of nowhere as if by magic, and, given these static equilibrium values, Robertson then describes how they change from one period to the next without explanation as to how these values came into being in the first place.

## 2. Stocks versus flows

In attempting to demonstrate the importance of Keynes' "crucial concession" with regard to "the so-called 'finance' demand for liquidity" Tsiang argued that Keynes' LP theory can be summarized by his monetary equilibrium condition:

$$M_t^s = L\left(C_t^p + I_t^p, r_t, \pi_t, W_t, \cdots\right) \tag{1}$$

where $L\left(C_t^p + I_t^p, r_t, \pi_t, W_t, \cdots\right)$ is Tsiang's interpretation of Keynes' money demand function; $C_t^p$ and $I_t^p$ are current planned consumption and investment expenditures, respectively; $r_t$ the current rate of interest; $\pi_t$ the current expected rate of price inflation; $W_t$ the current value of total wealth; and the "dots following these variables indicate that we shall keep our mind open as to the question whether more arguments should be introduced into the demand for money function" $L$. Tsiang then asserted, without explanation, that "the equilibrium condition that had already been established in the preceding period" is given by:

$$M_{t-1}^{s} = L\left(C_{t-1} + I_{t-1}, r_{t-1}, \pi_{t-1}, W_{t-1}, \cdots\right) \tag{2}$$

"where the planned expenditures have already been carried out and become actual expenditures of the period" and "$C_{t-1} + I_{t-1}$ is therefore the income received of the preceding period, i.e., $Y_{t-1}$." He then expanded (1) around $r_{t-1}, \pi_{t-1},$ and $W_{t-1}$ to obtain:

$$M_t^s = L\left(C_t^P + I_t^P, r_{t-1}, \pi_{t-1}, W_{t-1}, \cdots\right) + L_r\left(r_t - r_{t-1}\right) \tag{1a}$$

$$+L_\pi\left(\pi_t - \pi_{t-1}\right) + L_W\left(W_t - W_{t-1}\right)$$

+ higher orders of differentials and derivatives,.

and by way of "the reasonable assumption that" $L$ is linear in planned expenditures Tsiang wrote his specification of Keynes' money demand function $L$ as:

$$L\left(C^P + I^P, r, \pi, W, \cdots\right) = k\left(r, \pi, W, \cdots\right)\left(C^P + I^P\right) + L^*\left(r, \pi, W, \cdots\right) \tag{3}$$

He then substituted (3) "with appropriate subscripts" into (1a) and (2) and taking the difference he obtained his equation (4a):

$$\Delta M_t^S = k_{t-1} I_t^P - k_{t-1}\left(Y_{t-1} - C_t^P\right) + \Delta L_t^* \tag{4a}$$

where $\Delta M_t^S = M_t^S - M_{t-1}^S$, $k_{t-1} = k\left(r_{t-1}, \pi_{t-1}, W_{t-1}, \cdots\right)$, $Y_{t-1}$ is the income received in the previous period which is assumed to be equal to $C_{t-1} + I_{t-1}$. $\Delta L_t^* = L_t^* - L_{t-1}^*$ and represents "net hoarding" as defined by "the terms in differentials and derivatives" that appear as a result of the expansion of (1). Tsiang then concluded:

*It can be immediately recognized that (4a) is nothing but the equilibrium condition for the loanable funds market as stipulated by Robertson.* $\left(Y_{t-1} - C_t^P\right)$ *is exactly what he defined as planned saving, which is not what is expected to be saved out of income accruing in the future, but what is planned to be saved out of disposable income (i.e., income received in the preceding period).* [22]

That Tsiang's conclusion in this passage is unwarranted is easily demonstrated by substituting the definitions of $\Delta M_t^S$ and $\Delta L_t^*$ into (4a) and rewriting Tsiang's equilibrium condition (4a) as:

$$M_t^S - M_{t-1}^S = k_{t-1} I_t^P - k_{t-1} Y_{t-1} + k_{t-1} C_t^P + L_t^* - L_{t-1}^* \tag{4b}$$

and rearranging the terms to obtain:

$$M_t^S - M_{t-1}^S = k_{t-1} I_t^P + k_{t-1} C_t^P + L_t^* - \left(k_{t-1} Y_{t-1} + L_{t-1}^*\right) \tag{4c}$$

By virtue of Tsiang's linearization of Keynes' money demand function (3), the fact that $Y_{t-1}$ is equal to $C_{t-1} + I_{t-1}$, and the fact that planed values are always equal to realized values in Tsiang's model (see section 6 below) Tsiang's "equilibrium condition that had already been established in the preceding period" (2) can be rewritten as:

$$M_{t-1}^S = k_{t-1}\left(C_{t-1} + I_{t-1}\right) + L_{t-1}^* = k_{t-1}\left(Y_{t-1}\right) + L_{t-1}^* \tag{2a}$$

Thus, if we add Tsiang's previous period equilibrium condition (2a) to his current period equilibrium condition (4c), $M_{t-1}^S$ and $k_{t-1}\left(Y_{t-1}\right) + L_{t-1}^*$ cancel, and his current period LF equilibrium condition (4c) reduces to:

$$M_t^S = k_{t-1}\left(C_t^P + I_t^P\right) + L_t^* \tag{4d}$$

This is the LF equilibrium condition in Tsiang's model. This equilibrium condition (4d) can be compared to Keynes' LP equilibrium condition in Tsiang's model by substituting (3) "with appropriate subscripts" into Tsiang's LP equilibrium condition (1) to obtain:

$$M_t^S = k_t\left(C_t^P + I_t^P\right) + L_t^* \tag{1b}$$

where, the only difference between Keynes' and Tsiang's view of this equilibrium condition is that in Keynes' view the velocity of circulation $k_t(r_t,\pi_t,W_t,\cdots)$, and $L^*(r_t,\pi_t,W_t,\cdots)$, along with the other variables in the system $C_t^P$ and $I_t^P$, are assumed to be functions of the current values of their dependent variables.[23-27]

There are three characteristics of these equilibrium conditions that are particularly noteworthy. The first is that neither $k_{t-1}\left(Y_{t-1}-C_t^P\right)$ nor $Y_{t-1}-C_t^P$ appear in either (4d) or (1b) which means that neither of these two magnitudes plays a role in determining the equilibrium value of the rate of interest in Tsiang's model whether "$Y_{t-1}-C_t^P$ is exactly what he [Robertson] defined as planned saving" or not.

The second is that all of the magnitudes in these two equilibrium conditions— $M_t^S$, $k_{t-1}\left(I_t^P+C_t^P\right)$, $k_t\left(I_t^P+C_t^P\right)$, and $L_t^*$—are stocks of money; none of these magnitudes are flows of savings or investment [27]. A 'flow' variable in economics has a time dimension associated with it, for example, dollars *per year* consumed or earned. It defines the *rate* at which a magnitude changes. A 'stock' variable is a magnitude that does not have a time dimension associated with it, for example, the *amount* of money spent on consumption or earned during a period of time. All of the variables is Tsiang's model are stock variables: $M_t^S$ is the *amount* of money in existence, $Y_{t-1}$ is the *amount* of money earned in the previous period, $I_t^P$ is the *amount* of money investors plan to invest during the current period, $C_t^P$ is the *amount* of money consumers plan to consume in the current period, etc. The same situation exists with regard to the equilibrium conditions in any Robertsonian model; there are no flow magnitudes in the equilibrium conditions of any of these models, only various stocks of money. This means that *both* the LF theory of interest as embodied in Tsiang's (4a) through (4d) and the LP theory of interest as embodied in (1b) implicitly assume that the rate of interest is a purely monetary phenomenon in Tsiang's model, determined solely by the supply and demand for the *stock* of money; neither theory in Tsiang's model assumes that the rate of interest is determined by the supply and demand for the *flow* of loanable funds.

The third characteristic of these two equilibrium conditions that is particularly noteworthy is that planned consumption $C_t^P$ and planned investment $I_t^P$ expenditures are assumed to be a function of the previous period's income in Tsiang's equilibrium conditions (4a) through (4b). This, in itself, makes Tsiang's analysis irreconcilable with Keynes' since Keynes was quite explicit on his insistence that $Y_t$, $k_t$, $C_t^P$, and $I_t^P$ are functions of the current values of expectations and $W_t$ and that past values cannot have a direct effect on current decisions with regard to $Y_t$, $k_t$, $C_t^P$, and $I_t^P$, only an indirect effect, and, even then, only to the extent they have an effect on stocks of capital assets and subsequent expectations. [28-33]

## 3. Tsiang on an Increase in Thrift

According to Tsiang [34], Keynes' denial that a decision by the public "to spend more of their incomes on securities and less on consumable goods" [35] would have a direct effect on the rate of interest is "untenable" since by virtue of Tsiang's LF equilibrium condition (4a):

*Everything that Robertson tried to tell us is quite right. In particular, what has become the central issue of contention, via, the question whether a change in thrift (or propensity to save) will have a direct effect on*

*the rate of interest, should clearly be decided in favor of Robertson. From equation (4a) it is clear that an increase in thrift, which lowers the schedule of planned consumption, will certainly bring about a decline in interest rate in order to redress the current money market equilibrium without operating indirectly through the multiplier effect, Pigou effect, the real balance effect, and whatnot, which modern economists find necessary to invoke to reconcile the classical view with the Keynesian doctrine. (p. 474)* [18]

The problem is that Tsiang refused to consider the possibility that money may be demanded for the purpose of financing planned financial expenditures ( $F_t^P$ ) [36,37]. The importance of this refusal can be seen if we "keep our mind open as to the question whether more arguments should be introduced into the demand for money function" and note that if we include money demanded for this purpose then Tsiang's LF equilibrium condition (4d) becomes:

$$M_t^S = k_{t-1}\left(I_t^P + C_t^P + F_t^P\right) + L_t^* \tag{4e}$$

and Keynes LP equilibrium condition (1b) becomes:

$$M_t^S = k_t\left(I_t^P + C_t^P + F_t^P\right) + L_t^* \tag{1c}$$

where $F_t^P$ is the amount of planned financial expenditures of households. Given these equilibrium conditions there can be no direct effect of a change in thrift $\Delta C_t^P$ that takes the form of an increase in the demand for securities $\Delta F_t^P$ in either (4e) or (1c) since, by assumption, $\Delta F_t^P = -\Delta C_t^P$ in this hypothetical situation. As a result, any effect that arises from a change in planned consumption $\Delta C_t^P$ in either (4e) or (1c) must be exactly offset by the concomitant change in planned purchases of financial assets $\Delta F_t^P$.

The only way in which an increase in thrift could have an effect on the demand for money in this situation is if the rate of turnover of money in financing planned financial expenditures $F_t^P$ is different from the rate of turnover of money in financing planned consumption expenditures $C_t^P$. It is not exactly clear how Tsiang would incorporate this difference in his Robertsonian model since, by assumption, $k_t$ is the length of the unit time period in his model [38], but this difference is easily incorporated in Keynes' LP point-in-time model by assigning different $k_t$ s to each of the individual sources of the demand for money in Keynes' monetary equilibrium condition (1c) to obtain:

$$M_t^S = k_t^c C_t^P + k_t^i I_t^P + k_t^f F_t^P + L_t^*. \tag{1d}$$

It is clear from (1d) that the net direct effect of a decision by the public "to spend more of their incomes on securities and less on consumable goods" will depend on the relationship between $k_t^c \Delta C_t^P$ and $k_t^f \Delta F_t^P$ in Keynes' LP theory, and since, by assumption, $\Delta F_t^P = -\Delta C_t^P$, it will depend on the relative magnitudes of $k_t^c$ and $k_t^f$: If $k_t^c = k_t^f$ there can be no net direct effect, but if $k_t^c < k_t^f$ the net direct effect must be to increase the demand for money and, thereby, the rate of interest. Only if $k_t^c > k_t^f$ will the net direct effect be to decrease the demand for money and rate of interest. Thus, the meaningfulness of Tsiang's argument depends, at the very least, on his justification for assuming that money is not demanded for the purpose of financing planned financial expenditures.

Tsiang's justification for this assumption is contained in his 1966 argument:

*This type of Robertsonian period analysis also implies that trading in financial assets will always take place at the very beginning of the period. For as soon as each individual makes his decision as to how much to spend during the coming period, he will know how much of his accumulated cash holding can be spared*

*from his own requirement for finance, or how much further finance he must procure for his planned expenditures. It is to his interest that such adjustments of his cash holding should be carried out right at the beginning of the period.* [39,40]

This argument is far from convincing for financial investment decisions involve both information and transactions costs. In general, it takes time to gather the necessary information and/or to find a convenient opportunity to execute a financial investment decision even after one knows how much cash can be spared for the investment, and there are money costs associated with these decisions as well. Given these costs, there is just as much (if not more) reason to believe it is in the interest of each individual to allow his spare cash to remain idle for a period of time (and, perhaps, to accumulate to a respectable sum) in order to gather the necessary information required to make a wise investment decision, or to find a convenient opportunity to execute this decision, or to justify its money cost as there is to believe it is in the interest of each individual to adjust his cash holding immediately upon discovery of the existence of spare cash (i.e., "right at the beginning of the period"). Thus, since Tsiang's a priori justification for assuming that money is not demanded for the purpose of financing planned financial expenditures presupposes the absence of transactions and information costs it cannot provide a meaningful basis for his argument that a decrease in planned consumption expenditures must have the direct effect of decreasing the demand for money not withstanding Tsiang's 1966[41] rationalizations to the contrary [41].

Tsiang also attempted to justify his assumption that money is not demanded to finance planned financial transactions in 1957 by arguing that:

*Judging from the enormous fluctuations in the volume of transactions per calendar day that are capable of happening on the stock, bond and money markets combined, we must conclude that the speed of adjustment of aggregate idle cash holdings is also extremely variable in accordance with the aggregate magnitude of adjustments that are desired. That is why it seemed to me as reasonable an assumption as any that whatever changes in the stocks of idle cash may be desired can be carried out instantaneously when we are dealing with a minimum time unit, the Robertsonian "day," which is presumably much longer than a calendar day.* [42]

This rationalization is also far from convincing in that it ignores the fact that "the enormous fluctuations in the volume of transactions per calendar day that are capable of happening on the stock, bond and money markets combined" has to be financed, and while it may be true that "transactions in securities are generally settled by clearings" [43] those "clearings" are between brokers—not between the individual sellers and buyers. The individual accounts of the sellers must be credited and of the buyers debited for the total amount of the transactions involved—not just the clearings between brokers. Tsiang also ignores the money that is accumulated (i.e., demanded) for the purpose of purchasing financial assets in future periods, a possibility that Tsiang has ruled out by assumption.

Tsiang simply assumed that no money is demanded for the purpose of financing financial transactions in his model and that the stock of money demand for this purpose is not related to the size of the flow of these transactions, but assuming that this source of demand for money does not exist in his model does not change the fact that it does exist in the real world.

But even if one were to accept Tsiang's *a priori* justifications for assuming money is not demanded for the purpose of financing planned financial transactions, there is a second, more fundamental objection to Tsiang's argument, namely, that Tsiang's argument is in fact irrelevant to Keynes' actual position on this issue. In December 1937 Keynes stated:

*Now, I readily admit the intention to save may sometimes affect the willingness to become unliquid meanwhile. This factor should certainly be included in the list of motives affecting the state of liquidity-preferences. But it is only one amongst many, and, in practice (I should have thought), one of the least important.* [44]

In this passage, Keynes "readily" admitted that "the intention to save may sometimes affect the willingness to become unliquid meanwhile" and that this "factor should certainly be included in the list of motives affecting the state of liquidity-preferences." Thus, Tsiang clearly failed to grasp the nature of Keynes' position in this regard for it is clear from this passage that Keynes did not deny the fact that an increase in planned saving may have a direct effect on the demand for money. The issue raised by Keynes is whether or not "in practice" this phenomenon is "important." Tsiang may disagree with Keynes on this issue, but his disagreement can only be on the practical importance of this phenomenon not on its possibility. Such a disagreement can be settled only on the basis of empirical evidence, and since Tsiang has provided no empirical evidence in support of his view, he has provided no basis for his assertion that Keynes' position in this regard is "untenable." [45,46]

## 4. Keynes on the demand for money

Toward the beginning of his final attempt to explain his theory of interest to Robertson, Keynes summarized his concept of the demand for money as follows:

*The total demand [for liquidity] falls in two parts: the inactive demand due to the state of confidence and expectation on the part of the owners of wealth, and the active demand due to the level of activity established by the decisions of the entrepreneurs. The active demand in its turn falls in two parts: the demand due to the time-lag between the inception and execution of the entrepreneurs' decisions, and the part due to the time-lags between the receipt and disposal of income by the public and also between the receipt by entrepreneurs of their sale-proceeds and the payment of them of wages, etc.* [47]

According to Tsiang:

*The second element of what he [Keynes] classifies as the active demand really does not deserve this title. It should rather be called the "passive acceptance of money;" for these sums are not what the public or entrepreneurs plan to keep in the form of money, but are merely what they passively accept for services rendered or goods sold pending rational disposal later on at a more appropriate time. All transactions balances start out as demand for finance either for investment or for consumption expenditures, and end up as passive acceptance of cash toward the end of a cycle of money circulation to await reallocation at the beginning of a new cycle either as finance required for new expenditure plans again or as inactive hoards (asset balances).* [48]

Tsiang's statement to the effect that the second element of the active demand for money as explained by Keynes should be called "passive acceptance of money" rather than a demand for money clearly demonstrates confusion on Tsiang's part regarding the nature of the active demand for money. In Tsiang's own model, $k_{t-1}^{c}C_t^{P}$ in equation (4e) is, in fact, money demanded "due to the time-lag between receipt and disposal of income by the public" as is $k_t^{f}F_t^{P}+k_t^{c}C_t^{P}$ in the extension of Keynes' equilibrium condition (1d). Furthermore, Tsiang's inability to understand the demand for money "due to the time-lag . . . between the receipt by entrepreneurs of their sale-proceeds and the payment by them of wages, etc." within the context of his model is not surprising in view of the fact that the demand for money on the part of firms that arises from the need to finance expenditures on wages, intermediary goods, interest and dividend payments, and other kinds of expenditures that arise from the need to finance the *production* of goods is ignored in his model. At

the point in time at which the demand for money is measured in Tsiang's model (i.e., at the beginning of the period), there is no demand for money on the part of firms to finance these kinds of expenditures. But there is just as much reason to assume entrepreneurs demand money for the purpose of financing expenditures that arise from the need to finance the production of goods as there is to assume that consumers and investors demand money for the purpose of financing expenditures that arise from the need to finance the purchase of goods. The only reason this demand for money is "passive" in Tsiang's model is that it is simply assumed away and ignored. In the real world this demand cannot be ignored, and it is hardly appropriate to simply dismiss as "passive acceptance of money" the demand for money on the part of firms to meet their payrolls and finance their accounts payable as anyone who has actually had to meet a payroll or finance accounts payable will readily affirm.

The relevance of Tsiang's omission in this regard can be seen by assuming that the demand for money that arises from the need to finance the production of goods depends on the value of planed output as given by $Y_t^P$ and rewriting Keynes' equilibrium condition (1d) so as to include the need to finance the production of goods as well as the need to finance the purchase of goods and financial assets:

$$M_t^S = k_t^i I_t^P + k_t^y Y_t^P + \left(k_t^f F_t^P + k_t^c C_t^P\right) + L_t^* \tag{1e}$$

where $k_t^y$ denotes the *k* that applies to $Y_t^P$. When this is done, the aggregate demand for money in Keynes' theory as given by the right-hand side of (1e) is easily interpreted in terms of Keynes' description of the total demand for liquidity in the passage quoted above: The "inactive demand due to the state of confidence and expectation on the part of the owners of wealth" is given by $L_t$; that part of the active demand "due to the time-lag between the inception and execution of the entrepreneurs' decisions" is given by $k_t^i I_t^P$; that part of the active demand due to "receipt by entrepreneurs of their sale-proceeds and the payment of them of wages, etc." is given by $k_t^y Y_t^P$ [49] and that part of the active demand "due to the time-lags between the receipt and disposal of income by the public" is given by $\left(k_t^f F_t^P + k_t^c C_t^P\right)$ [50]. Thus, when the specification of Keynes' demand for money function is extended in such a way as to incorporate the need to finance the production of goods as well as to finance financial and other planned expenditures there is no difficulty in understanding Keynes' description of the total demand for liquidity [50].

## 5. The supply of finance

In his final attempt to explain his concept of 'finance' to Robertson, Keynes concluded:

*It is Mr. Robertson's incorrigible confusion between the revolving fund of money in circulation and the flow of new saving which causes all his difficulties. Saving has no special efficacy, as compared with consumption, in releasing cash and restoring liquidity. . . . Consumption does just as well. . . . A given level of activity and income will involve the same active demand for cash, if the technical conditions governing the time-lags are the same, irrespective of the current rate of net investment and saving. . . . In short, I accept the usual view that the demand for cash in the active circulation is a function of income and of business habits, not of saving. The 'finance,' or cash, which is tied up in the interval between planning and execution, is released in due course after it has been paid out in the shape of income, whether the recipients save it or spend it. There is, therefore, just as much reason for adding current consumption to the rate of increase of new bank-money in reckoning the flow of cash becoming available to provide new 'finance,' as there is for adding current saving.[1] Until Mr. Robertson understands that, he will not grasp what I am driving at, however carefully I attempt to reword it.* [51]

In commenting on this passage, Tsiang observed that "Robertson failed completely to understand Keynes' strange logic that would make both consumption and savings equally the components of the supply of finance" and that "[h]ow Keynes could have arrived at such an amazing conclusion is indeed an historical puzzle." [52] Tsiang then attempted to explain Keynes' presumed confusion on this issue by observing that $C_{t-1}$ and $I_{t-1}$ (the sum of which is equal to $Y_{t-1}$ in Tsiang's model) enter (4a) with the opposite sign of $C_t$ and $I_t$ :

*This is perhaps what Keynes had in mind when he wrote: "Finance is a revolving fund. . . . As soon as it is used in the sense of being expended, the lack of liquidity is automatically made good. That is, consumption and investment expenditures actually carried out,* $C_{t-1}$ *and* $I_{t-1}$ *appear to provide the finance for the new consumption and investment expenditures planned,* $C_t$ *and* $I_t$ *. . . . So far, it seems to be all right. However, when Keynes went on to assert with equanimity that "consumption is just as effective in liquidating short-term finance as saving is," he was clearly wrong about timing. . . . At the moment of decision for the current period . . .* $C_{t-1}$ *is already a given datum of the past. It is no longer a decision variable. Only current consumption* $C_t$ *, or its complement, saving (*$Y_{t-1} - C_t$*), is still to be decided together with the current investment plans. From equation . . . (4a), it is obvious that* $C_t$ *would be competing with current investment,* $I_t$ *for available finance. It is only* $(Y_{t-1} - C_t) = S_t$ *that can properly be said to provide the finance for investment apart from dishoarding or money creation.* [52]

Aside from a) the obvious confusion of stocks for flows in this passage, b) the failure to distinguish between planned and actua1 magnitudes, and c) the fact that $C_{t-1}$, $I_{t-1}$ , and $Y_{t-1}$, cancel out of his equilibrium condition (4d) and, thus, that $Y_{t-1} - C_t$ plays no role in his LF theory so that there can be no issue of timing with regard to this variable in Tsiang's model, the above seems to have been written with a total disregard for what Keynes actually said on this subject.

Keynes stated quite clearly in the passage quoted above that "given the level of activity and income" and "if the technical conditions governing the time-lags are the same," and if one accepts "the usual view that the demand for cash in the active circulation is a function of income and of business habits, not of saving," then it can be assumed that changes in saving do not have a direct effect on the supply or demand for money. [53-58] In this ceteris paribus situation, finance balances can always be replenished as they are spent irrespective of the individual rates of consumption and saving by households since all money received by households in the form of income payments, by pure logic, must be returned to firms at a constant rate through the credit and goods markets. The only thing that a change in saving can accomplish in this ceteris paribus situation is to change the individual rates at which money is returned to firms through the individual markets but not the rate at which money is returned to firms through the two markets combined. Given the supply and demand for money, a change in saving cannot change the rate at which money is made available to investors to replenish their 'finance' balances—only a change in one of the other demands for money or in the supply of money can change this rate. Thus, in the specific ceteris paribus situation posited by Keynes in the above passage it is logically impossible for an increase in saving to have a direct effect on the amount of money available to meet an increase in the demand for finance. [59-67]

Keynes' statement to the effect that the "finance,' or cash, which is tied up in the interval between planning and execution, is released in due course after it has been paid out in the shape of income" clearly indicates the mechanism by which Keynes assumed money "tied up in the interval between planning and execution" becomes available to be tied up again—namely, by being spent on either goods or securities after being paid out in the shape of income. There is no reason to believe that Keynes' statement to the effect that

"consumption is just as effective in liquidating short-term finance as saving is" means anything other than what is stated above—namely, that once money has been received in the shape of income, it makes no difference whether it is spent on consumption goods or saved and, thus, (given the supply and demand for money) spent on securities in that in either case the money so received and spent continues on as part of the revolving fund of money in circulation *without affecting the size of this fund*.

This does not mean that a decision with regard to saving cannot, or even will not have an effect on the supply or demand for money and, thereby, on "the flow of cash becoming available to provide new 'finance'" if, for example, "the technical conditions governing the time-lags are [not] the same"—that is, if $k_t^c$ is not equal to $k_t^f$ in (1e). It only means that a decision with regard to the flow of saving cannot have a direct effect on the rate of interest that is independent of its effects, either direct or indirect, on the supply or demand for the stock of money [68,69]. To the extent that a change in the flow of saving does have an effect on the supply or demand for the stock of money, there must, of course, be an effect on the rate at which money is made available to firms to replenish their finance balances. But, nevertheless, given the premises of Keynes' ceteris paribus argument in the above passage, Keynes' argument is logically valid, and Tsiang's objection to Keynes argument is nothing more than a straw man that has nothing to do with what Keynes actually said.

## 6. Robertson's and Tsiang's confusion

Keynes argued that income is determined by saving and investment, the rate of interest by the supply and demand for money (i.e., liquidity), and that a ceteris paribus increase in saving cannot, in itself, have a direct effect on the rate of interest in the absence of an effect on the supply and demand for money [70-72]. Even though Keynes argument in this regard is rather straightforward and easy to understand to anyone who actually tries to understand it from the prospective of Marshall [73,74], the inability of Tsiang and Robertson to understand this argument within the context of Tsiang's Robertsonian model is not surprising given Tsiang's assumption that equation (2) is "the equilibrium condition that had already been established in the preceding period."

The actual previous period equilibrium condition in Tsiang's Robertsonian model is in fact given by:

$$M_{t-1}^S = L\left(C_{t-1}^P + I_{t-1}^P, r_{t-1}, \pi_{t-1}, W_{t-1}, \cdots\right) \tag{7}$$

not by (2) as asserted by Tsiang. In order to get from (7) to (2) Tsiang had to adopt the Walrasian assumption that planed expenditures are always realized—that is, that $C_{t-1}^P = C_{t-1}$, $I_{t-1}^P = I_{t-1}$, and, thus, that $Y_{t-1} = C_{t-1} + I_{t-1} = C_{t-1}^P + I_{t-1}^P$. This means that income $Y_t$, consumption $C_t$, investment $I_t$, and the rate of interest $r_t$ are all implicitly assumed to be determined simultaneously at the beginning of each period in Tsiang's model. As a result, it is impossible to consider the affects of a ceteris paribus change in saving given income $Y_t$ within the context of Tsiang's model (even if the demand for money were specified properly within this context) because it is impossible to hold income $Y_t$, (and therefore the demand for money which depends on $Y_t$) constant in the face of a change in saving in Tsiang's model since income $Y_t$ and all of the other endogenous variables in this model are implicitly assumed a priori to adjust simultaneously to their equilibrium values at the beginning of each period in response to a change in saving or any other exogenous variable or parameter. Thus, it is impossible to understand the nature of Keynes', or any other argument that attempts to identify those factors that, in themselves, determine the individual variables in the system at each point in time within the context of Tsiang's model since all of the variables in

his model are implicitly assumed to be determined simultaneously by way of some form of mythical tâtonnement/recontract auctioneer.

What this means is that Robertson's and Tsiang's method of analysis is that of comparative statics in that they assumed a state of static equilibrium with regard to $r_t$, $C_t$, $I_t$, and $Y_t$ is achieved each period; they then describe how these states of static equilibrium change from one period to the next without explanation as to how these equilibriums are achieved other than by way of an implicit assumption of some kind of mythical tâtonnement/recontract process. [75,76]

## 7. Summary and conclusion

It has been demonstrated that the rate of interest is a purely monetary phenomenon in Tsiang's Robertsonian model, determined solely by the supply and demand for the stock of money and that much of Robertson's and Tsiang's confusion with regard to Keynes' discussion of the way in which the rate of interest is determined can be resolved by expanding Keynes' money demand function as defined by Tsiang in (1) to include terms to account for the demands for money to finance financial transactions and the production of goods as given by (1e). It has been further demonstrated that Robertson's and Tsiang's method of analysis is that of comparative statics in that they, in the spirit of Walras, assumed that all of the endogenous variables in their analysis are determined simultaneously at the beginning of each period; they then describes how the states of static equilibrium established at the beginning of each period change from one period to the next without explanation as to how or why these equilibriums are achieved each period. [77]

Herein lies the fundamental difference between Keynes' and Robertson's method of analysis: Keynes identified those factors that in themselves determine each variable at each point in time in terms of the behavior of those decision-making units that actually have the power to determine each variable at each point in time[78-80] while Robertson's analysis is descriptive and static in that the static equilibrium values in his intraperiod analysis just suddenly appear out of nowhere as if by magic, and given these static equilibrium values Robertson describes how they change from one period to the next without explanation as to how these values came into being in the first place.[80]

If there is "strange logic" to be found in the LP/LF controversy that separated Robertson and Keynes it is to be found in the belief that it is possible to refute Keynes' causal/dynamic arguments as to how the rate of interest is determined at each point in time whether the system is in equilibrium or not by way of a comparative static analysis that simply assumes the system is always in equilibrium from one period to the next without explanation as to how the equilibrium is obtained in each period.

Comparative static analysis has proven to be an extremely valuable analytic tool in economics when it is used in conjunction with the kind of causal/dynamic analysis employed by Keynes to explain how and why the static equilibrium values are obtained. When it is not used in this way the result is the kind of arguments employed by Robertson in his controversy with Keynes; arguments that are, at best, semantic, [81-84] and, at worst, border on ideological sophistry. [85-87]

The simple fact is that there is no way to refute Keynes' causal/dynamic arguments as to how the rate of interest is determined by way of the LF theory of interest since this theory is, as Keynes noted in 1936 [88] and explained in 1930 [89], a "nonsense theory". It is time to take the LF theory out of economics textbooks.

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## Conflict of interest

The authors declare no conflict of interest.

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