A Note on Keynes' Integration of Monetary and Value Theory

George H. Blackford, Ph.D. (02/20/2025)
George@rwEconomics.com

Abstract

A model of Keynes' integration of monetary and value theory that explicitly incorporates the supplies and demands in the markets for consumption and investment goods as well as for money, assets, and the government and foreign sectors is specified below. This model is used to demonstrate that when economic variables are assumed to be determined by the choices of those decision-making units that actually have the power to determine their values given the actual constraints on their behavior Keynes' general theory, based on Marshall's theory of supply and demand as presented in every economic principles textbook, provides an analytic framework within which a logically consistent, causal analysis of dynamic behavior is possible in economics.

Keywords: Keynes, Causality, Methodology, Macroeconomics, Neoclassical, History of Thought, Monetary Theory, International Finance.

JEL Codes: B22, B41, D51, E12, E13, E41, E43, J23, Q11

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors, and the author has no conflicts of interest in this paper.

A Note on Keynes' Integration of Monetary and Value Theory

1. Intorduction

The behavioral and structural equations of Keynes' integration of monetary and value theory are specified in section 2 where the way in which Keynes' marginal efficiency of capital and consumption functions are derived from the supplies and demands for consumption and investment goods is explained. The adjustment functions that define the dynamic properties of the system are specified in section 3 based on Keynes' assumption that employment, output, and income (that is, the value of output produced) are determined at each point in time by the expectations of decision-making units as their expectations adjust to the realized results that are achieved within the system as the system evolves through time.

The structure of the model and the way in which each variable is determined by demanders and suppliers in the markets for consumption and investment goods and for money and assets is examined in section 4. The nature of a system-wide equilibrium is examined in detail in section 5 where the interrelationships between the various sectors of the system are outlined. In section 6 the causal/dynamic nature of the analytical framework developed by Keynes' throughout *The General Theory* is demonstrated by examining how the effects of an increase in the foreign exchange rate work their way through the system through time within the context of this framework. Concluding observations are given in section 7 where the fundamental differences between Keynes' causal/dynamic methodology and the static/descriptive methodology of neoclassical economics are examined. The Appendix: List of Equations provides a list of the equations specified in the text.

2. Behavioral and Structural Equations

It is assumed that the government sector's demand for goods and services ($\boldsymbol{G_t^d}$) is exogenously determined:

$$(\mathbf{1}) \quad \boldsymbol{G_t^d = G_t},$$

and that its demands for taxes net of transfers ($\boldsymbol{T_t^d}$) is a direct function of income ($\boldsymbol{Y_t}$):

$$(\mathbf{2}) \quad \boldsymbol{T_t^d = t(Y_t)}, \quad \boldsymbol{0 < t'}.$$

It is also assumed that the foreign sector's demand for exports ($\boldsymbol{X_t^d}$) is inversely related to the prices of investment ($\boldsymbol{P_t^i}$) and consumption ($\boldsymbol{P_t^c}$) goods—that is, the complex of prices of investment $\boldsymbol{P_t^i}$ and consumption $\boldsymbol{P_t^c}$ goods—and the foreign exchange rate ($\boldsymbol{\mu_t}$):

(**3**) $\boldsymbol{X_t^d = x(P_t^i, P_t^c, \mu_t), \quad x_1, x_2, s_3 < 0,}$

and that the demand for imports ($\boldsymbol{F_t^d}$) is assumed to be directly related to aggregate output/income $\boldsymbol{Y_t}$, the prices of investment $\boldsymbol{P_t^i}$ and consumption $\boldsymbol{P_t^c}$ goods, and the foreign exchange rate $\boldsymbol{\mu_t}$:

(**4**) $\boldsymbol{F_t^d = f(Y_t, P_t^i, P_t^c, \mu_t), \quad 0 < x_1, x_2, s_3, s_4.}$

The supply price for consumption goods ($\boldsymbol{P_t^{sc}}$) is assumed to be a direct function of the real flow of consumption goods supplied ($\boldsymbol{C_t^s}$) and of the foreign exchange rate $\boldsymbol{\mu_t}$ (to the extent imports are inputs to the productive process) and is given by: [1]

(**5**) $\boldsymbol{P_t^{sc} = c^{sp}(C_t^s, \mu_t), \quad 0 < c_1^{sp}, c_2^{sp}.}$

It is also assumed that the demand price of consumption goods ($\boldsymbol{P^{dc}}$) is a direct function of output/income $\boldsymbol{Y_t}$ and of the government sector's demand for goods and services $\boldsymbol{G_t^d}$, and is an inverse function of the flow of consumption goods demanded ($\boldsymbol{C_t^d}$), of the

---

[1] The supply-price functions $\boldsymbol{c^{sp}}$ (**5**) and $\boldsymbol{i^{sp}}$ (**9**) below are assumed to be derived from their corresponding employment functions and, hence, are independent of industry output. See Keynes (1936, pp. 280-91). It should also be noted that for the purposes of this paper one can consider the variables as being measured in either wage-units or constant dollars as one wishes. In addition, Keynes defined income $\boldsymbol{Y_t}$ as the value of output produced, and income so defined is, by definition, equal to the value of output produced as *perceived in the minds of decision-making units*, and will be referred to as 'output/income' throughout this paper. See Keynes (1936, pp. 46-7) and Blackford (2024 pp. 86-7).

international exchange rate $\boldsymbol{\mu_t}$ (to the extent imports decrease the demand for consumption $\boldsymbol{C_t^d}$ goods), and the flow of taxes net of transfers $\boldsymbol{T_t}$ as given by:

$$(\mathbf{6}) \quad \begin{aligned} \boldsymbol{P_t^{dc}} &= \boldsymbol{c^{dp}}\left(\boldsymbol{C_t^d}, \boldsymbol{Y_t}, \boldsymbol{T_t^d}, \boldsymbol{G_t^d}, \boldsymbol{\mu_t}\right) \quad \boldsymbol{c_1^{dp}}, \boldsymbol{c_3^{dp}}, \boldsymbol{c_5^{dp}} < 0 < \boldsymbol{c_2^{dp}}, \boldsymbol{c_4^{dp}} \\ &= \boldsymbol{c^{dp}}\left(\boldsymbol{C_t^d}, \boldsymbol{Y_t}, \boldsymbol{t}(\boldsymbol{Y_t}), \boldsymbol{G_t}, \boldsymbol{\mu_t}\right) \\ &= \boldsymbol{c^{dp}}\left(\boldsymbol{C_t^d}, \boldsymbol{Y_t}, \boldsymbol{G_t}, \boldsymbol{\mu_t}\right), \qquad \boldsymbol{c_1^{dp}}, \boldsymbol{c_4^{dp}} < 0 < \boldsymbol{c_2^{dp}}, \boldsymbol{c_3^{dp}}. \end{aligned}$$

Keynes' consumption function is obtained by equating the supply price of consumption goods $\boldsymbol{P_t^{sc}}$ (**5**) and the demand price of consumption goods $\boldsymbol{P^{dc}}$ (**6**) to obtain:

$$(\mathbf{7}) \quad \boldsymbol{c^{sp}}(\boldsymbol{C_t^s}, \boldsymbol{\mu_t}) = \boldsymbol{c^{dp}}\left(\boldsymbol{C_t^d}, \boldsymbol{Y_t}, \boldsymbol{G_t}, \boldsymbol{\mu_t}\right) = \boldsymbol{P_t^i},$$

and solving for the equilibrium rate of consumption goods demanded $\boldsymbol{C_t^d}$ (=$\boldsymbol{C_t^s}$) as a function of aggregate output/income $\boldsymbol{Y_t}$, and the foreign exchange rate $\boldsymbol{\mu_t}$:

$$(\mathbf{8}) \quad \boldsymbol{C_t^d} = \boldsymbol{c}(\boldsymbol{Y_t}, \boldsymbol{G_t}, \boldsymbol{\mu_t}), \quad \boldsymbol{c_3} < 0 < \boldsymbol{c_1}, \boldsymbol{c_2}$$

where $\boldsymbol{c}$ denotes Keynes' aggregate consumption function, and $\boldsymbol{C_t^d}$ (=$\boldsymbol{C_t^s}$) is the rate of consumption goods demanded (and supplied) at each level of output/income $\boldsymbol{Y_t}$, government demand for goods and services $\boldsymbol{G_t}$, and the foreign exchange rate $\boldsymbol{\mu_t}$ given the assumption of equilibrium in the various markets for consumption goods.

Keynes' Marginal Efficiency of Capital (MEC) schedule can be obtained in a manner parallel to the derivation of Keynes' consumption function. If it is assumed that the supply price of investment goods ($\boldsymbol{P_t^{si}}$) is a direct function of the rate of investment goods supplied $\boldsymbol{I_t^s}$ and the foreign exchange rate $\boldsymbol{\mu_t}$, the supply price of investment goods $\boldsymbol{P_t^{si}}$ can be written as:

$$(\mathbf{9}) \quad \boldsymbol{P_t^{si}} = \boldsymbol{i^{sp}}(\boldsymbol{I_t^s}, \boldsymbol{\mu_t}), \quad \mathbf{0} < \boldsymbol{i_1^{sp}}, \boldsymbol{i_2^{sp}}.$$

If it is further assumed that the demand price of investment goods ($\boldsymbol{P_t^{di}}$) is an inverse function of the rate at which investment goods are demanded ($\boldsymbol{I_t^d}$), the rate of interest $\boldsymbol{R_t}$, and the foreign exchange rate $\boldsymbol{\mu_t}$, and a direct function of the price of assets $\boldsymbol{P_t^a}$ (Keynes 1936, p. 151), the government sector's demand for goods and services $\boldsymbol{G_t^d}$, and the demand for consumption goods $\boldsymbol{C_t^d}$ (**4**) (Keynes 1936, pp. 46, 210-12), the demand price of investment goods $\boldsymbol{P^{di}}$ can be written as:

$$(\mathbf{10}) \quad P_t^{di} = i^{dp}\left(I_t^d, R_t, P_t^a, C_t^d, G_t^d, \mu_t\right), \quad i_1^{dp}, i_2^{dp}, i_6^{dp} < 0 < i_3^{dp}, i_4^{dp}, i_5^{dp}$$
$$= i^{dp}\left(I_t^d, R_t, P_t^a, c(Y_t, G_t, \mu_t), G_t, \mu_t\right)$$
$$= i^{dp}\left(I_t^d, R_t, P_t^a, Y_t, G_t, \mu_t\right), \quad i_1^{dp}, i_2^{dp}, i_6^{dp} < 0 < i_3^{dp}, i_4^{dp}, i_5^{dp}$$

Keynes' MEC schedule can then be obtained by equating the supply price of investment goods P^{si} (**9**) and demand price of investment goods P^{di} (**10**) to obtain:

$$(\mathbf{11}) \quad i^{sp}(I_t^s, \mu_t) = i^{dp}\left(I_t^d, R_t, P_t^a, Y_t, G_t, \mu_t\right) = P_t^i,$$

and solving for the equilibrium rate of investment goods demanded I_t^d (=I_t^s) as a function of the rate of interest R_t, price of assets P_t, aggregate output/income Y_t, the governments' demand for goods and services G_t, and the foreign exchange rate μ_t: [2]

$$(\mathbf{12}) \quad I_t^d = i(R_t, P_t^a, Y_t, G_t, \mu_t), \qquad i_1, i_5 < 0 < i_2, i_3, i_4$$

where i denotes Keynes' MEC schedule; I_t^d (=I_t^s) is the demand for (and supply of) investment goods at each rate of interest R_t, output/income Y_t, price of assets P_t^a, the government sector's demand for goods and services G_t, and the foreign exchange rate μ_t given the assumption of equilibrium in the various markets for investment goods.[3]

---

[2] The assumption that $i_5 < 0$ presupposes that the positive effect of an increase in the foreign exchange rate μ_t on the supply price of investment goods $i^{sp}(I_t^s, \mu_t)$ (**9**) due to the lower cost of imported inputs does not offset the negative effects of the increase in the foreign exchange rate μ_t and the resulting decrease in the demand for consumption goods on the demand price of investment goods $i^{dp}\left(I_t^d, R_t, P_t^a, c(Y_t, G_t, \mu_t), G_t, \mu_t\right)$ (**10**). See Keynes (1936, pp. 105-06) and Blackford (2021; 2022a).

[3] Cf. Keynes:

> If Q_r is the prospective yield from an asset at time r, and d_r, is the present value of £1 deferred r years at the current rate of interest, $\sum Q_r d_r$ is the demand price of the investment; and investment will be carried to the point where $\sum Q_r d_r$ becomes equal to the supply price of the investment as defined above. (1936 p. 137)

Keynes' liquidity-preference/money-demand function is assumed to be a direct function of output/income $\boldsymbol{Y_t}$ and an inverse function of the rate of interest $\boldsymbol{R_t}$:

$$\textbf{(13)}\quad \boldsymbol{M_t^d = m^d(Y_t, R_t),\quad m_2^d < 0 < m_1^d}$$

where $\boldsymbol{M_t^d}$ is the stock of money demanded [4] and we can think of 'the' rate of interest $\boldsymbol{R_t}$ in terms of "the complex of the various rates of interest current for different periods of time, i.e. for debts of different maturities" (Keynes, 1936, p 167n) "and risks"(p. 28).[5]

Keynes assumed the stock of money to be exogenously "determined by the action of the central bank" in *The General Theory* (p. 247), but in 1937 he observed that "an illuminating way of expressing the liquidity-theory" is in terms of the willingness of the public "to become more or less liquid and … the banking system … to become more or less unliqulid." (1937b, p. 666) Hence, it is assumed that the real quantity of money supplied by the financial system ($\boldsymbol{M_t^s}$) is directly related to the rate of interest $\boldsymbol{R_t}$:

$$\textbf{(14)}\quad \boldsymbol{M_t^s = m^s(R_t),\quad 0 < m^{s'}.}$$

It is also assumed that the existing stock of assets ($\boldsymbol{A_t}$) is exogenously determined; thus the supply of assets ($\boldsymbol{A_t^s}$) is given by:

$$\textbf{(15)}\quad \boldsymbol{A_t^s = A_t,}$$

---

[4] For a formal discussion as to how this function is derived see Blackford (2019a).

[5] Keynes argued in *The General Theory* (p. 304) that the demand for money is a function of effective demand, and in his 1938 attempt to clarify the nature of this demand in its relationship to 'finance' Keynes also argued that the demand for money "is a function of income and of business habits" (1938, p. 321-2). I believe that the best way to incorporate this aspect of Keynes' understanding of the demand for money is to assume that the demand for money is a direct function of realized income $\boldsymbol{Y_t}$ and that changes in effective demand $\boldsymbol{Y_t^e}$ as defined below (**27**) have the effect of shifting the demand for money function $\boldsymbol{m^d(Y_t, R_t)}$ (**13**) by way of changes in the 'finance' demand for money. See Bibow, Blackford (2019; 2020a), Davidson, and Keynes (1937b).

and the demand for assets ($\boldsymbol{A_t^d}$) is assumed to be inversely related to the price of assets $\boldsymbol{P_t^a}$ and the rate of interest $\boldsymbol{R_t}$ and is directly related to income $\boldsymbol{Y_t}$ and the foreign exchange rate $\boldsymbol{\mu_t}$: [6]

$$(\mathbf{16}) \quad \boldsymbol{A_t^d = a^d(P_t^a, R_t, Y_t, \mu_t)}, \qquad \boldsymbol{a_1^d, a_2^d < 0 < a_3^d, a_4^d.}$$

It is also instructive, for expository purposes, to specify the *asset equilibrium schedule* in this model even though Keynes did not utilize this relationship. This schedule can be obtained by setting the supply of assets (**15**) equal to the demand for assets (**16**),

$$(\mathbf{17}) \quad \boldsymbol{A_t = a^d(P_t^a, R_t, Y_t, \mu_t),}$$

and solving for the equilibrium price of assets $\boldsymbol{P_t^a}$ as a function of the rate of interest $\boldsymbol{R_t}$, output/income $\boldsymbol{Y_t}$, and stock of assets $\boldsymbol{A_t}$, given equilibrium in the markets for assets:

$$(\mathbf{18}) \quad \boldsymbol{P_t^a = a(P_t^a, R_t, Y_t, \mu_t)}, \qquad \boldsymbol{a_1, a_2 < 0 < a_3, a_4.}$$

The aggregate demand schedule implied by Keynes' consumption (**8**) and MEC (**12**) schedules is given by:

$$(\mathbf{19}) \quad \begin{aligned} \boldsymbol{Y_t^d} &= \boldsymbol{C_t^d + I_t^d} \\ &= \boldsymbol{c(Y_t, G_t, \mu_t) + i(R_t, P_t^a, Y_t, G_t, \mu_t)} \\ &= \boldsymbol{d(Y_t, R_t, P_t^a, G_t, \mu_t)}, \qquad \boldsymbol{d_2, d_5 < 0 < d_1, d_3, d_4,} \end{aligned}$$

and the implied aggregate savings function is given by:

$$(\mathbf{20}) \quad \begin{aligned} \boldsymbol{S_t^d} &= \boldsymbol{Y_t - C_t^d} \\ &= \boldsymbol{Y_t - c(Y_t, G_t, \mu_t)} \\ &= \boldsymbol{s(Y_t, G_t, \mu_t)}, \qquad \boldsymbol{s_3 < 0 < s_1, s_2} \end{aligned}$$

where $\boldsymbol{s}$ is Keynes' aggregate saving function, and $\boldsymbol{S_t^d}$ is the rate of desired saving. It should be noted that the demands for government goods and services $\boldsymbol{G_t^d}$, imports $\boldsymbol{F_t^d}$, exports $\boldsymbol{X_t^d}$, and taxes $\boldsymbol{T_t^d}$ do not explicitly enter the aggregate demand (**19**) or saving

---

[6] In Blackford (2022b) only non-debt assets were referred to in the model. Here both debt and non-debt assets are combined in the assets variable $\boldsymbol{A_t}$.

(**20**) schedules as they are implicitly included in the derivation of Keynes' MEC (**12**) and consumption (**8**) functions in the specification of the supply prices $\boldsymbol{P_t^{sc}}$ (**5**) $\boldsymbol{P_t^{si}}$ (**9**) and demand prices $\boldsymbol{P_t^{dc}}$ (**6**) $\boldsymbol{P_t^{di}}$ (**10**) above.

To complete the behavioral equations in Keynes' aggregate model it is necessary to specify the relationship between effective demand, employment ($\boldsymbol{N_t}$) and output/income $\boldsymbol{Y_t}$ where Keynes defined *effective demand* as the point at which the "entrepreneurs' expectation of profits will be maximized" (1936, p. 25).[7] It is assumed that the rate at which labor is demanded and output is produced in the investment- and consumption-goods industries are direct functions of the effective demands for investment ($\boldsymbol{I_t^e}$) and consumption ($\boldsymbol{C_t^e}$) goods—that is, are direct functions of the level of output and employment at which producers *expect* to maximize their profits. Accordingly, we can write the demand for labor in the investment-goods industries ($\boldsymbol{N_t^{id}}$) as:

(**21**) $\boldsymbol{N_t^{id} = n^{id}(I_t^e), \qquad 0 < n^{id'},}$

and the demand for labor in the consumption-goods industries ($\boldsymbol{N_t^{cd}}$) as:

---

[7] See Keynes:

> In Chapter 3 we have defined the aggregate supply function Z = φ(N), which relates the employment N with the aggregate supply price of the corresponding output. The employment function only differs from the aggregate supply function in that it is, in effect, its inverse function and is defined in terms of the wage-unit; the object of the employment function being to relate the amount of the effective demand, measured in terms of the wage-unit, directed to a given firm or industry or to industry as a whole with the amount of employment, the supply price of the output of which will compare to that amount of effective demand. Thus, if an amount of effective demand D_{wr}, measured in wage-units, directed to a firm or industry calls forth an amount of employment N_r in that firm or industry, the employment function is given by $N_r = F_r(D_{wr})$. Or, more generally, if we are entitled to assume that D_{wr} is a unique function of the total effective demand D_w, the employment function is given by $N_r = F_r(D_w)$. (1936, p. 280)

$$(\mathbf{22})\quad N_t^{cd} = n^{cd}(C_t^e), \qquad 0 < n^{cd'}.$$

Similarly, we can write the output of goods produced in the investment goods industry (I_t) as:

$$(\mathbf{23})\quad I_t = i^e(I_t^e), \qquad 0 < i^{e'},$$

and the output of goods produced in the consumption goods industries (C_t) as:

$$(\mathbf{24})\quad C_t = c^e(C_t^e), \qquad 0 < c^{e'}.$$

And "if we are entitled to assume that [employment in each firm or industry] is a unique function of the total effective demand" (1936, p. 280), (**22**) and (**23**) imply that Keynes' aggregate employment function can be written as:

$$\begin{aligned}(\mathbf{25})\quad N_t^{wd} &= N_t^{id} + N_t^{cd}\\ &= n^{id}(I_t^e) + n^{cd}(C_t^e)\\ &= n^{id}(Y_t^e) + n^{cd}(Y_t^e)\\ &= n^{d}(Y_t^e), \qquad n^{wd'} = 1\end{aligned}$$

where N_t^{wd} is the aggregate demand for labor if variables are measured in 'wage-units', and Y^e is the aggregate effective demand: [8]

$$(\mathbf{26})\quad Y_t^e = C_t^e + I_t^e.$$

If variables are measured in constant dollars the aggregate demand for labor measured in constant dollars (N_t^d) can be written as:

$$(\mathbf{27})\quad N_t^d = n^{cd}(C_t^e) + n^{id}(I_t^e)$$

---

[8] See footnote 7 above. Since the aggregate employment function is defined net of user cost, both ($N_t^{id} + N_t^{cd}$) and ($C_t + I_t$) define the number of hours-of-ordinary-labor/time-unit needed to satisfy Y_t^e when these aggregate variables are measured in 'wage-units'. Thus, $n^d(C_t^e + I_t^e) = Y_t^e$ and $dn^d(C_t^e + I_t^e) = dY_t^e$ which implies that $n^{d'} = \mathbf{n^{d-1'}} = \mathbf{1}$. See Blackford (2022, p. 2n) and Keynes (1936, p. 55n).

$$= \boldsymbol{n^{cd}(Y_t^e)} + \boldsymbol{n^{id}(Y_t^e)}$$
$$= \boldsymbol{n^{d}(Y_t^e)}, \qquad \mathbf{0} < n^{d'} < 1.$$

3. Dynamic Adjustment Functions

In specifying the dynamic adjustment functions that determine the dynamic behavior of the variables of the model it is assumed that demanders and suppliers behave in accordance with what Leijonhufvud referred to as Marshall's "laws of motion" (pp. 61-77) to equate supplies and demands. Thus it is assumed that demanders and suppliers of money adjust the rate of interest $\boldsymbol{R_t}$ to equate the demand for money $\boldsymbol{M_t^d}$ (**13**) to the supply of money $\boldsymbol{M_t^s}$ (**14**):

$$(\mathbf{28}) \qquad \boldsymbol{dR_t} = \boldsymbol{g^r}\left(\boldsymbol{M_t^d} - \boldsymbol{M_t^s}\right)$$
$$= \boldsymbol{g^r}\left(\boldsymbol{m^d}(\boldsymbol{Y_t}, \boldsymbol{R_t}) - \boldsymbol{m^s}(\boldsymbol{R_t})\right),$$

as they adjust the stock of money $\boldsymbol{M_t}$ in existence to the short side of the market:

$$(\mathbf{29}) \qquad \boldsymbol{dM_t} = \boldsymbol{g^m}\left(\boldsymbol{M_t^d} - \boldsymbol{M_t}\right)$$
$$= \boldsymbol{g^m}\left(\boldsymbol{m^d}(\boldsymbol{Y_t}, \boldsymbol{R_t}) - \boldsymbol{M_t}\right)$$

where $\boldsymbol{dR_t}$ and $\boldsymbol{dM_t}$ are the time derivative operator $\boldsymbol{d}$ ($\boldsymbol{= d/dt}$) applied to $\boldsymbol{R_t}$ and $\boldsymbol{M_t}$, and the time derivative functions $\boldsymbol{g^r}$ and $\boldsymbol{g^m}$ (as well as the time derivative functions specified below) are assumed to increase monotonically through the origin.[9]

It is also assumed that demanders and suppliers of assets adjust the price of assets $\boldsymbol{P_t^a}$ to equate the existing supply of assets $\boldsymbol{A_t}$ (**15**) to the demand for assets $\boldsymbol{A_t^d}$ (**16**):

---

[9] It should be noted that the time derivative functions in this model are not assumed to be continuous, well-behaved mathematical functions in the real world even though for ease of exposition they will be specified as such. They can be modified to fit the hypotheses of an endogenous money supply or markup pricing, oligopoly, monopoly, etc., as one wishes, but to do so here is beyond the scope of this paper. Cf., Brady, Hayes, Lavoie and Godley, and Keynes (1936; 1937a).

$$(\mathbf{30}) \quad dP_t^a = g^{pa}\left(A_t^d - A_t^s\right)$$
$$= g^{pa}\left(a^d(P_t^a, R_t, Y_t) - A_t\right).$$

Next it is assumed that producers in the investment- and consumption-goods industries adjust their expectations to equate the effective demands for consumption (C_t^e) and investment (I_t^e) goods to the actual demands for these goods C_t^d and I_t^d as defined by the inverses of (**6**) and (**10**): [10]

$$(\mathbf{31}) \quad dC^e = g^{ce}\left(C_t^d - C_t^e\right)$$
$$= g^{ce}\left(c^{dp-1}(P_t^c, Y_t, G_t, \mu_t) - C_t^e\right)$$
$$(\mathbf{32}) \quad dI^e = g^{ie}\left(I_t^d - I_t^e\right)$$
$$= g^{ie}\left(i^{dp-1}\left(P_t^i, R_t, P_t^a, Y_t, G_t, \mu_t\right) - I_t^e\right)$$

as they adjust the rates of consumption C_t and investment I_t goods production to their respective effective demands:

$$(\mathbf{33}) \quad dC_t = g^c(C_t^e - C_t)$$
$$(\mathbf{34}) \quad dI_t = g^i(I_t^e - I_t),$$

and that suppliers and demanders in the markets for investment I_t and consumption C_t goods adjust the prices of investment P_t^i and consumption P_t^c goods to equate the supplies I_t^s C_t^s and demands I_t^d C_t^d for these goods as given by the inverses of the supply price P_t^{si} (**9**) P_t^{sc} (**5**) and demand price P_t^{di} (**10**) P_t^{dc} (**6**) functions for these goods:

$$(\mathbf{35}) \quad dP_t^i = g^{pi}\left(I_t^d - I_t^s\right)$$
$$= g^{pi}\left(i^{dp-1}\left(P_t^i, R_t, P_t^a, Y_t, G_t, \mu_t\right) - i^{sp-1}\left(P_t^i, \mu_t\right)\right)$$
$$(\mathbf{36}) \quad dP_t^i = g^{pc}\left(C_t^d - C_t^s\right)$$

---

[10] Cf., Keynes: "the effects on employment of the realized sale-proceeds of recent output and those of the sale-proceeds expected from current input; and producers' forecasts are more often gradually modified in the light of results than in anticipation of prospective changes" (1936, p. 51).

$$= g^{pc}\left(c^{dp-1}\left(P_t^i, Y_t, G_t, \mu_t\right) - c^{sp-1}\left(P_t^i, \mu_t\right)\right).$$

It is also assumed that as the effective demands for output in the investment I_t^e and consumption C_t^e goods industries adjust to the actual demands for the output of these industries in accordance with (**31**) and (**32**) employment in the investment (N_t^i) and consumption (N_t^c) goods industries adjust to the actual demand for employment N_t^{id} (**21**) N_t^{cd} (**22**) in these industries:

(**37**) $$dN_t^i = g^{ni}\left(N_t^{id} - N_t^i\right)$$
$$= g^{ni}\left(n^{id}(I_t^e) - N_t^i\right)$$

(**38**) $$dN_t^c N_t^d = g^{nc}\left(N_t^{cd} - N_t^c\right)$$
$$= g^{nc}\left(n^{cd}(C_t^e) - N_t^c\right)$$

Thus, aggregate employment (N_t) adjusts concomitantly to equate the aggregate demand for employment (**27**):[11]

(**39**) $$dN_t = g^n\left(N_t^d - N_t\right)$$
$$= g^n(n(Y_t^e) - N_t)$$

as the aggregate effective demand Y_t^e (**27**) adjusts concomitantly to the actual demands for consumption C_t^d (**8**) and investment I_t^d(**12**) goods:

(**40**) $$dY_t^e = g^e\left(Y_t^d - Y_t^e\right)$$
$$= g^e(c(Y_t, G_t, \mu_t) + i(R_t, P_t^a, Y_t, G_t, \mu_t) - Y_t^e),$$

as the aggregate output/income Y_t adjusts to the aggregate demand for output/income Y_t^d (**19**):

(**41**) $$dY_t = g^e(Y_t^d - Y_t)$$

---

[11] This assumes, of course, that variables are measured in constant dollars. If employment is measured in wage-units N_t^w (**25**) the employment adjustment function becomes: $dN_t^w = g^{nd}\left(N_t^{wd} - N_t^w\right) = g^{nd}\left(n^{wd}(Y_t^e) - N_t^w\right)$.

$$= g^e(d(Y_t, R_t, P_t^a, G_t, \mu_t) - Y_t).$$

Finally, it assumed that exports X_t, imports F_t, taxes net of transfers T_t and government expenditures G_t, and saving S_t adjust according to the foreign sector's demand for exports X_t^d (**3**), the domestic sector's demand for imports F_t^d (**4**), the government sector's demands goods and services G_t^d (**1**) and for taxes net of tr*ansfers* T_t^d *(***2**), and the various sectors' desire for saving S_t^d (**20**):

(42) $$dX_t = g^x(X_t^d - X_t)$$
$$= g^x(x(P_t^i, P_t^c, \mu_t) - X_t)$$

(43) $$dF_t = g^f(F_t^d - F_t)$$
$$= g^f(f(Y_t, P_t^i, P_t^c, \mu_t) - F_t)$$

(44) $$dG_t = g^g(G_t^d - G_t)$$

(45) $$dT_t = g^t(T_t^d - T_t)$$
$$= g^t(t(Y_t) - T_t)$$

(46) $$dS_t = g^s(S_t^d - S_t)$$
$$= g^s(s(Y_t, G_t, \mu_t) - S_t).$$

4. Structure of Keynes' *Aggregate* Model

The adjustment functions (**28**) - (**46**) define the way in which changes in nineteen endogenous variables are determined in Keynes' aggregate model: C_t^e, C_t, P_t^c, I_t^e, I_t, P_t^i, N_t^i, N_t^c, N_t, M_t, R_t, P_t^a, T_t, G_t, X_t , F_t, S_t, Y_t^e, and Y_t. Since these functions are assumed to pass through the origin the system is in equilibrium in the sense that there is no reason for any variable to change when all of the adjustment functions are equal to zero. This gives us nineteen equilibrium conditions which contain nineteen endogenous variables as summarized in **Table 1**.

This table outlines the mathematical structure of the short-run aggregate model specified above. The equilibrium values of the endogenous variables are assumed to be determined by the behavioral relationships defined by the behavioral equations (**1**) - (**27**) g*i*ven the assumption that employment is determined by the effective demands of producers as their expectations adjust to equate their effective demands to the actual demands that exist in markets by way of the adjustment functions (**28**) - (**44**).

Table 1: Structure of Keynes' Aggregate Model			
Sectors	**Equilibrium Conditions**		**Endogenous Variables**
Consumption	$C_t^d = C_t^e$	$C^e = C_t$	C_t^e, C_t, P_t^c
	$C_t^d = C_t^s$		
Investment	$I_t^d = I_t^e$	$I_t^e = I_t$	I_t^e, I_t, P_t^i
	$I_t^d = I_t^s$		
Labor	$N_t^{id} - N_t^i$	$N_t^{cd} - N_t^c$	N_t^i, N_t^c, N_t
	$N_t^d = N_t$		
Money	$M_t^d = M_t^s$	$M_t^d = M_t$	M_t, R_t
Government	$T_t^d = T_t$	$G_t^d = G_t$	T_t, G_t
Foreign	$X_t^d = X_t$	$F_t^d = F_t$	X_t, F_t
Aggregate Income	$Y_t^d = Y_t^e$	$Y_t^d = Y_t$	Y_t^e, Y_t
Assets	$A_t^d = A_t^s$		P_t^a
Saving	$S_t^d = S_t$		S_t

5. Achieving Equilibrium

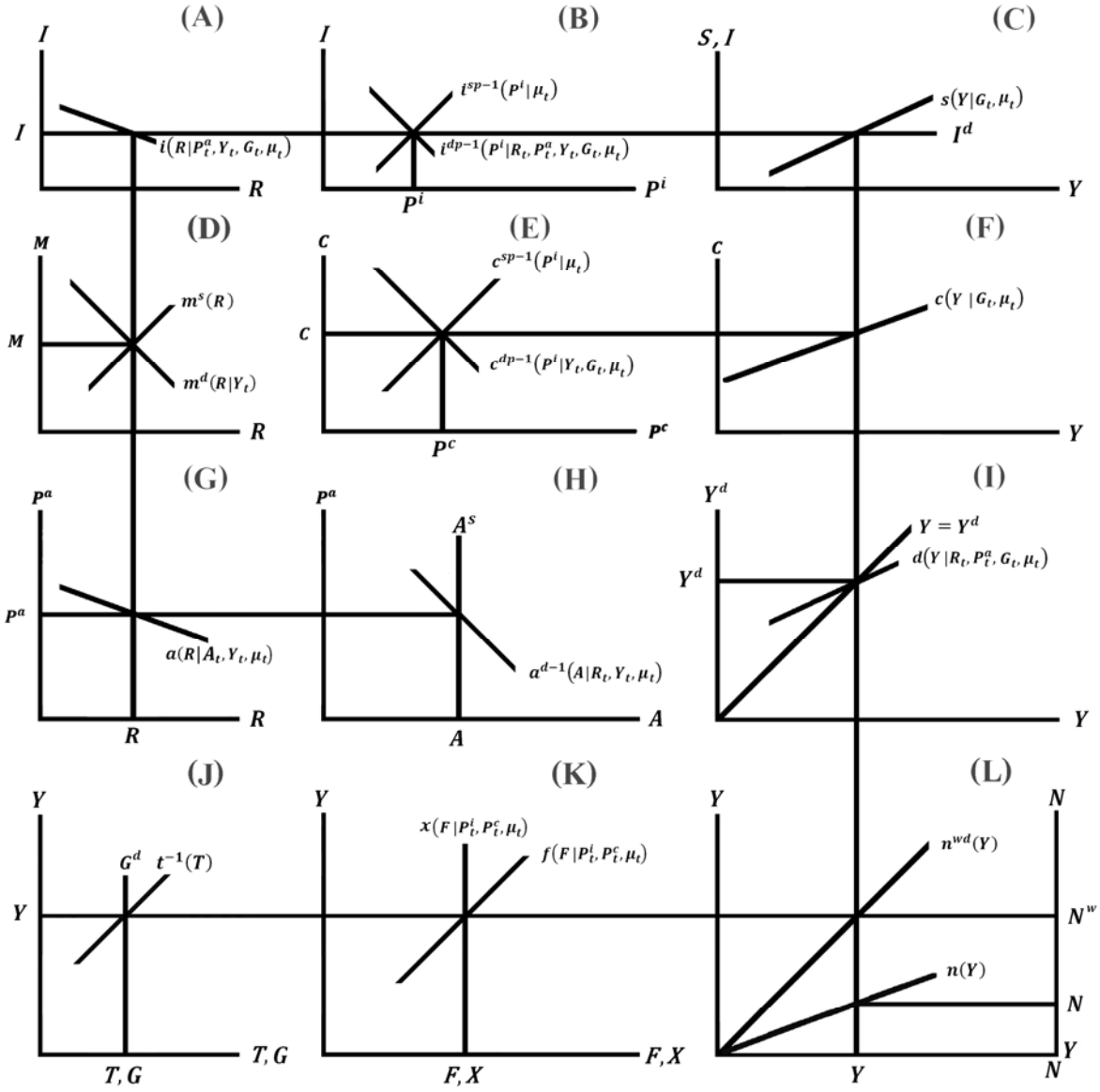
The way in which the short-run equilibrium values of the variables in the model are determined by suppliers and demanders in individual markets is illustrated in **Figure 1** where: [12]

1. Given the rate of interest R_t, the price of assets P_t^a, output/income Y_t, government demand for goods and services G_t, and the foreign exchange rate μ_t, the price of investment goods P_t^i and rate of investment goods production I_t are determined in panel (**B**) by demanders and suppliers of investment goods as dictated by the demand for $i^{dp-1}(P^i | R_t, P_t^a, Y_t, G_t, \mu_t)$ (**10**) and supply of $i^{sp-1}(P^i | \mu_t)$ (**9**) investment goods from which Keynes' MEC schedule $i(R | P_t^a, Y_t, G_t, \mu_t)$ (**12**) in panel (**A**) is derived.
2. Given output/income Y_t, government demand for goods and services G_t, and the

[12] For a detailed discussion of the way in which equilibrium is defined and achieved in the works of Marshall, Keynes, and neoclassical economists see Hayes (2006), and Lavoie and Godley.

foreign exchange rate $\boldsymbol{\mu_t}$, the price $\boldsymbol{P_t^i}$ and rate of consumer goods production $\boldsymbol{C_t}$ are determined in panel (**E**) by demanders and suppliers of consumer goods as dictated by the demand for $\boldsymbol{c^{dp-1}(P^c|Y_t, G_t, \mu_t)}$ (**6**) and supply of $\boldsymbol{c^{sp-1}(P^c|\mu_t)}$ (**5**) consumer goods from which Keynes consumption function $\boldsymbol{c(Y|G_t, \mu_t)}$ (**8**) in panel (**F**) is derived.

Figure 1: Short-Run Equilibrium.



3. Given output/income $\boldsymbol{Y_t}$, the rate of interest $\boldsymbol{R_t}$ and stock of money $\boldsymbol{M_t}$ are determine in panel (**D**) by the demanders and suppliers of money as dictated by the demand for $\boldsymbol{m^d(R|Y_t)}$ (**13**) and supply of $\boldsymbol{m^s(R)}$ (**14**) money functions.

4. Given the rate of interest $\boldsymbol{R_t}$, output/income $\boldsymbol{Y_t}$, and the foreign exchange rate $\boldsymbol{\mu_t}$, the price of assets $\boldsymbol{P_t^a}$ is determine in panel (**H**) by the demanders and suppliers of assets as dictated by the supply of $\boldsymbol{A_t^s}$ (**15**) and demand for $\boldsymbol{a^{d-1}(A|R_t, Y_t, \mu_t)}$ (**16**) assets from which the asset equilibrium function $\boldsymbol{a(R|A_t, Y_t, \mu_t)}$ (**18**) in panel (**G**) is derived.

5. Given the rate of interest $\boldsymbol{R_t}$, prices of assets $\boldsymbol{P_t^a}$ and consumption $\boldsymbol{P_t^c}$ goods, government demand for goods and services $\boldsymbol{G_t}$, and the foreign exchange rate $\boldsymbol{\mu_t}$, output/income $\boldsymbol{Y_t}$ is determined in panel (**I**) in accordance with the aggregate demand schedule $\boldsymbol{d(Y|R_t, P_t^a, G_t, \mu_t)}$ (**19**) such that aggregate output/income $\boldsymbol{Y_t}$ is equal to the aggregate demand for output $\boldsymbol{Y_t^d}$ in panel (**I**) along with the level of employment $\boldsymbol{N_t}$ in panel (**L**) in accordance with the labor demand schedule $\boldsymbol{n^{wd}(Y^e)}$ (**25**) if variables are measured in wage-units and by $\boldsymbol{n^d(Y^e)}$ (**27**) if variables are measured in constant dollars where it is assumed thao $\boldsymbol{Y_t^e}$ is equal to $\boldsymbol{Y_t}$ in this panel.

6. Concomitantly, given government demand for goods and services $\boldsymbol{G_t}$ and the foreign exchange rate $\boldsymbol{\mu_t}$, the equilibrium value of output/income $\boldsymbol{Y_t}$ and the rate of saving $\boldsymbol{S_t}$ are determined in panel (**C**) by savers and investors in accordance with Keynes' savings function $\boldsymbol{s(Y|G_t, \mu_t)}$ (**20**) and the rate of investment demaonded $\boldsymbol{I_t^d}$.

7. Given output/income $\boldsymbol{Y_t}$, the prices of investment $\boldsymbol{P_t^i}$ and consumption $\boldsymbol{P_t^c}$ goods, and the exchange rate $\boldsymbol{\mu_t}$, exports $\boldsymbol{X_t}$ are determined by the demands of foreigners as dictated by the export demand function $\boldsymbol{x\left(P_t^i, P_t^c, \mu_t\right)}$ (**3**) in panel (**K**), and imports $\boldsymbol{F_t}$ are determined in this panel by the demands of consumers, investors, and governments as dictated by the import demand function $\boldsymbol{f\left(F|P_t^i, P_t^c, \mu_t\right)}$ (**4**) where to simplify the graph it is assumed that exports are equal to imports in this panel.

8. Finally, taxes net of transfers $\boldsymbol{T_t}$ and government goods and services $\boldsymbol{G_t}$ are assumed to be determined by governments as dictated by the governments' demand for taxes net of transfers function $\boldsymbol{t^{-1}(T)}$ (**2**) in panel (**J**) and government demand for goods and services $\boldsymbol{G_t^d}$ in this panel where to simplify the graph it is assumed that government demand for goods and services $\boldsymbol{G_t}$ is equal to tax receipts net of transfers $\boldsymbol{T_t}$ in this panel.

But what is most significant about the model embodied in equations (**1**) through

(**46**) and summarized in **Figure 1** above is that it formalizes the analytical framework develop by Keynes throughout *The General Theory*—a framework within which a *logically consistent, causal analysis of* the *dynamic behavior of the economic system is possible.* (Blackford 2024) Rather than view the economic system from the perspective of a set of Walrasian equations Keynes viewed the system from the perspective of a set of Marshallian partial equilibrium models in which the values of individual variables are determined by the choices of those decision-making units that actually have the power to determine the value of each variable *at each point in time* as the system evolves *through time*. (Blackford 2022; 2024) Accordingly, in examining the dynamic behavior of the system it is assumed that given the money wage $\boldsymbol{W_t}$,[13] stock of assets $\boldsymbol{A_t}$, foreign exchange rate $\boldsymbol{\mu_t}$, and the other exogenous variables and parameters of the model:

1. The complex of prices and rates of production and sale of goods and resources along with the complex of prices of assets are determined through the interactions of suppliers and demanders in the markets for goods, resources, and assets.
2. The rate of interest (i.e., the complex of rates of interest on new loans and debt assets) is (are) determined by the suppliers and demanders for money (i.e., liquidity) in "the money market" (Fisher 1930, p. 12).
3. Employment and output/income are determined by producers in accordance with their *effective demands*—that is, at the point at which producers *expect* to maximize their profits—and governments in accordance with their decisions to demand government services.
4. And the entire process by which these variables are determined *at each point in time* is governed by the *expectations* of decision-making units as their expectations adjust to the realized results that are achieved within the system as the system evolves *through time*.

---

[13] It is beyond the scope of this note to examine the effects of changes in money wage $\boldsymbol{W_t}$. For a detailed examination of this problem see Keynes (1936, Ch. 19).

These assumptions make it possible to isolate those factors that *directly* and *in themselves* determine each variable at *each point in time* whether the *system* is in equilibrium or not. This, in turn, makes it possible to establish *the temporal order in which events must occur* (Blackford 2024) as decision-making units respond to changes in the exogenous determinants of the variables *in each sector* of the economy at each point in time. It is the ability to establish the temporal order in which events must occur within the analytical framework developed by Keynes throughout *The General Theory* that makes it possible to separate cause and effect within this context and within economics in general. [14]

6. Increasing the Foreign Exchange Rate

To illustrate the causal/dynamic nature of the analytical framework developed by Keynes' throughout *The General Theory* as embodied in the model specified above, consider a situation in which the domestic sector allows the foreign sector to bid up the foreign exchange rate $\boldsymbol{\mu_t}$ by purchasing the domestic sector's assets $\boldsymbol{A_t}$ as the United States has been allowing the foreign sector to do for the past thirty odd years. [15] How will this affect the equilibrium position of the system in **Figure 1**, and, other things being equal, how will a new equilibrium come about? We can begin to answer this question by examining the direct effects of this policy on the behavioral equations in **Figure 1**.

The initial effect of this policy will be to increase the demand for assets $\boldsymbol{a^{d-1}(A|R_t, Y_t, \mu_t)}$ (**16**) in panel (**H**), and as the foreign exchange rate $\boldsymbol{\mu_t}$ increases the demand for imports $\boldsymbol{f\left(F|P_t^i, P_t^c, \mu_t\right)}$ (**4**) will increase as the demand for exports $\boldsymbol{x\left(P_t^i, P_t^c, \mu_t\right)}$ (**3**) decreases in panel (**K**). There will also be an increase in the supplies of

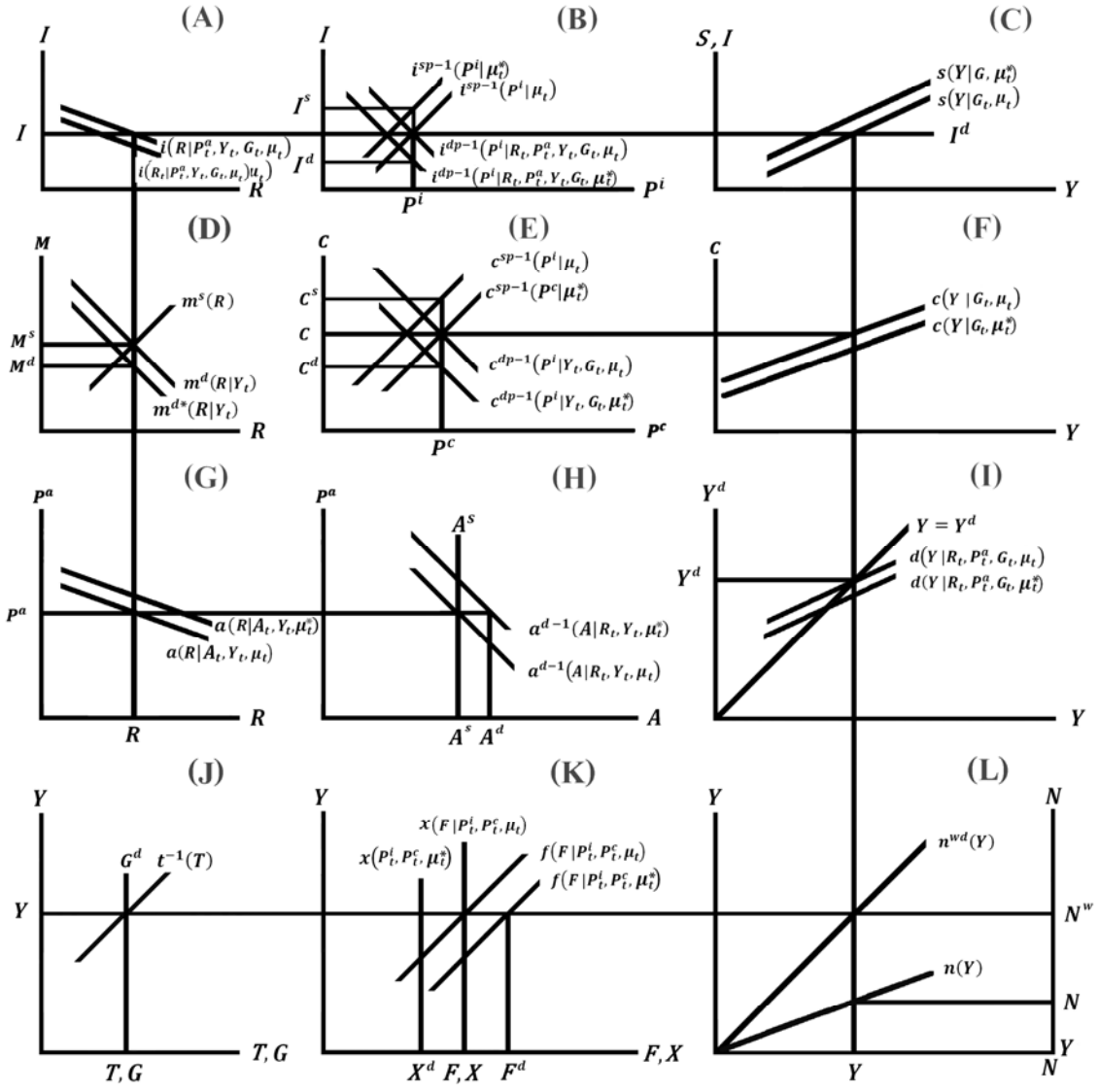
---

[14] See Blackford (2020; 2021; 2022; 2024) and Hume, and cf., Brady, Hayes, and Lavoie and Godley.

[15] See Blackford (2018, ch. 2) for a discussion of the effects of capital flows (i.e, foreign purchases of domestic assets) on exchange rates in international financial markets.

investment $\boldsymbol{i^{sp-1}(P^i|\mu_t)}$ (**9**) and consumption $\boldsymbol{c^{sp-1}(P^c_t|\mu_t)}$ (**5**) goods along with a decrease in the demands (**6**) $\boldsymbol{i^{dp-1}\left(P^i|R_t, P^a_t, C^d_t, G^d_t, \mu_t\right)}$ (**10**) $\boldsymbol{c^{dp-1}(P^c|Y_t, G_t, \mu_t)}$ for these goods in panels (**B**) and (**E**) in response to the increase in the exchange rate $\boldsymbol{\mu_t}$. In addition, as the effective demands for consumption $\boldsymbol{C^e_t}$ and investment $\boldsymbol{I^e}$ goods adjust to the actual demands for these goods in accordance with (**31**) and (**32**) the resulting decrease in the demand for 'finance' (Bibow) will cause the demand for money $\boldsymbol{m^d(Y|R_t)}$ (**13**) to fall in panel (**D**).

Figure 2: Direct Effects of an Increase in International Exchange Rate.



The result will be to create an excess supply of money $\boldsymbol{M_t}$ in panel (**D**), an excess

demand for assets $\boldsymbol{A_t}$ in panel (**H**), and excess supplies in the markets for consumption goods $\boldsymbol{C_t}$ in panel (**E**) and investment goods $\boldsymbol{I_t}$ in panel (**B**) as the demand for exports $\boldsymbol{x(P^i, P_t^c, \mu_t)}$ (**3**) decreases and the demand for imports $\boldsymbol{f\left(F|P_t^i, P_t^c, \mu_t\right)}$ (**4**) increases in panel (**K**) as is illustrated in **Figure 2**.

In the absence of a change in the exogenous variables and parameters in the system, as the excess supplies of consumption $\boldsymbol{C_t}$ and investment $\boldsymbol{I_t}$ goods are created the effective demands for these goods $\boldsymbol{C_t^e}$ $\boldsymbol{I_t^e}$ must adjust in accordance with (**31**) and (**32**) which will cause the prices of consumption $\boldsymbol{P_t^c}$ and investment $\boldsymbol{P_t^i}$ goods in panels (**E**) and (**B**) to fall in accordance with (**35**) and (**36**) along with the production of consumption $\boldsymbol{C_t}$ and investment $\boldsymbol{I_t}$ goods in accordance with (**33**) and (**34**). The fall in the production of consumption $\boldsymbol{C_t}$ and investment $\boldsymbol{I_t}$ goods means that the value of output produced—that is, output/income $\boldsymbol{Y_t}$—must fall as well along with employment $\boldsymbol{N}$ in accordance with (**37**), (**38**) and (**39**). In addition, the fall in output/income $\boldsymbol{Y_t}$ must further enhance the excess supply of money in panel (**D**) putting added pressure on the rate of interest $\boldsymbol{R_t}$ and stock of money $\boldsymbol{M_t}$ to fall in accordance with (**28**) and (**29**)

The fall in output/income $\boldsymbol{Y}$ will, in turn, further increase the fall in the demands for investment $\boldsymbol{i^{dp-1}(P^i\,|R_t, P_t^a, Y_t, G_t, \mu_t)}$ (**10**) and consumption $\boldsymbol{c^{dp-1}(P^c|Y_t, G_t, \mu_t)}$ (**6**) goods in panels (**B**) and (**E**) as it and inhibits the increase in imports $\boldsymbol{f\left(F|P_t^c, P_t^i, \mu_t\right)}$ (**4**) in panel (**K**). The fall in the prices of consumption $\boldsymbol{P_t^c}$ and investment $\boldsymbol{P_t^i}$ goods will, in turn, inhibit the decrease in the demand for exports $\boldsymbol{x\left(P_t^c, P_t^i, \mu_t\right)}$ (**3**) and inhibit the increase in the demand for imports $\boldsymbol{f\left(F|P_t^c, P_t^i, \mu_t\right)}$ (**4**) in panel (**K**) while the fall in the production of consumption $\boldsymbol{C_t}$ and investment $\boldsymbol{I_t}$ goods (and, therefore, in employment $\boldsymbol{N_t}$ and output/income $\boldsymbol{Y_t}$) will, in turn, cause an additional decrease in the demands for consumption $\boldsymbol{c^{dp-1}(P^c|Y_t, G_t, \mu_t)}$ (**6**) and investment $\boldsymbol{i^{dp-1}(P^i\,|R_t, P_t^a, Y_t, G_t, \mu_t)}$ (**10**) goods in panels (**E**) and (**B**) where the decrease in the demand for investment goods $\boldsymbol{i^{dp-1}(P^i\,|R_t, P_t^a, Y_t, G_t, \mu_t)}$ (**10**) will be partially offset by the increase in the price of assets $\boldsymbol{P_t^a}$.

The result will be a further increase in the excess supplies of consumption $\boldsymbol{C_t}$ and investment $\boldsymbol{I_t}$ goods that will lead to a continuation of the fall in the prices of

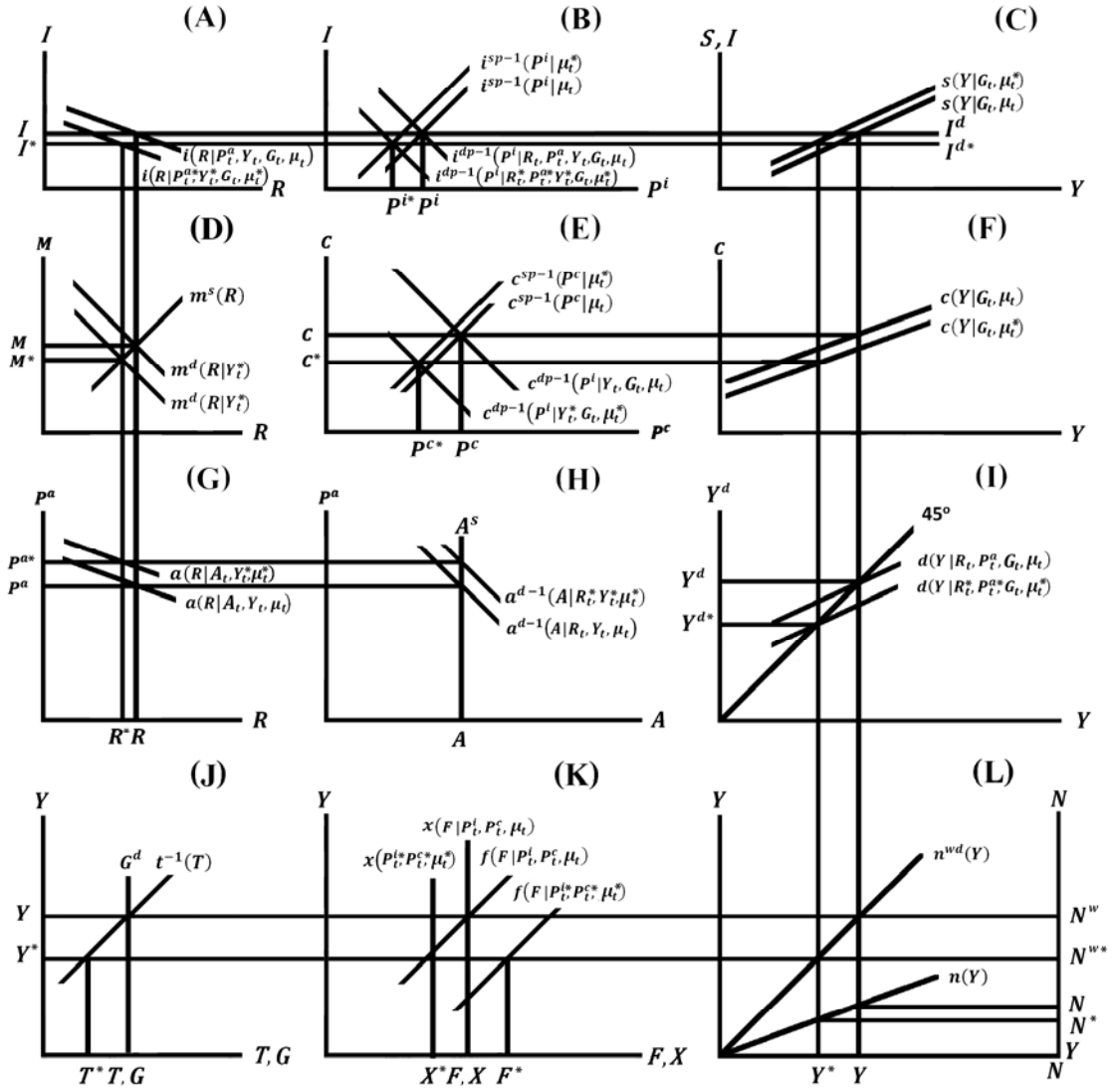
consumption $\boldsymbol{P_t^c}$ and investment $\boldsymbol{P_t^i}$ goods as the production of consumption $\boldsymbol{C_t}$ and investment $\boldsymbol{I_t}$ goods continue to fall along with output/income $\boldsymbol{Y_t}$ and employment N_t. At the same time, the excess demand for money $\boldsymbol{M_t}$ in panel (**D**) will cause both the rate of interest $\boldsymbol{R_t}$, and the stock of money $\boldsymbol{M_t}$ to continue to fall in accordance with (**28**) and (**29**) which will, in turn, further inhibit the fall in the demand for investment goods $\boldsymbol{i^{dp-1}(P^i\,|R_t, P_t^a, Y_t, G_t, \mu_t)}$ (**10**) in panel (**B**) and increase the demand for assets $\boldsymbol{a^{d-1}(A|R_t, Y_t, \mu_t)}$ (**16**) in panel (**H**). This will, in turn, enhance the increase in the price of assets $\boldsymbol{P_t^a}$ in panel (**H**) which will further inhibit the fall in the demands for investment goods $\boldsymbol{i^{dp-1}(P^i\,|R_t, P_t^a, Y_t, G_t, \mu_t)}$ (**10**) in panel (**E**).

In the absence of a change in the exogenous variables or parameters in the system the interactions of suppliers and demanders in the markets for investment and consumption goods, money, exports and imports, and assets in panels (**B**), (**E**), (**D**), (**K**) and (**H**) must cause the prices $\boldsymbol{P_t^i}$ $\boldsymbol{P_t^c}$ and production of consumption $\boldsymbol{C_t}$ and investment $\boldsymbol{I_t}$ goods, income $\boldsymbol{Y_t}$, the rate of interest $\boldsymbol{R_t}$, and exports $\boldsymbol{X_t}$ to fall as the price of assets $\boldsymbol{P_t^a}$ and imports $\boldsymbol{F_t}$ increase in these panels until they reach a point of equilibrium where their demands $\boldsymbol{C_t^d}$, $\boldsymbol{I_t^d}$, $\boldsymbol{M_t^d}$, $\boldsymbol{X_t^d}$, $\boldsymbol{A_t^d}$, $\boldsymbol{F_t^d}$ are equal to their respective supplies $\boldsymbol{C_t^s}$, $\boldsymbol{I_t^s}$, $\boldsymbol{M_t^s}$, $\boldsymbol{X_t^s}$, $\boldsymbol{A_t^s}$, $\boldsymbol{F_t^s}$. At this point the increasing aggregate saving $\boldsymbol{s(Y|G_t, \mu_t)}$ (**20**) schedule and the falling demand for investment $\boldsymbol{I^d}$ in panel (**C**) and the falling aggregate demand schedule $\boldsymbol{d(Y|, R_t, P_t^a, G_t, \mu_t)}$ (**19**) in panel (**I**) will reach a point of equilibrium at which the fall in aggregate output/income $\boldsymbol{Y}$ equates aggregates saving $\boldsymbol{S}$ and investment $\boldsymbol{I}$ in panel ($\boldsymbol{C}$), and aggregate demand $\boldsymbol{Y^d}$ and output/income $\boldsymbol{Y}$ in panel (**I**). **Figure 3** shows the resulting decreases in the prices $\boldsymbol{P^i}$ $\boldsymbol{P^c}$ and rates of investment $\boldsymbol{I}$ and consumer $\boldsymbol{C}$ goods production in panels (**B**) and (**E**), in the stock of money $\boldsymbol{M}$ and rate of interest $\boldsymbol{R}$ in panel (**D**), in output/income $\boldsymbol{Y}$ in panel (**I**), in employment $\boldsymbol{N}$ ($\boldsymbol{N^w}$) in panel (**L**), in exports $\boldsymbol{X}$ in panel (**K**), and in taxes $\boldsymbol{T}$ in panel (**J**), and the increase in the price of assets $\boldsymbol{P^a}$ in panel (**H**) and in imports $\boldsymbol{F}$ in panel (**K**) from ($\boldsymbol{P^i, P^c, C, I, M, R, Y, N, X, T, P^a, F_t}$) to ($\boldsymbol{P^{i*}, P^{c*}, C^*, I^*, M^*, R^*, Y^*, N^*, X^*, T^*, P^{a*}, F_t^*}$).

It should be noted that the implication that the rates of consumption $\boldsymbol{C_t}$ and investment $\boldsymbol{I_t}$ goods production fall in this situation presupposes that the positive effects of the increase in the exchange rate $\boldsymbol{\mu_t}$ on the supplies of investment $\boldsymbol{i^{sp-1}(P^i|\mu_t)}$ (**9**) and

consumption $\boldsymbol{c^{sp-1}(P_t^i|\mu_t)}$ (**5**) goods along with the positive effects of the increase in the price of assets $\boldsymbol{P_t^a}$ on the demand for investment goods $\boldsymbol{i^{dp-1}(P^i|R_t, P_t^a, Y_t, G_t, \mu_t)}$ (**10**) in **Figure 3** are more than offset by the negative effects of the increase in the exchange rate $\boldsymbol{\mu_t}$ on the demands for investment $\boldsymbol{i^{dp-1}(P^i|R_t, P_t^a, Y_t, G_t, \mu_t)}$ (**10**) and consumption $\boldsymbol{c^{dp-1}(P^c|Y_t, G_t, \mu_t)}$ (**6**) goods in panels (**B**) and (**E**).

Figure 3: Short-Run Effects of an Increasing the Foreign Exchange Rate.



It is worth emphasizing at this point that the aggregate schedules—consumption (**8**), MEC (**12**), asset equilibrium (**18**), demand (**19**), and saving (**20**)—are explicitly derived from the behaviour of suppliers (**5**) (**9**) (**15**) (**14**) and demanders (**6**) (**10**) (**16**) (**13**) for investment and consumption goods, assets, and money given the behaviour of governments (**1**) (**2**), exporters (**3**), and importers (**4**). It is the decision-making units

that exist in the real-world markets for investment and consumption goods, assets, and money along with those that determine the demands of governments, imports, and exports that are assumed to determine the behaviour of the variables in the system at any point in time, not a mythical auctioneer. The result is an analytic framework in which the determination of each variable can be examined, analyzed, explained, and predicted in terms of the behaviour of decision-making units that actually exist in the real world, an analytical framework within which it is possible:

> to provide ourselves with an organized and orderly method of thinking out particular problems; and, after we have reached a provisional conclusion by isolating the complicating factors one by one, we then have to go back on ourselves and allow, as well as we can, for the probable interactions of the factors amongst themselves. This is the nature of economic thinking. Any other way of applying our formal principles of thought (without which, however, we shall be lost in the wood) will lead us into error. (Keynes 1936, pp. 297-8)

7. Concluding Observation

The fundamental difference between the structure of the analytic framework embodied in Keynes general theory as exemplified in the model specified above and that of the Walrasian paradigm of neoclassical economics is that Keynes' behavioral equations are assumed to be consistent with Marshallian supply and demand functions rather than the Walrasian supply and demand functions assumed by neoclassical economists.[16] They are presumed to be determined by the optimizing behavior of decision-making units as they interact in markets, just as Walrasian supply and demand functions are presumed to be determined by optimizing behavior. The difference is that in Keynes' understanding of these functions they are specified by isolating those factors that are perceived to have a *direct* effect on the *willingness* of buyers and sellers to buy and sell in individual markets whether the system as a whole is in equilibrium or not without assuming that these choices are constrained by an arbitrary Walrasian budget constraint that is nothing more than an accounting identity. (Blackford 2019a; 2020a,

[16] See Brady, Clower, Hayes, Leijonhufvud, and Blackford (2022b)

pp. 20-77; 2024)

Instead, they are derived by observing the actual behavior of decision-making units in markets, hypothesizing with regard to the motivations of these units given their *expectations* with regard to those magnitudes that affect their choices *directly* in each individual market, and then reasoning through the logical implications of what the actual choices available to decision-making units and their motivations and expectations imply with regard to their willingness to buy and sell in individual markets. As a result, even though the set of equilibrium conditions specified above when taken together define a general equilibrium of the system as a whole they are the product of a *partial* equilibrium analysis of individual markets in which *the values of individual variables are assumed to be determined by the choices of those decision-making units that actually have the power to determine the value of each variable at each point in time as the system evolves through time.*[17]

Keynes did not view the economic system as being determined by a set of simultaneous equations but by those decision-making units that actually have the power to affect the system at each point in time. (Keynes 1936; Blackford 2019a; 2020a, pp. 29-77; 2021) This way of looking at the economy made it possible for him to establish *the temporal order in which events must occur* and, thereby, to undertake a *logically consistent, causal* analysis of the *dynamic* behavior (Blackford 2024) by way of "an organized and orderly method of thinking out particular problems, … isolating the complicating factors one by one" and after reaching provisional conclusions going back, as well as he could, to account "for the probable interactions of the factors amongst themselves" in an attempt to understand "the complexities and interdependencies of the real world." (Keynes 1936, pp. 297-8)

This was Keynes' method of analysis throughout *The General Theory of Employment, Interest, and Money* as he followed the example set by Marshall. It is the

---

[17] See Marshall (1920; 1961, Books III-IV) and Blackford (2019; 2020a pp. 18-73), and cf., Keynes (1936, Books III-IV), Hayes, Brady, and Lavoie and Godley.

inability or unwillingness of neoclassical economists to examine economic problems in this way that led to their downfall as they advocated the policies that led to the economic, political, and social problems we face today—problems that were the inevitable result of economic policies that ignored Keynes' analysis in *The General Theory* and led directly to the Crash of 2008, the economic stagnation that followed, and the economic, social, and political chaos we see throughout the world today. (See Keynes 1936; Blackford 2016; 2021; 2022; 2024.)

References

Bibow, Jörg. 2000a. "The Loanable Funds Fallacy in Retrospective", *History of Political Economy*, vol. 32, 769-831.

_____. 2001. "The loanable funds fallacy: exercises in the analysis of disequilibrium", *Cambridge Journal of Economics*, vol. 25, 591-616.

_____. 2009. Keynes on Monetary Policy, Finance and Uncertainty: Liquidity Preference Theory and the Global Financial Crisis. Kindle: Routledge.

Blackford, George H. 2016. "On the pseudo-scientific nature of Friedman's 'as if' methodology", *Evonomics*. https://evonomics.com/economists-stop-defending-milton-friedmans-pseudo-science/

_____. 2018. Where Did All The Money Go? How Lower Taxes, Less Government, and Deregulation Redistribute Income and Create Economic Instability. Second Edition. Amazon.com: www.rwEconomics.com.

_____. 2019a. "A Stock-flow Model of Keynes' Theory of Interest", Unpublished paper: https://rweconomics.com/SFM.pdf, reprinted in Blackford (2020b) *Essays on Political Economy, Volume III: Keynes*, ch. 5, 140-174.

_____. 2019b. "A Note on Robertson and Tsiang versus Keynes", Unpublished paper: https://rweconomics.com/MKATN.pdf, reprinted in Blackford (2020b) *Essays on Political Economy, Volume III: Keynes*, ch. 4, 109-139.

_____. 2019c. Essays *on Political Economy, Volume I: Reality*, Amazon.com: www.rwEconomics.com

_____. 2019d. Essays *on Political Economy, Volume II: Ideology*, Amazon.com: www.rwEconomics.com

_____. 2020a. The *Theory of Interest: Robertson versus Keynes and the Long-period Problem of Saving and Debt*, Third Edition, Amazon.com: www.rwEconomics.com

_____. 2020b. Essays *on Political Economy, Volume III: Keynes*, Amazon.com: www.rwEconomics.com

_____. 2021. "Keynes on Economic Stagnation and Debt", *International Journal of Political Economy*, 50:1, 28-43.

_____. 2022a. "On the Efficacy of Saving", Real-World Economics Review, Issue. 102, pp 119-136, http://www.paecon.net/PAEReview/issue102/whole102.pdf.

_____. 2022b. "Mr. Keynes and the NeoClassics: A Reinterpretation", The International Review of Economic Studies, vol 1, no 2, https://www.cmjpublishers.com/wp-content/uploads/2023/03/Mr-Keynes-and-theNeoclassics-A-Reinterpretation.pdf

_____. 2024. "Causality in Economics and Keynes' General Theory", *Real-World Economics Review*, Issue. 109, 84-107. https://www.paecon.net/PAEReview/issue109/Blackford109.pdf

Brady, Michael Emmett. 1994. "Keynes, Pigou and the Supply Side of the General Theory", *History of Economics Review,* 34-46.

_____. 1995. "A Study of J. M. Keynes' Marshallian-Pigouvian Elasticity Approach in Chapter 20 and 21 of the GT", *History of Economics Review*. 55-71.

Clower, Robert W. 1965. "The Keynesian Counter-Revolution: A Theoretical Appraisal", In F. Hahn and F. Breeching, eds., *The Theory of Interest Rates*. New York: St. Martin's Press.

_____. 1975. "Reflections on the Keynesian Perplex", *Zeitschrift für Nationalökonomie/Journal of Economics*. 1-24.

Fisher, Irving. 1930. The Theory of Interest: As Determined by Impatience to Spend Income and Opportunity to Invest It. New York: Macmillan.

Hayes, M. G. 2006. The Economics of Keynes: A New Guide to The General Theory, London: Edward Elgar.

Hume, David. 1739. *A Treatise of Human Nature*. International Relations and Security Network, Eth Zurich, Last accessed 2/9/2018:

https://people.rit.edu/wlrgsh/HumeTreatise.pdf

Keynes, John M. 1936. *The General Theory of Employment, Interest, and Money*. New York: Harcourt, Brace and Co.

_____. 1937a. "Alternate Theories of the Rate of Interest", *Economic Journal,* vol. 47, 241-52.

_____. 1937b. "The '*ex-ante*' Theory of the Rate of Interest.", *Economic Journal,* vol. 47, 663-69.

_____. 1938. "Mr. Keynes and 'Finance'", *The Economic Journal,* vol. 48, 314-322.

Leijonhufvud, Axel. 2006. "Keynes as a Marshallian" in Backhouse, R. and B. Bateman eds. *The Cambridge Companion to Keynes*. Cambridge University Press. 58-77.

Marshall, Alfred. 1920. *Industry and Trade*, 3rd edition, New York: The Macmillan Company.

_____. 1961. *Principles of Economics*, 9th edition. New York: Macmillan.

Appendix: List of Equations

2. Behavioral and Structural Equations

(1) $G_t^d = G_t,$

(2) $T_t^d = t(Y_t),\ \ 0 < t'.$

(3) $X_t^d = x\left(P_t^i, P_t^c, \mu_t\right), \qquad x_1, x_2, s_3 < 0,$

(4) $F_t^d = f\left(Y_t, P_t^i, P_t^c, \mu_t\right), \quad 0 < x_1, x_2, s_3, s_4.$

(5) $P_t^{sc} = c^{sp}(C_t^s, \mu_t), \qquad 0 < c_1^{sp}, c_2^{sp}.$

(6) $P_t^{dc} = c^{dp}\left(C_t^d, Y_t, T_t^d, G_t^d, \mu_t\right) \quad c_1^{dp}, c_3^{dp}, c_5^{dp} < 0 < c_2^{dp}, c_4^{dp}$

$= c^{dp}\left(C_t^d, Y_t, t(Y_t), G_t, \mu_t\right)$

$= c^{dp}\left(C_t^d, Y_t, G_t, \mu_t\right), \qquad c_1^{dp}, c_4^{dp} < 0 < c_2^{dp}, c_3^{dp}.$

(7) $c^{sp}(C_t^s, \mu_t) = c^{dp}\left(C_t^d, Y_t, G_t, \mu_t\right) = P_t^i,$

(8) $C_t^d = c(Y_t, G_t, \mu_t), \quad c_3 < 0 < c_1, c_2$

(9) $P_t^{si} = i^{sp}(I_t^s, \mu_t\ ), \quad 0 < i_1^{sp}, i_2^{sp}.$

(10) $P_t^{di} = i^{dp}\left(I_t^d, R_t, P_t^a, C_t^d, G_t^d, \mu_t\right), \quad i_1^{dp}, i_2^{dp}, i_6^{dp} < 0 < i_3^{dp}, i_4^{dp}, i_5^{dp}$

$= i^{dp}\left(I_t^d, R_t, P_t^a, c(Y_t, \mu_t), G_t, \mu_t\right)$

$= i^{dp}\left(I_t^d, R_t, P_t^a, Y_t, G_t, \mu_t\right), \qquad i_1^{dp}, i_2^{dp}, i_6^{dp} < 0 < i_3^{dp}, i_4^{dp}, i_5^{dp}$

(11) $i^{sp}(I_t^s, \mu_t) = i^{dp}\left(I_t^d, R_t, P_t^a, Y_t, G_t, \mu_t\right) = P_t^i,$

(12) $I_t^d = i(R_t, P_t^a, Y_t, G_t, \mu_t), \qquad i_1, i_5 < 0 < i_2, i_3, i_4$

(13) $M_t^d = m^d(Y_t, R_t), \quad m_2^d < 0 < m_1^d$

(14) $M_t^s = m^s(R_t), \quad 0 < m^{s'}.$

(15) $A_t^s = A_t,$

(16) $A_t^d = a^d(P_t^a, R_t, Y_t, \mu_t), \qquad a_1^d, a_2^d < 0 < a_3^d, a_4^d.$

(17) $A_t = a^d(P_t^a, R_t, Y_t, \mu_t),$

(18) $P_t^a = a(P_t^a, R_t, Y_t, \mu_t), \quad a_1, a_2 < 0 < a_3, a_4.$

(19) $Y_t^d = C_t^d + I_t^d$

(20) $S_t^d = Y_t - C_t^d$

$= Y_t - c(Y_t, G_t, \mu_t)$

$= s(Y_t, G_t, \mu_t), \qquad s_3 < 0 < s_1, s_2$

(21) $N_t^{id} = n^{id}(I_t^e), \qquad 0 < n^{id'},$

(22) $N_t^{cd} = n^{cd}(C_t^e), \qquad 0 < n^{cd'}.$

(23) $I_t = i^e(I_t^e), \qquad 0 < i^{e'},$

(24) $C_t = c^e(C_t^e), \qquad 0 < c^{e'}.$

(25) $N_t^{wd} = N_t^{id} + N_t^{cd}$

$= n^{id}(I_t^e) + n^{cd}(C_t^e)$

$= n^{id}(Y_t^e) + n^{cd}(Y_t^e)$

$= n^d(Y_t^e), \qquad n^{wd'} = 1$

(26) $Y_t^e = C_t^e + I_t^e.$

(27) $N_t^d = n^{cd}(C_t^e) + n^{id}(I_t^e)$

$= n^{cd}(Y_t^e) + n^{id}(Y_t^e)$

$= n^d(Y_t^e), \qquad 0 < n^{d'} < 1.$

3. Dynamic Adjustment Functions

(28) $dR_t = g^r\left(M_t^d - M_t^s\right)$

$= g^r\left(m^d(Y_t, R_t) - m^s(R_t)\right),$

(29) $dM_t = g^m\left(M_t^d - M_t\right)$

$= g^m\left(m^d(Y_t, R_t) - M_t\right)$

(30) $dP_t^a = g^{pa}\left(A_t^d - A_t^s\right)$

$= g^{pa}\left(a^d(P_t^a, R_t, Y_t) - A_t\right).$

(31) $dC^e = g^{ce}\left(C_t^d - C_t^e\right)$

$= g^{ce}\left(c^{dp-1}(P_t^c, Y_t, G_t, \mu_t) - C_t^e\right)$

(32) $dI^e = g^{ie}\left(I_t^d - I_t^e\right)$

$= g^{ie}\left(i^{dp-1}\left(P_t^i, R_t, P_t^a, Y_t, G_t, \mu_t\right) - I_t^e\right)$

(33) $dC_t = g^c(C_t^e - C_t)$

(34) $dI_t = g^i(I_t^e - I_t),$

(35) $dP_t^i = g^{pi}\left(I_t^d - I_t^s\right)$

$= g^{pi}\left(i^{dp-1}\left(P_t^i, R_t, P_t^a, Y_t, G_t, \mu_t\right) - i^{sp-1}\left(P_t^i, \mu_t\right)\right)$

(36) $dP_t^i = g^{pc}\left(C_t^d - C_t^s\right)$

$$= g^{pc}\left(c^{dp-1}\left(P_t^i, Y_t, G_t, \mu_t\right) - c^{sp-1}\left(P_t^i, \mu_t\right)\right).$$

(37) $$dN_t^i = g^{ni}\left(N_t^{id} - N_t^i\right)$$

$$= g^{ni}\left(n^{id}(I_t^e) - N_t^i\right)$$

(38) $$dN_t^c N_t^d = g^{nc}\left(N_t^{cd} - N_t^c\right)$$

$$= g^{nc}\left(n^{cd}(C_t^e) - N_t^c\right)$$

(39) $$dN_t = g^n\left(N_t^d - N_t\right)$$

$$= g^n(n(Y_t^e) - N_t)$$

(40) $$dY_t^e = g^e\left(Y_t^d - Y_t^e\right)$$

$$= g^e(c(Y_t, G_t, \mu_t) + i(R_t, P_t^a, Y_t, G_t, \mu_t) - Y_t^e),$$

(41) $$dY_t = g^e(Y_t^d - Y_t)$$

$$= g^e(d(Y_t, R_t, P_t^a, G_t, \mu_t) - Y_t).$$

(42) $$dX_t = g^x(X_t^d - X_t)$$

$$= g^x(x\left(P_t^i, P_t^c, \mu_t\right) - X_t)$$

(43) $$dF_t = g^f(F_t^d - F_t)$$

$$= g^f(f\left(Y_t, P_t^i, P_t^c, \mu_t\right) - F_t)$$

(44) $$dT_t = g^t(T_t^d - T_t)$$

$$= g^t(t(Y_t) - T_t)$$

(45) $$dS_t = g^s(S_t^d - S_t)$$

$$= g^s(s(Y_t, G_t, \mu_t) - S_t).$$

(46) $$dG_t = g^g(G_t^d - G_t)$$