JCU CENTRE FOR INTERNATIONAL TRADE AND BUSINESS IN ASIA (CITBA)

An Introduction to SFC Modelling

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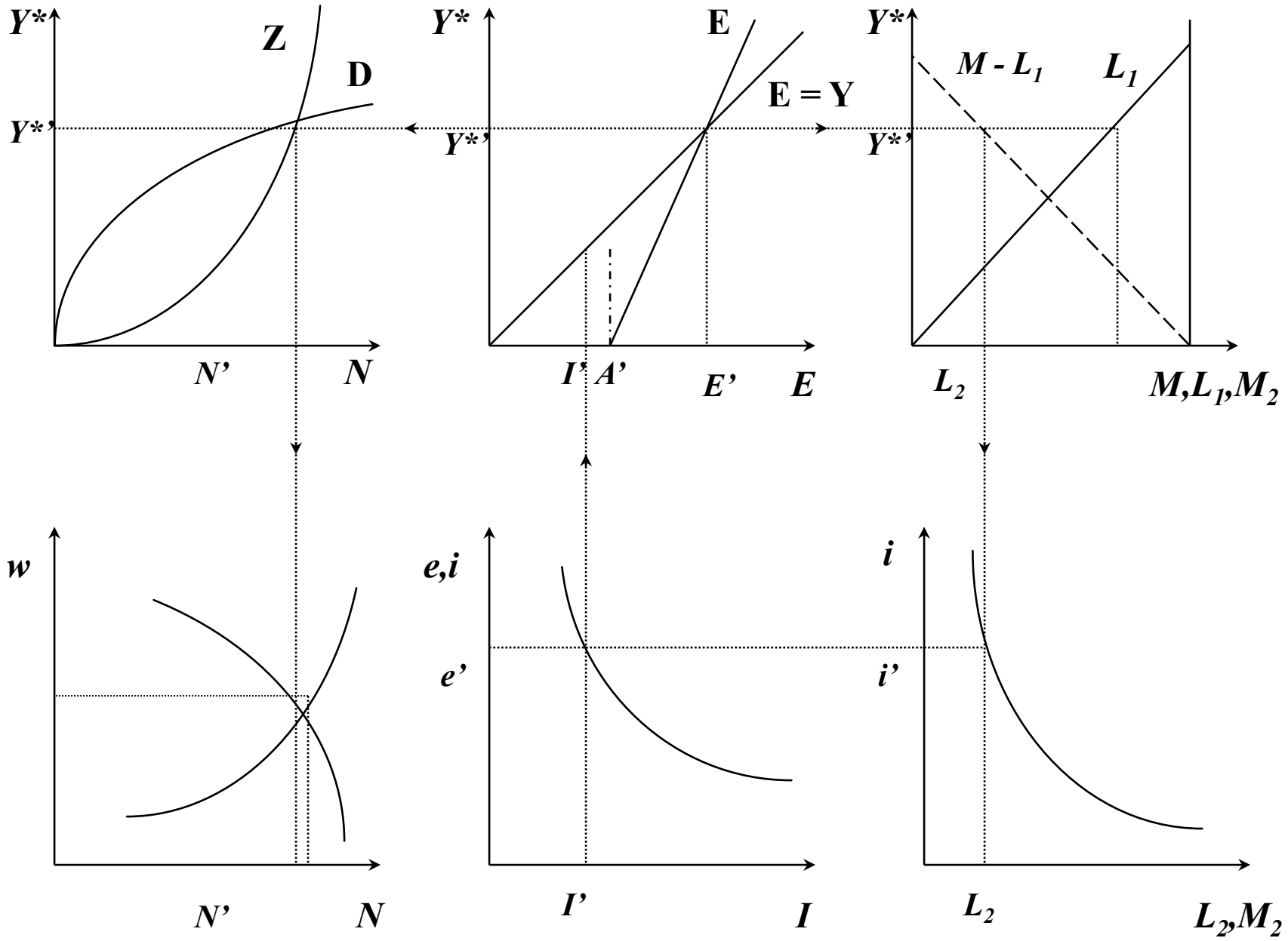
- **Introduction**
  - Origins
    - Historical Influences
    - Cambridge Economic Growth Project
    - Godley & Lavoie
  - Quadruple Accounting & the Balance-Sheet Approach
    - Stock-Flow Consistency
    - Transactions Tables, Balance Sheets and Flow-of-Funds
    - ‘Horizontal’ and ‘Vertical’ Transactions
  - Monetary Issues
    - Marx and the Monetary Circuit
    - Uncertainty and the Endogeneity of Money
    - Tobin-style Asset Market Equilibrium
    - The 3-Step Approach to Modelling
    - Open and Closed Economies
  - A Starting Point – the Chapter 3 SIM Model

- For largely *strategic* reasons,
  - Keynes left the logical kernel of the neoclassical growth theory — the Wicksellian notion of the *natural rate of interest*—intact in the aftermath of the 'Keynesian revolution'
  - i.e. 'loanable funds theory'
- It would effectively become the 'chink in the armour' accommodating,
  - the Monetarist, and later
  - the Rational Expectations counter-revolutions
- e.g., Sargent's (1979, 1986) demonstration:
  - of the block recursive structure of the neoclassical growth model
  - i.e. such that all nominal variables are determined independently from the structure of the real economy so that monetary interventions only influence the aggregate price level
  - Thus imposing *neutrality* & *super-neutrality* of money
  - *How exactly does that work*? Via Tobin's q-ratio as the driver of investment (reflecting discounted revenue deriving from marginal value product of capital)

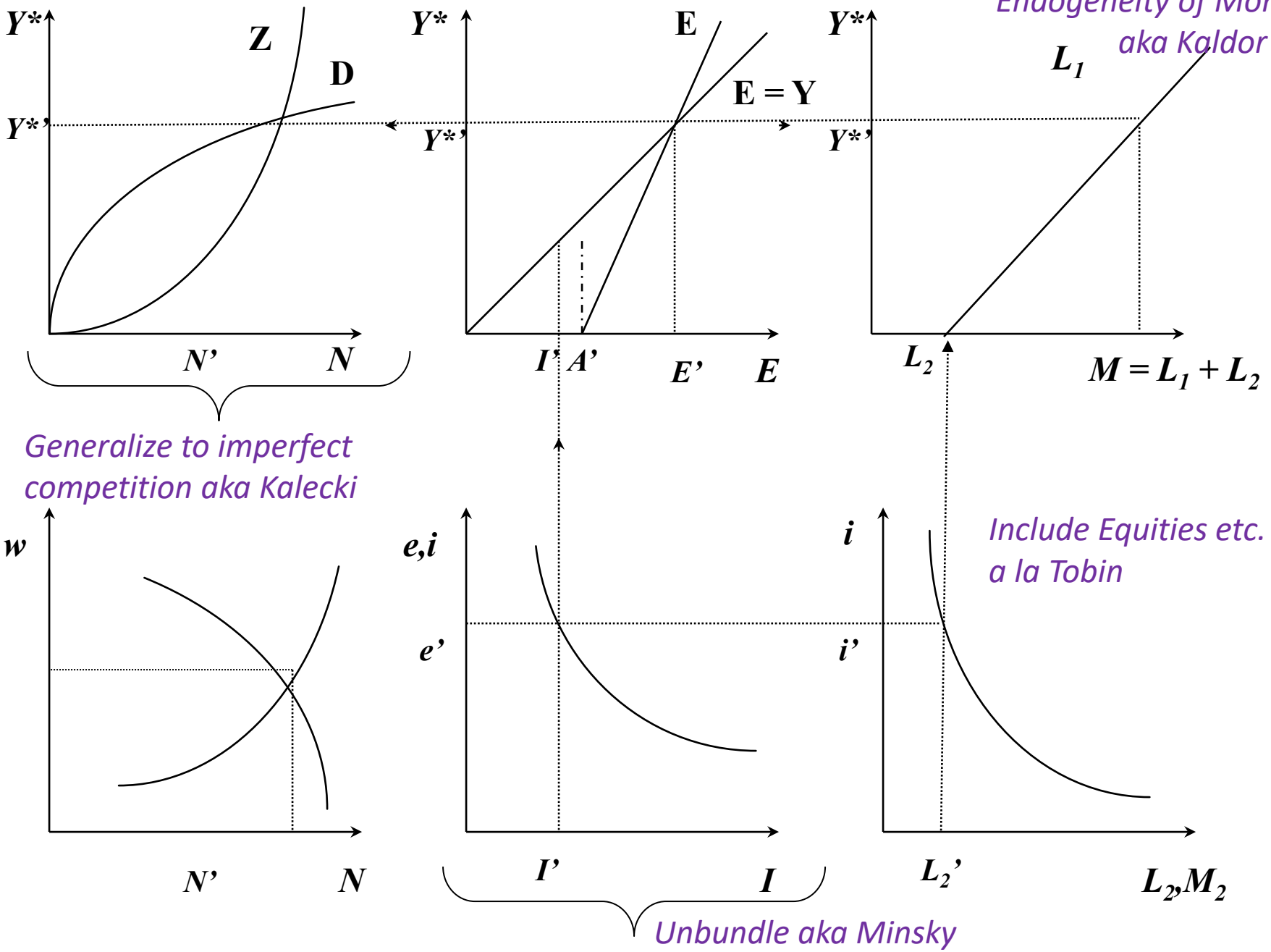
- Two Paradigms in Macroeconomics (G&L, Chp.2)
  - The Neo-classical Paradigm, based on the premise that
    - economic activity is exclusively motivated by the aspirations of individual agent
    - market-clearing prevented by 'sticky prices'
    - no *essential* place for loans, credit money or banks
    - Production functions with factor-returns associated with their marginal productivity
  - Post-Keynesian/Structuralist
    - Associated with s Joan Robinson, Richard Kahn, Nicholas Kaldor, and James Meade, as well as Michal Kalecki
    - recognizing the manifest existence of institutions, especially firms
    - operating under conditions of imperfect competition and increasing returns
    - Systematic need for loans provided by institutions outside the firm sector (as production and investment take time while expectations are in general falsified)
  - Diminished Influence of Latter
    - Due to 'lack of theoretical cohesion' & 'scant attention to the fundamentals' in a "monetary production economy" [Pasinetti]
    - i.e. the way in which an industrial capitalist economy works as an organic whole

- Key Elements of the Post-Keynesian Approach
  - The Principle of Effective Demand
  - Book V of *GT* (flexible *w* and *p not* stabilizing)
    - 'Wealth' Effects (posited by Pigou's 'Treasury line') as weak & more than offset by:
      - Debt-deflation
      - Rising uncertainty & liquidity preference
  - Sraffa's 'Geometric' Approach & Capital Debates
    - Breaking linkage between RoR and Marg. Rev. Product
  - SFC Modelling of Aggregate Supply
    - Mark-up pricing on prime costs versus Marginal Cost pricing
  - Stock-Flow Consistency
  - Extended Financial Modelling
    - Tobin's model of Asset Markets (after Sraffa)
  - Minsky's (1975) Two-Price Model (Unbundling the MEC)
    - Unit Supply and Demand Price of Capital
    - Plus Borrowers & Lenders Risk (wrt external funds)
  - Open Economy considerations
    - Parity Conditions
    - Open economy implications of Classical PE

Vercelli's Reading of the GT's "Heuristic" Model



Accounting for Endogeneity of Money Supply



- Godley and Lavoie on Stock-Flow Modelling
  - Our claim is thus that the present modelling approach is an integral part of the post-Keynesian school. Indeed, as emphasized by Dos Santos (2005), there is a long tradition among post-Keynesian authors in attempting to analyse flows and financial stocks together, as can be seen from the works of Davidson (1968a,b), Minsky (1975, 1986) and Eichner (1987), just to mention a few well-known authors, and more recently from Dalziel (2001). The purpose of our book is to make this concern more explicit. [G&L, 2007: 18]
  - Our method guarantees that we will always be learning to live in a logically coherent world. And we are prepared to conjecture that, given that there are limits to the extent to which stock-flow ratios can change, the system dynamics of whole economies will pin down their overall behaviour in a way that can override the findings of econometrics as to the putative behaviour of bits and pieces. [11]
  - The structure of an economic model that is relevant to a capitalist economy needs to include the interrelated balance sheets and income statements of the units of the economy. The principle of double entry bookkeeping, where financial assets and liabilities on another balance sheet and where every entry on a balance sheet has a dual in another entry on the same balance sheet, means that every transaction in assets requires four entries (Minsky 1996: 77).

- Stock-Flow Modelling contd.
  - . The Cambridge UK group, which was known as the Cambridge Economic Policy Group (CEPG) or the New Cambridge school, used the stock-flow consistent framework mainly for forecasting whether an expansion was sustainable, as Godley (1999) still does today, and to discuss the balance of payments problems that were then plaguing the United Kingdom.
  - Dawson (1996: 5) points out that 'the acceptance of … flow-of-funds accounting by academic economists has been an uphill battle because its implications run counter to a number of doctrines deeply embedded in the minds of economists', and he adds that Morris A. Copeland, who is considered to be the inventor of flow-of-funds accounts, 'himself was at pains to show the incompatibility of the quantity theory of money with flow-of-funds accounting'. [22]
  - But these new models [i.e. Classical and New Keynesian]are devoid of the comprehensive outlook that characterizes the approach advocated by the Yale school [Tobin] and the CEPG.

- Accounting for Stocks and Flows [Zezza, 2015]
  1. “everything comes from somewhere and goes somewhere, namely, there are no black holes (e.g. someone’s spending is someone else’s income)” (Godley and Lavoie, 2007:6)
  2. debt for someone is a credit for someone else;
  3. flows imply stocks, e.g. a positive saving ,which is a flow item, implies an increase in net wealth, a stock item;
  4. stocks feedback on flows, for instance, higher debt (stock) implies higher future interest payments (flow)
  - In a theoretical growth model, stock/flow ratios are used as norms to which economic activities converge
  - In the transactions-flow matrix, all rows and all columns sum to zero
  - The flow matrix, along with a revaluation matrix (if capital gains and losses are accounted for), must be linked to the stock matrix to find the evolution of stocks

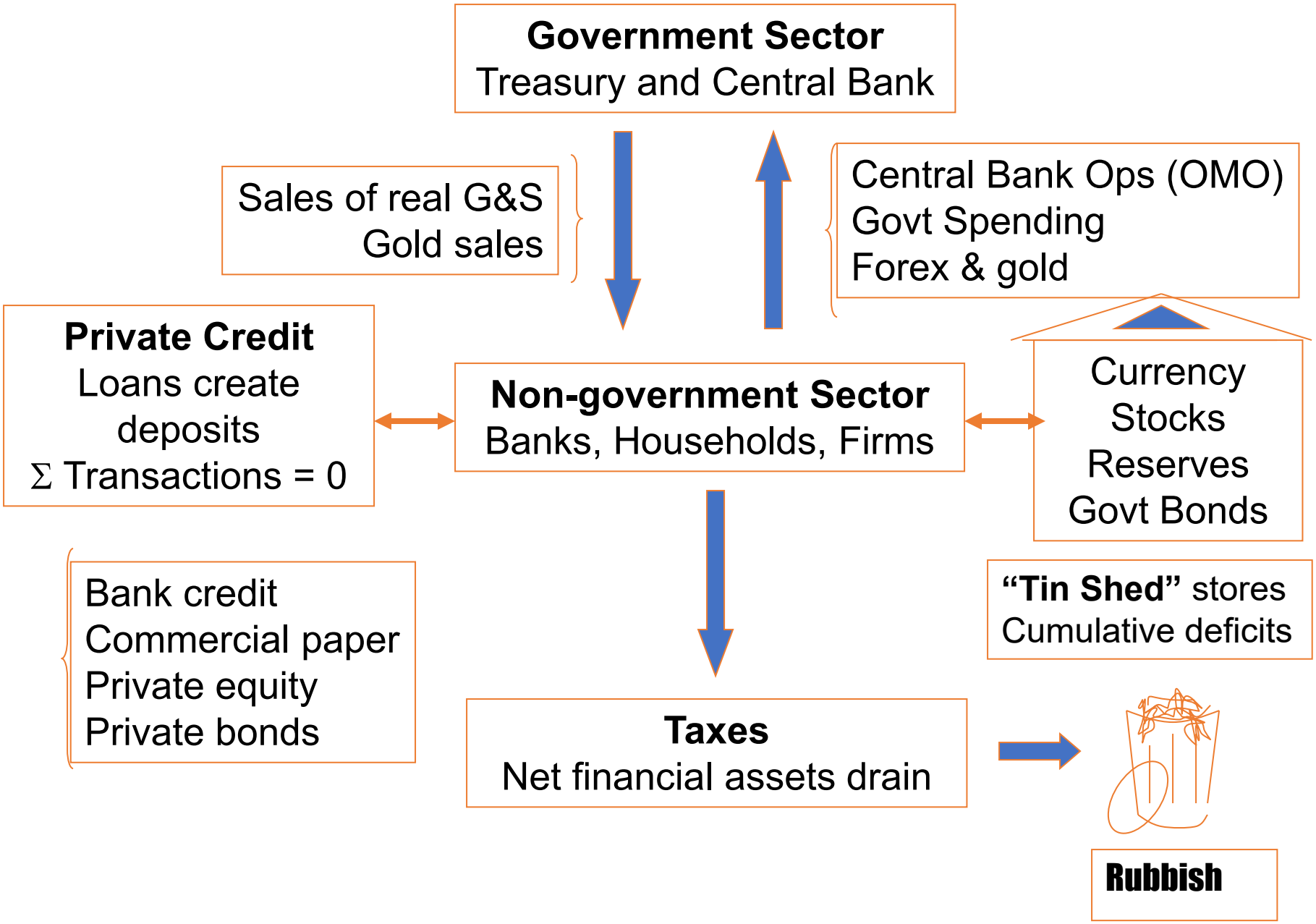
- The quadruple entry principle
  - Any change in the sources of funds of a sector must be compensated by at least one change in the uses of funds of the same sector. But any transaction must have a counterparty. Therefore the above two changes must be accompanied by at least two changes in the uses and sources of funds of another sector
  - *"Because money flows transactions involve two transactors, the social accounting approach to money flows rests not on a double-entry system but on a quadruple-entry system"(Copeland, 1949)*
  - The structure of an economic model that is relevant for a capitalist economy needs to include the interrelated balance sheets and income statements of the units of the economy. The principle of double entry book keeping, where financial assets are liabilities on another balance sheet and where every entry on the balance sheet has a dual in another entry on the same balance sheet, means that every transaction in assets requires four entries.
  - Minsky, Hyman P. Ph.D., "The Essential Characteristics of Post-Keynesian Economics" (1993). Hyman P. Minsky Archive. 19. https://digitalcommons.bard.edu/hm_archive/19
- The *payments mechanism* is also an important focus of analysis

- Constructing a SFC Model
  - The System of National Accounts 2008 says (page 21):
    - In principle, the recording of the consequences of an action as it affects all units and all sectors is based on a principle of quadruple entry accounting, because most transactions involve two institutional units. Each transaction of this type must be recorded twice by each of the two transactors involved. For example, a social benefit in cash paid by a government unit to a household is recorded in the accounts of government as a use under the relevant type of transfers and a negative acquisition of assets under currency and deposits; in the accounts of the household sector, it is recorded as a resource under transfers and an acquisition of assets under currency and deposits. The principle of quadruple entry accounting applies even when the detailed from-whom-to-whom relations between sectors are not shown in the accounts. Correctly recording the four transactions involved ensures full consistency in the accounts.
      https://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf
  - Signing Accounts
    - Current Transactions: (+) sign denotes receipt, (-) sign denotes a payment
    - Flow of Funds: (+) sign denotes sources of funds, (-) denotes uses of funds (flows that accumulate to determine end of the period's stocks)
    - Aggregate Balance Sheets: (+) sign before a variable denotes an asset while a (-) sign denotes a liability (end-of-period stocks)

- Stock-Flow Modelling contd. - A "Whiff of Monetarism?"
  - In retrospect, the confusion [of Dixon, 1982-83; Worswick and Trevithick, 1983] arose, so it seems, as a result of the insistence of New Cambridge School members upon stock-flow consistency and the long-run relationships or medium-run consequences that this required coherence possibly entailed. [xl]
  - […] even more recently, as Godley is virtually omitted from King's (2003) history of post-Keynesianism. By contrast, Hamouda and Harcourt (1988: 23–4) do devote a full page to his work. [fn. 4, xl]
- G&L's Response
  - We conclude that the level and growth rate of the fiscal stance is predetermined if economic growth at full employment is to be achieved. But the government's budget deficit is equal, by identity, to personal saving plus firms' net saving (undistributed profits less investment in fixed and working capital) which we call 'private net saving'. There is no way in which the government can change private net saving measured at full employment, which will normally be positive. It necessarily follows that the steady state budget deficit is determined by private net saving, rather than the other way round, and that the budget balance must normally be in deficit. [G&L, 2007: 444]
  - *I see this argument as entirely compatible with the position of Modern Monetary Theory on the role of Government*

Horizontal and Vertical Transactions

- Vertical transactions between the government and non-government sectors.
- These transactions must be clearly distinguished from their Horizontal counterparts: those between banks, households, and firms.
- The basis for this distinction is that only vertical transactions give rise to *net financial assets* or increases in real wealth, whereas horizontal transactions net out to zero.
- This is demonstrated in the following Table taken from Dos Santos & Zezza's closed economy model


Government Sector
Treasury and Central Bank
Sales of real G&S
Gold sales
Central Bank Ops (OMO)
Govt Spending
Forex & gold
Private Credit
Loans create deposits
Σ Transactions = 0
Non-government Sector
Banks, Households, Firms
Currency
Stocks
Reserves
Govt Bonds
Bank credit
Commercial paper
Private equity
Private bonds
"Tin Shed" stores
Cumulative deficits
Taxes
Net financial assets drain
Rubbish

Current Transactions Matrix (Dos Santos & Zezza)

	H'Hs	Firms		Govt	Banks	Σ
		Current	Capital			
C	$-C$	C				0
G		G		$-G$		0
Inv		$p.\Delta K$	$-p.\Delta K$			0
Wages	W	$-W$				0
Taxes	$-T_w$	$-T_f$		T		0
Int on Loans		$-i^l_{-1}.L_{-1}$			$i^l_{-1}.L_{-1}$	0
Int on Bills				$-i^b_{-1}.B_{-1}$	$i^b_{-1}.B_{-1}$	0
Int of Deposits	$i^b_{-1}D_{-1}$				$-i^b_{-1}.D_{-1}$	0
Div's	$F_d + F_b$	$-F_d$			$-F_b$	0
Σ	S_h	F_u	$-p.\Delta K$	S_g	0	0

- The Sources and Uses of Funds
  - Can be determined by reading the entries in each of the cells in any given column of the matrix
    - For the household sector, the sources of funds include wages, interest on deposits, and distributed dividends from banks and firms
    - Uses of funds include consumption and payment of taxes on household income
    - For firms, sources of funds include revenue from the sale of goods and services to households and government, as well as that component derived from the sale of capital goods to other firms (i.e. capital gains or losses, which must appear in a separate integration account for revaluations—see G&L, 2007: 43-46)
    - These funds are used for investment, the payment of corporate taxes, the payment of interest on borrowings, and the distribution of dividends
    - Banks receive interest on loans and issued bank bills, and use their funds for payment of interest on deposits and the distribution of profits

- By summing across the rows for the transactions accounts of banks, households and firms, it is apparent that all transactions cancel out with the exception of the interest paid on bank bills by government, the payment of taxes by firms and households, and the receipt of revenue by firms for the sale of goods and services to the government
- However, these components are all vertical transactions between the government and non-government sectors
- The bottom row of the Current Transactions Matrix indicates that government savings (surplus) or tax revenue net of government spending and payment of interest on bonds are equal to the non-government sector's dis-savings
- This is a crucial accounting identity because it implies that, in periods when governments run continual budget surpluses, although economic growth could well be sustained over the short run, this will only happen if the non-government sector runs an on-going deficit, thus accumulating ever-increasing levels of debt (i.e. Minsky's financial instability)

- Keynes on Uncertainty (1937) QJE, Vol. 51
- By ‘uncertain’ knowledge, let me explain, I do not mean merely to distinguish what is known for certain from what is only probable. The game of roulette is not subject, in this sense, to uncertainty; nor is the prospect of a Victory bond being drawn. Or, again, the expectation of life is only slightly uncertain. Even the weather is only moderately uncertain. The sense in which I am using the term is that in which the prospect of an European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealth-owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know.
- Nevertheless, the necessity for action and for decision compels us as practical men to do our best to overlook this awkward fact and to behave exactly as we should if we had behind us a good Benthamite calculation of a series of prospective advantages and disadvantages, each multiplied by its appropriate probability, waiting to be summed. How do we manage in such circumstances to behave in a manner which saves our faces as rational, economic men? We have devised for the purpose a variety of techniques, of which much the most important are the three following:

- (1) We assume that the present is a much more serviceable guide to the future than a candid examination of past experience would show it to have been hitherto. In other words we largely ignore the prospect of future changes about the actual character of which we know nothing. (2) We assume that the existing state of opinion as expressed in prices and the character of existing output is based on a correct summing up of future prospects, so that we can accept it as such unless and until something new and relevant comes into the picture. (3) Knowing that our individual judgment is worthless, we endeavour to fall back on the judgment of the rest of the world which is perhaps better informed. That is, we endeavor to conform with the behaviour of the majority or the average. The psychology of a society of individuals each of whom is endeavouring to copy the others lead to what we may strictly term a conventional judgment.
- Now a practical theory of the future based on these three principles has certain marked characteristics. In particular, being based on so flimsy a foundation, it is subject to sudden and violent changes. The practice of calmness and immobility, of certainty and security, suddenly breaks down. New fears and hopes will, without warning, take charge of human conduct. The forces of disillusion may suddenly impose a new conventional basis of valuation. All these pretty, polite techniques, made for a well-panelled board room and a nicely regulated market, are liable to collapse. At all times the vague panic fears and equally vague and unreasoned hopes are not really lulled, and lie but a little way below the surface.

- Godley and Lavoie on Money and Uncertainty
  - With no need to make the strange assumption that there is a given, fixed, exogenous stock of money in order to obtain a solution for any kind of general equilibrium (market clearing or otherwise), we can freely restore to money its natural attributes. We have a plausible story about how money enters and leaves the system. And money is the vehicle via which people receive income, settle their debts, pay their taxes and store their wealth, thus linking each period to the next. In a world of uncertainty, money permits glitches and mistakes. So far from being fixed, money is as volatile as Tinker Bell – as any book of monetary statistics will immediately reveal. Add finally that money in the stock-flow model, unlike 'money' in the mainstream model, is an asset which does, and always, must have a counterpart liability. [G&L, 2007: 91]
  - Firms require revolving finance from banks, not only because production and distribution take time while wages have to be paid in advance of sales being made, but also because they cannot know exactly what their sales are going to be … . It is unrealistic to suppose … that what is produced in one period will automatically be sold in the next. (Godley, 1999: 396)
  - It is inventories on the one hand, and money stocks on the other, which provide the essential flexible elements – the 'buffers' – which enable the whole system to function in a world of uncertainty. [G&L, 2007: 292]

- Marx and the Monetary Circuit
  - *Merchant Capital*:
    - $C \xrightarrow{\text{trade}} M \xrightarrow{\text{trade}} C'$
  - *Industrial Capital*:
    - $M \xrightarrow{\text{purchase MoP}} C \xrightarrow{\text{production}} C' \xrightarrow{\text{distr}'\text{n \& exchange}} M'$
  - Indeed, I was later to discover that Wynne Godley himself felt very much in sync with the theory of the monetary circuit and its understanding of Keynes's finance motive, as propounded by Augusto Graziani (1990, 2003). [Lavoie in G&L, 2007: xl]
  - Under this view, the predominant role of banks is to create loans, providing credit to firms who carry on production in a world where goods take time to be produced and sold. [498]
  - In G&L models, banks take pricing decisions: they set deposit and lending rates. By contrast, in Tobinesque models, deposit and lending rates are market clearing prices, which adjust the demand for and supply of deposits and loans respectively. [498]

- Sraffa's 'Geometric' Method

- Sraffa challenged the usual mode of theorizing in terms of essential and mechanical causation and, instead, argued for a descriptive or geometrical theory based on simultaneous relations. A consequence of this approach was a complete removal of 'agent's subjectivity' and 'marginal method' or counterfactual reasoning from economic analysis – the two fundamental pillars of orthodox economic theory
- By mathematically constructing a 'standard system' and a 'standard commodity' uniquely associated with any given system of inputs and outputs, Sraffa showed that both the maximum rate of profits that a system can achieve and its average rate of profits, given wages from outside in terms of the standard commodity, are non-price phenomenon or the property of the structure of the system and can be determined independently of prices. A consequence of this is that the postulate of a uniform rate of profits turns out to be a mathematincome distributionical property of a system that is not itself a standard system. Prices, in this context, do not carry any information that prompts 'agents' to adjust their supplies and demands to bring about an equilibrium in the market. [Sinha, 2016]
- *Sraffa's critique undermines neoclassical theories of investment and income distribution*

THE RESWITCHING PHENOMENON

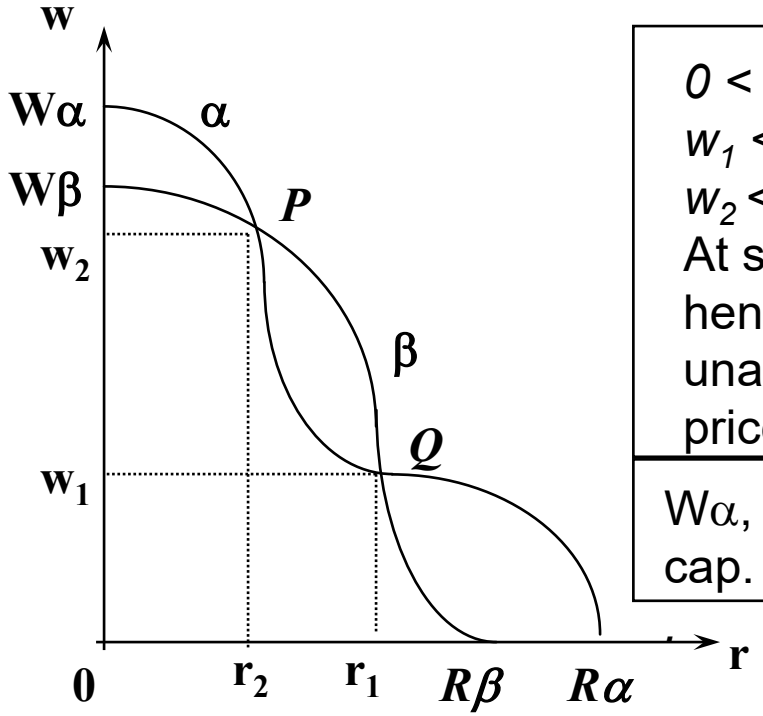
$p = (1 + r)Ap + wl$

Max rate of profit = R $\Rightarrow p/w$ approaches infinity

Min rate of profit = *0* $\Rightarrow$ prices in proportion to labour values

$r > 0$ $\Rightarrow$ prices deviate from values in different ways for each industry unless there are uniform proportions of labour to means of production across industries $\Rightarrow$ capital-labour, capital-output ratios can't be ranked independently of distribution

Different economy-wide wage curve $w = w(r)$ for any given industry production technique α *or* β where w and p are expressed in terms of a commodity produced in both systems



$0 < w < w_1 \Rightarrow$ technique α chosen

$w_1 < w < w_2 \Rightarrow$ technique β chosen

$w_2 < w < W\alpha \Rightarrow$ technique α chosen

At switch-points *P* and *Q,* both equiprofitable hence input proportions not related unambiguously to changes in relative factor prices

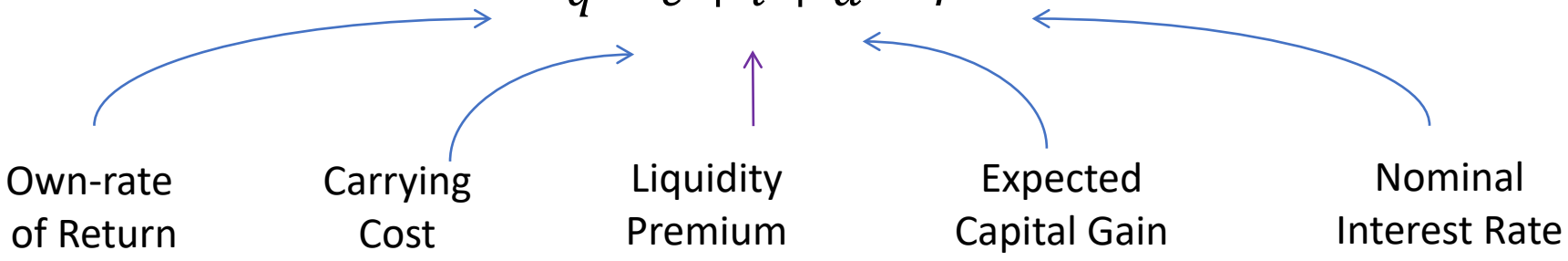
Wα, Wβ = net product per worker $\Rightarrow$ higher cap. stock at each switch point for technique α

- Sraffa ‘s Multi-sectoral Approach
  - Undermines equilibrating role of both rates of return and price adjustment
  - Undercutting (loanable funds theory) as well as any resort to aggregative ‘Robinson-Crusoe’ Models of producer-consumer-investor agents
    - So corn uneaten (Savings) ≠ ‘seed corn’ (Investment) planted in ground
- While contributing to degree of uncertainty so that
  - Monetary policy like ⇒ “pushing on a piece of string”
  - Liquidity preference distorts entire asset spectrum
    - Differentially affecting financial versus real assets
    - Domestic versus foreign assets
  - Hence, explaining
    - Gap opening b/n initial & final finance ($\text{Inv} \downarrow \Rightarrow ED \downarrow$)
    - Explaining existence of global/local hierarchy of assets
    - Explaining importance of ‘liability conditions’ for emerging economies
    - Questioning applicability of Modigliani-Miller theorem
- Implications for cross-border transactions (interest parity conditions) governed by:
  - Equilibrating role of real effective exchange rate questioned wrt
  - productivity differentials for each sector, the monetary expression of labour time (MELT), & nominal exchange rate

- Godley and Lavoie on the Capital Controversies
  - Although elementary and intermediate textbooks often claim that excess demand is always eliminated by rising prices, things are not so simple in a world with several commodities: demand curves may not be downward sloping; they may not be 'well-behaved'. In the world of produced commodities, this problem is included among what are known as the Cambridge capital controversies (Harcourt 1972; Garegnani 1990). In general equilibrium theory, it is known as the Impossibility theorem, or the Sonnenschein-Debreu-Mantel theorem (Kirman 1989); despite starting with all the conditions associated with rational consumers, it is impossible to demonstrate that the market excess demand curve of every good is downward sloping. In other words, the equilibrium may not be stable, and there might be a multiplicity of them. [G&L, 2007, fn. 4: 64]
  - While neo-classical economists have general equilibrium theory and computable general equilibrium models that helped capture the overall implications of their vision and the interdependence between markets and sectors, post-Keynesian economics could only offer the Sraffian model as a formal tool to tackle production interdependencies and relative prices, but which, ironically, did not and could not deal with the crucial Keynesian issues of output, unemployment, inflation, financial flows and debts. [3]

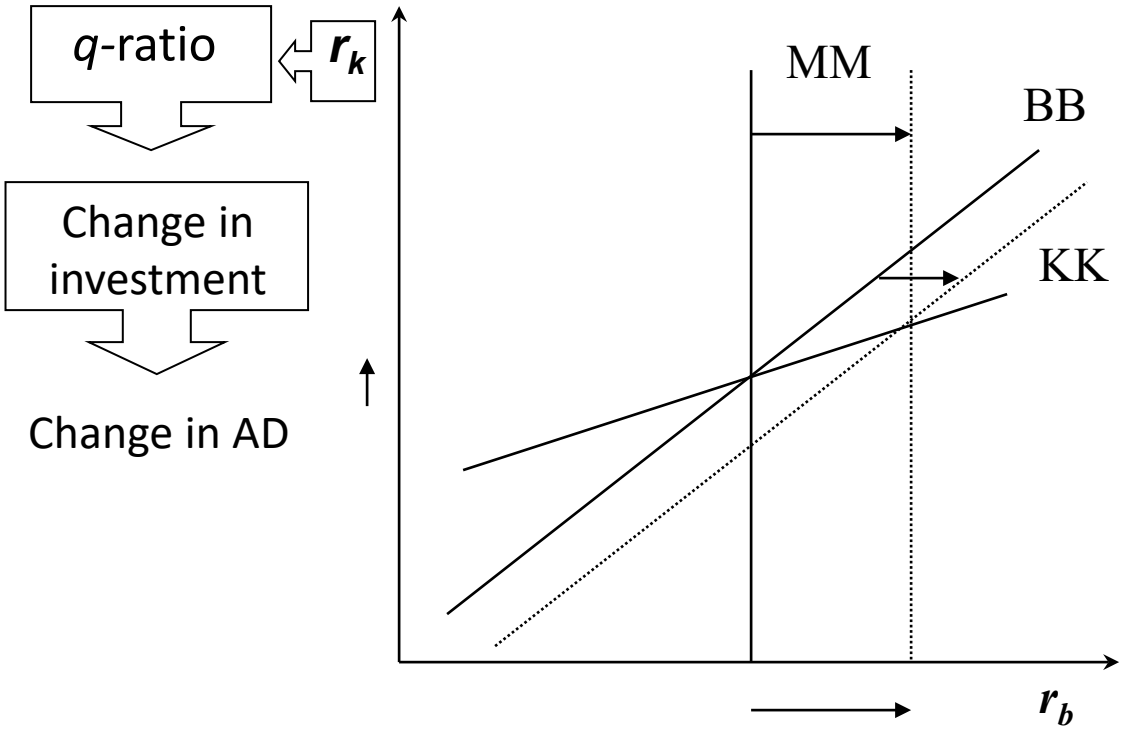
Keynes on Asset Markets—SR-Equilibrium (*GT* Ch. 17)

$$q - c + l + a = r$$



- Keynes
  - Transmission mechanism
    - uncertainty →regressive 'money love' →liq.pref.↑ →spot prices on illiquid assets↓ s.t. exp. cap gain ↑ to compensate
- Tobin's Asset Demand System
  - For each asset demand is a function of:
    - Wealth & Income (exp. disp. Income in G&L, 2007: Sect. 4.4)
    - Own- & Cross-Rates of Return (no liq. Pref. by assumption)
  - Portfolio Demand framework
    - Mean-variance approach (min var. for given exp. Return)
    - Non-financial investment determined by Tobin's *q-ratio*
      - Market value of capital/Replacement cost
      - ∝ Internal rate of return/User cost of funds

Tobin-style Asset Demand (with Endog. Money)



OMO (↑B^s)
MM right (r_k ↑, r_b ↑)
BB right (r_k ↓, r_b ↑)
KK no change

Transmission mechanism*:*

- Presumes equity markets are major source of external funds (?!)
- A higher r_k implies lower *q*-ratio (*q* = internal rate of return/cost of funds) implies lower investment implies lower effective demand!

Tobin's q-ratio

Let r_k = the marginal efficiency of capital

$$P_t K_t = \frac{C_{t+1}}{(1+\rho_k)} + \frac{C_{t+2}}{(1+\rho_k)^2} + \frac{C_{t+3}}{(1+\rho_k)^3} + \ldots$$

Let r_k = the required rate of return on equity

$$V_t = \frac{C_{t+1}}{(1+r_k)} + \frac{C_{t+2}}{(1+r_k)^2} + \frac{C_{t+3}}{(1+r_k)^3} + \ldots$$

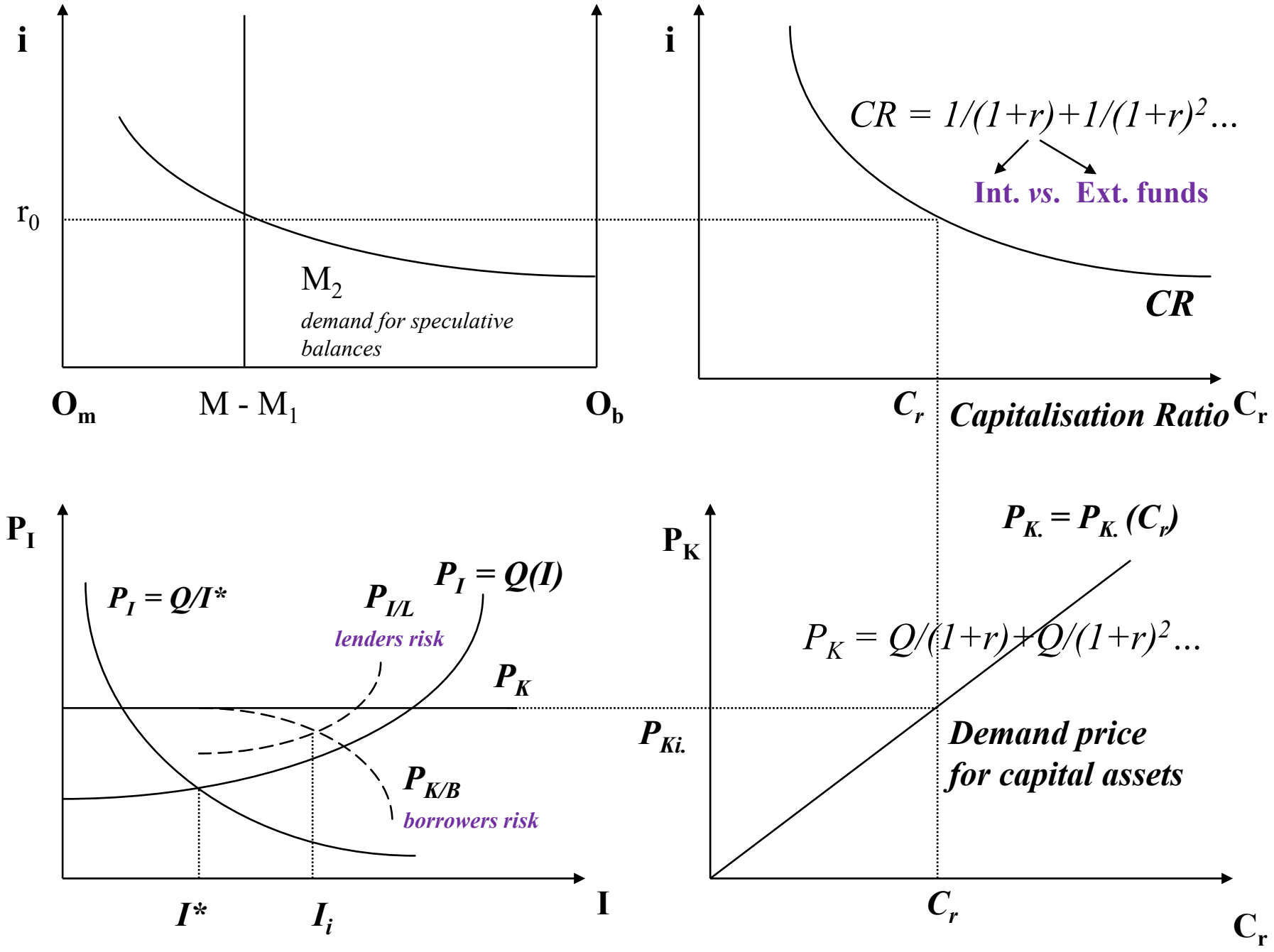
If C's are constant, then the q-ratio equals the following:

$$q = \frac{V}{P_k K} = \frac{\rho_k}{r_k}$$

$$\text{And investment } I = f(q) \text{ such that } f(1) = 0, \quad f'(q) > 0$$

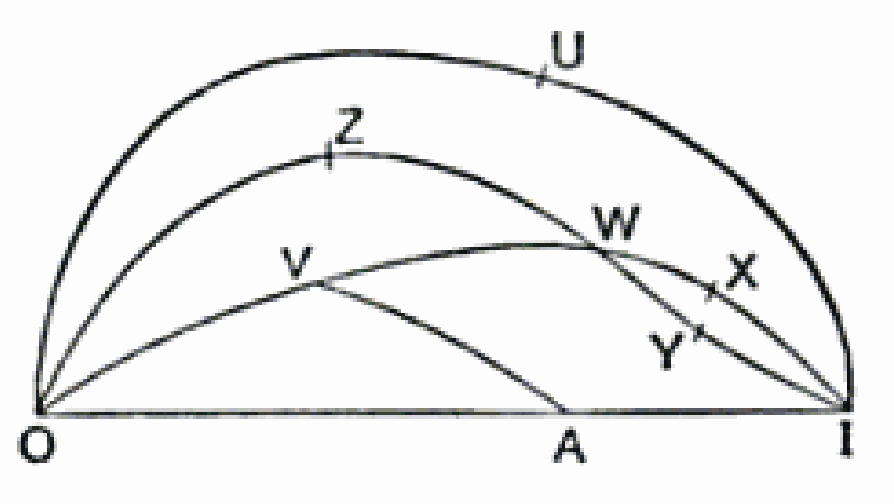
- Godley and Lavoie's Discussion of Tobin & Money
  - Davidson underlines the fact that that Tobin does not introduce an independent investment function, which is the hallmark of Keynesian analysis, so as to avoid Say's law, thus assuming that households choose between money balances and real capital, whereas their choice ought to be between money balances and placements, that is, securities or equities. [21]
  - Tobin's approach really does not deviate significantly from the exogenous approach, in which "deposits make loans". In contrast the post-Keynesian endogenous money approach insists that "loans make deposits".
  - In the Mundell–Fleming approach and in the so-called 'monetary approach to the balance-of-payments', the money supply is said to be endogenous in the case of fixed exchange rates, but this endogeneity process is supply-led. There, the stock of money falls or rises because the amount of foreign reserves falls or rises. […] In the Post-Keynesian approach … the money supply grows (or diminishes) because more (or less) of it is being demanded by the households of the domestic economy. [199]

Minsky's Two-Price Model of Investment



- Godley and Lavoie on Uncertainty
  - With stock-flow norms, the exact way in which expectations are formed generally is not crucial. In addition, except in the simplest models, agents will be assumed to know only the values taken by the various key variables of the previous period, and not those of the current period. This information about the past will allow them to make predictions about future values, but in a world of uncertainty. [G&L, 2007: 16]
  - Model SIM used the strong assumption that consumers have perfect foresight with regard to their income – something which is inconceivable in a world dominated by uncertainty, where the future states of nature are themselves uncertain, and where agents have unreliable knowledge and limited capacity in processing information. (fn. 13, those two aspects of uncertainty are respectively called ontological and epistemological uncertainty). [78]
  - Our model is rooted in a solid, comprehensive and realistic accounting framework and, as we believe, accords with many stylized facts backed up by a lot of theory well grounded in the post-Keynesian tradition. In short, our conjecture is that subject to admitted major simplifications, the model does indeed provide important insights regarding the evolution of a modern industrial economy through historical time and the way in which the financial system fulfils an essential role, given that production takes time and all decisions have to be taken under conditions of uncertainty. [441]

Keynes' view of degrees of belief in probability

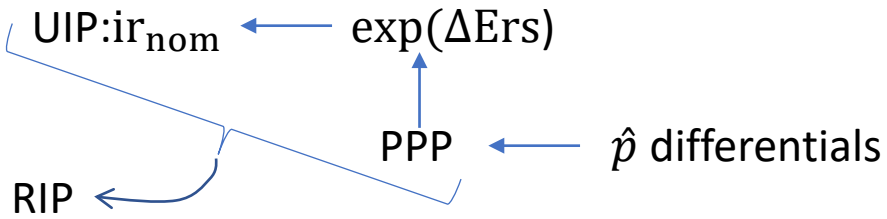


1. O represents impossibility, I certainty, and A a numerically measurable probability intermediate between O and I;
2. 2. U, V, W, X, Y, Z are non-numerical probabilities, of which, however, V is less than the numerical probability A, and is also less than W, X and Y. X and Y are both greater than W, and greater than V, but are not comparable with one another, or with A.
3. 3. V and Z are both less than W, X, and Y, but are not comparable with one another, U is not quantitatively comparable with any of the probabilities V, W, X, Y, Z (J.M. Keynes 1921, CW VIII, p. 42).

- Keynes and ‘weight’ in the Urn Problem
  - "The typical case, in which there may be a practical connection between weight and probable error, may be illustrated by the two cases following of balls drawn from an urn. In each case we require the probability of a white ball; in the **first case** we know that the urn contains black and white in equal proportions; in the **second case** the proportion of each color is unknown, and each ball is as likely to be black as white. It is evident that in either case the probability of drawing a white ball is 1/2, but that the weight of the argument in favor of this conclusion is greater in the first case." (Keynes, 1921, pp. 75-76)
    i. In advance of Ellsberg
    ii. Never referred to by Ellsberg
  - It was a shocking truth that Ellsberg failed to refer to Keynes in the 1961 paper, but showed much respect to Keynes in the 1962 dissertation. (Sakai, 2018: 10)

- Lavoie on Interest Parity Conditions
  - Closed economy
    - authorities can set short-term rates of interest given policy objectives viz inflation, unemployment, output gaps, etc.
  - Open economy
    - Must also consider impact on exchange rate and the level of foreign reserves
  - Mainstream belief
    - impossible for real interest rates to be any different from those ruling in the rest of the world.
  - Lavoie's view
    - central banks retain the ability to set interest rates of their choice, within a wide spectrum
  - Two parity conditions—UIP & CIP
    - UIP: nominal interest rates (in a riskless environment) are determined by world interest rates plus the expected change in exchange rate
    - PPP: Inflation rate differentials, as determined by money supply growth differentials net of output growth, should provide the correct expectations
    - UIP + PPP ⇒ RIP: equalization of real interest rates between countries
    - CIP: interest rate differentials must be equal to the forward exchange premium (or discount) with respect to the spot exchange rate
    - CIP + UIP: forward exchange rate and the expected future spot exchange rate must be equal

- Interest Parity Conditions in more detail
  - However, forward rate not a good predictor of
    - Future spot rates
    - Differences in interest rates
  - Latter can explain differences b/n forward & spot but not converse
  - UIP presumes perfect substitutability of assets, but not perfect capital mobility
    - Quite possible some rates are determined by monetary authorities as adjustment occurs in proportions of wealth accounted for by various assets
    - For imperfect asset substitutability UIP cannot prevail!
    - Uncovered positions carry currency risk
    - But can't be observed directly due to role of expectations
  - CIP? Forward rate as predictor of spot "falsified time and time again"
    - Large econometric models perform no better than
    - But causality from L to R, not R to L
  - RIP theorem



Open Economy: Sectoral Balances

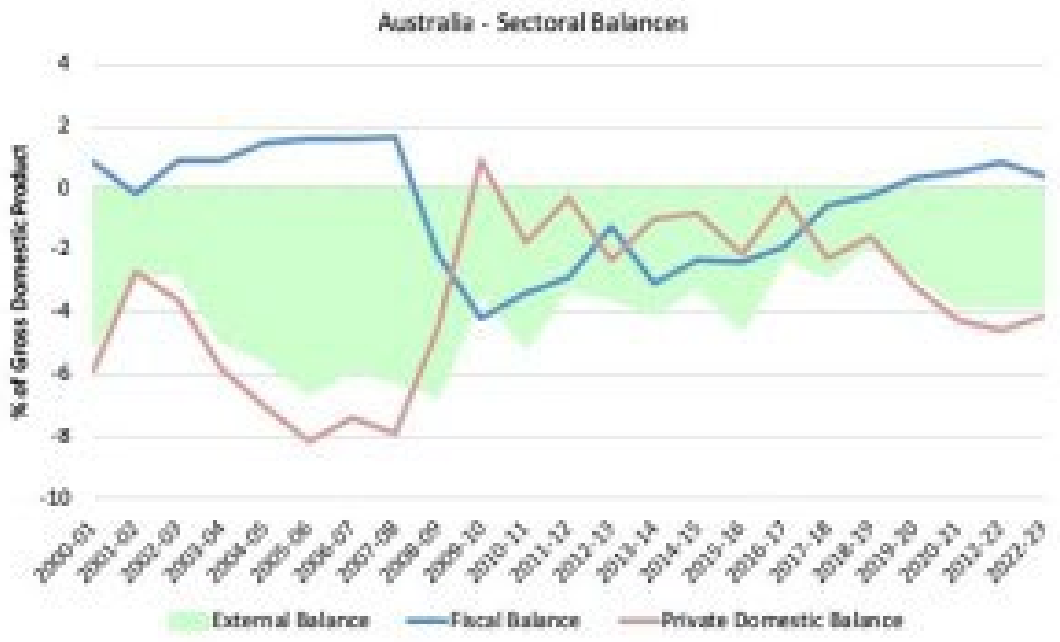
- The three accounting Identities:
  - $(S - I) + (T - G) - CAB \equiv 0$
    - If one sector is going to run a surplus, at least one other sector must run a deficit. In order for one sector to accumulate wealth, at least one other sector must be in deficit. It is impossible for all sectors to accumulate net financial wealth by running surpluses.
  - $(S - I) = NAFA = (G - T) + CAB$
    - $private\ domestic\ financial\ balance\ =$ $net\ acquisition\ of\ financial\ assets = government\ deficit + current\ account\ surplus$
    - i.e. government sector deficits and current account surpluses generate national income and additional net financial assets for the private domestic sector and vice versa!
  - $(S - I) - CAB = (G - T)$
    - The government sector deficit (surplus) is equal to the non-government sector surplus (deficit) i.e. deficits create financial wealth
    - This flow-of-funds approach is based on accounting principles rather than being a behavioural framework for explaining these flows

Current Transactions Table (Godley & Izurieta)

	Income & Expenditure	Production	Government	Foreign Sector	Σ
Private Expenditure	-PX	+PX			0
Exports		+X		-X	0
Government Expenditure		+G	-G		0
Imports		-M		+IM	0
GDP	+Y	-Y			0
Taxes, factor payments…	-TP		+T	-TF	0
Financial Balances	+NAFA	0	-PSNB	-BP	0

Source: Godley and Izureita (2004: Table 1, 132)

Foreign sector column shows that imports minus exports and transfers paid by the external sector, *TF*, equals the balance of payments deficit. . GDP: *Y* = Private expenditure, *PX* + government expenditure, *G*, + exports, *X*, - imports, *M*. Every item in the Production (GDP) account matched by a corresponding negative entry in some other column. Taxes net of transfers are received by the government, while net property income, taxes and transfers, *TF* and *TP*, are paid, respectively, by the external and private sectors. The **final row** totals implies public sector net borrowing, PSNB, equals the private net acquisition of financial assets, NAFA (private savings less investment) minus the balance of payments surplus (or plus the deficit), BP.


Australia - Sectoral Balances
% of Gross Domestic Product
4
2
0
-2
-4
-6
-8
-10
2000-01
2001-02
2002-03
2003-04
2004-05
2005-06
2006-07
2007-08
2008-09
2009-10
2010-11
2011-12
2012-13
2013-14
2014-15
2015-16
2016-17
2017-18
2018-19
2019-20
2020-21
2021-22
2022-23
External Balance
Fiscal Balance
Private Domestic Balance

- The Chapter 3 SIM Model (see Excel File)
  - The economy is closed to the outside world: there are neither exports nor imports, nor foreign capital flows
  - Production is carried out by labour alone –there are no private banks, no firms and no profits
  - Supply of labour assumed not to be a constraint on production
  - every component of the transaction-flow matrix must have an equivalent component, or a sum of equivalent components, elsewhere
  - any sector's financial balance – that is, the difference between inflows of income and outflows of expenditure – must be exactly matched by the sum of its transactions in stocks of financial assets
  - Total production (Y), which is *not* a transaction between two sectors and hence only appears once, in the production column
  - Every row and every column sum to zero, thus describing the identities that must be satisfied in every solution to the mode

- The SIM Model contd.
- *How do we arrive at the equality between sales and purchases ((services, taxes and labour)?*
  - Mainstream: variations in prices clear the market
    - For goods and labour—counterfactual, inappropriate and misleading!
  - Rationing: adjustment is done on the short side of the market
    - However, , it is still the case that prices and nominal wages give the signals and what happens to unsold commodities is waived aside
  - Inventories are always large enough to absorb any discrepancy between production and demand
    - Must first introduce private money; in Chapters 8–11, production will be equal to sales plus changes in inventories
  - Keynesian, or Kaleckian quantity adjustment mechanism
  - The issue of money by the government and the additional amount of money which people decide to hold must be equal
    - $\Delta H_{\mathrm{h}} = \Delta H_{\mathrm{S}}$
    - a "quasi-Walrasian principle" (redundant equation)

- SIM Model contd.
  - The Steady-State
    - $\frac{G}{\theta}$ = ratio of government expenditure to its income share
    - determines GDP in the steady state in all models
    - in the stationary state there is no change in financial stocks (i.e. no saving) $\Rightarrow \Delta H_{\mathrm{h}}^{*} \equiv YD^{*} - C^{*} = 0$
    - Equations (3.5)–(3.7), (3.11A) and (3.15) $\Rightarrow YD^{*} = C^{*} = \frac{G(1-\theta)}{\theta}$
    - i.e. the change in disposable income responds to the addition to government expenditure; and how consumption responds to disposable income, eventually converging onto it
    - Stationary value of the stock of household wealth
    - $H^{*} = \left\{\frac{(1-\alpha_1)}{\alpha_2}.YD^{*}\right\} = \alpha_3.YD^{*}$
    - i.e. wealth – here the stock of money – converges onto its steady state value with household saving converging to 0
    - $\Delta H_{\mathrm{h}} = \alpha_2.(\alpha_3.YD - H_{\mathrm{h}-1})$
    - wealth is being accumulated at a certain rate, determined by the partial adjustment parameter α_2, towards some desired proportion α_3 of disposable income (stock-flow norm)
    - the existence of the stock-flow norm is equivalent to the existence of a well-accepted Keynesian consumption function with lagged wealth ($C = YD - \Delta H_{\mathrm{h}}$)

A simple SFC example :- *contra* 'helicopter money'

	HH	Firm		Bank	
		Curr	Cap		
Δ loans			$+\Delta L$	$-\Delta L$	← Use of funds
Δ deposits			$-\Delta M$	$+\Delta M$	← Source of funds
Σ		0	0	0	

Money can't 'appear from nowhere' with no counterpart in rest of economy

1. Firms want to increase their liabilities, banks increase *both* sides of their balance sheets (granting loans, running down deposits simultaneously)
2. INITIAL FINANCE = construction finance ⇒ output produced
3. Firm deposits then run down to pay workers, so HH savings increase ($\text{Inv} - WB = 0$; i.e. inventories must necessarily rise by an amount exactly equal to the production costs = wages paid WB, plus $\text{Inv} - \Delta L_F = 0$)
4. FINAL FINANCE = investment finance: H spend money from wage earnings, firms recover their money balances, repay loans, & issue equities, HH receive dividends & interest payments. Last rows in Transaction Matrix show how financed (via RE, loans, equities)
5. At new start of circuit new loans = new deposits again [G&L: 48-51]

Some SFC Resources

- The Stock-Flow-Consistent Modelling Website
  - http://sfc-models.net/
- Levy Economics Institute (see SFC theme)
  - http://www.levyinstitute.org/
- Godley, W. (1999) Seven Unsustainable Processes. Strategic Analysis. Levy Institute. January (use of sectoral balances predicted demise of dot-com boom)
- Godley, Wynne and Marc Lavoie (2007). *Monetary Economics: Integrated Approach to Money, Income, Production and Wealth*. Palgrave MacMillan.
  - https://www.nytimes.com/2013/09/11/business/economy/economists-embracing-ideas-of-wynne-godley-late-colleague-who-predicted-recession.html
- Dr. Maria Nikolaidi (2017). Post-Keynesian Stock-Flow-Consistent Modelling. 6th FMM Summer School
  - Good technical discussion of capital gains & equity markets (but no Govt. sector!)
  - https://www.boeckler.de/pdf/v_2017_07_30_nikolaidi.pdf
- Barwell, R., & Burrows, O. (2014). Growing fragilities? Balance sheets in the Great Moderation. In *A Flow-of-Funds Perspective on the Financial Crisis* (pp. 40-109): Springer. (Also, BoE website)
- James Juniper and William Mitchell (2008). There is no financial crisis so deep that cannot be dealt with by public spending. CoFEE Working Paper No. 08-10.
  - http://www.fullemployment.net/publications/wp/2008/08-10.pdf .

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