

Chapter V: A Theory of Currency & Bank Money

15. It has been shown in the previous chapters that a Sraffa system can be extended to incorporate the effects of stock and flow coefficient. It was also seen that extending the Sraffa system in this manner does not distort the basic properties of Sraffa system. In such a system with stock and flow coefficients, production is carried out in its real sense; unlike the Sraffa system that has an agrarian flavour. The stocks in such a system take the form of capital; a capital truly measurable in terms of the inputs valued at the going market prices. A mark-up on this (value) capital is charged by the producers as the rate of profits. This marked-up capital plus the recurring expenses of materials and labour produce a defined scale of sales revenue. In such a capitalistic environment, it is important to then drop the notions of barter and express commodity prices and the wage rate in terms of a defined standard of value. However, this standard of value needs to be store as well as a medium of exchange. For the standard to be a “*store*” it would be sufficient to provide durability to the standard; however for it to be a medium of exchange, it should possess a few properties: firstly that it should be commonly accepted as a means of exchange and any exchange without it should be made impossible. Secondly, it should be necessarily used in every activity of the economy, from production to consumption and investment. It is important albeit it is used in every activity, it should never be used up. Thirdly, it should have a value in exchange: the exchange value of money is defined in terms of its purchasing power. Lastly, the medium of exchange should be able to make trades possible and markets exist: it in itself should be a good hedge for inflation. We have already explored the roles of currency and commodity money in previous chapters. In an active capitalist economy, it would be prudent to assume that the producers require credit along with assuming some money stocks with them. The previous chapter on commodity money exhibited that producers normally tend to keep these money stock balances. The tract of monetary chronologies is as under: the preliminary medium of exchange was commodity. Owing to the complications of the system, the a role of a state was established and the state decided to convert

the commodity equivalent into some fixed value, and printed either notes or minted coins of the same value; somewhere around the 1920s, the governments decided to boycott this commodity standard and move on to a free float currency backed adequately through a banking system. The roles and the preliminary responsibility of a banking system were enabling the smooth flow of the legal tender and manage public money. Currency money system also had a regulator in the form of a government. However, in case of a bank money or a banking system, it is the bank which regulates all the transactions. Production activities are conducted with the use of bank money and a true capitalist monetary economy emerges. While dealing with commodity money, it was seen that the most important function it performs is that of a unit of value and medium of exchange. This medium needed to be invariable and a standard of account and hence currency money was required. However, even currency money may not possess durability unless it is stored. The banking system provides the storage function in an economy. The banking system is responsible for creation of two most important forms of assets: the deposits and secondly the loans or advances. The deposits and loans taken together form the basis for a monetary production. An economy with credit money is necessarily an economy with deposits. After all, it is production of credit by means of credit (deposits). All economic agents deal in deposits or loans at some point in time. Capitalists save in form of deposits, so do the workers. These deposits itself are churned as loans or credit to those who demand these loans. As we pause here, we may ask the question that if loans are created, they must be borrowed by some economic agents. The producers are assumed to manage their production activities using these loans. It is financial motive alone that requires producers to borrow from the banking system. Money enters the scene with its role in production, consumption, investment, and above all exchange. In such a system, goods buy money, money buys goods but goods would not buy goods! The production system takes the following form:

capitalist rational economy with money would provide the role for capital and hence its cost: not in terms of profits but in terms of interest. Rate of profits and rate of interest are purely distinct in this system. Rate of profit can be thought of as the net operating profit generated by businesses after meeting all its expenses out of the collect sales proceeds. Interest on the other hand is a payment the businesses make to the lending institutions to maintain a smother production schedule. Thus, it is worthy to note that capital generates profits, but to generate the profits, it in the process makes way for interest. The demand and supply of capital would and ideally can never determine either interest or profits; such a matching would only determine the price of capital, which is what would exactly happen in the system just outlined. The intersection of borrowers and lenders to provide for capital would ideally determine interest, and after the prices of capital and the money rates of interest facilitating capital are determined, only then can be profits determined, else not! A capitalist monetary economy engaged in the business of producing commodities for generating profits ideally intends to grow, expand and create more value. The realizations of every period's profits are the only motivation for a producer to continue production. The labourers on the other hand, work and remain employed till a point that the wages they generate are able to cover their requirements of consumption and investments. No external forces stop the functioning of such an economy other than the hindrance to creation of wealth for each of the classes. Thus, the distribution of incomes in the economy becomes an important feature of such an economy. Entrepreneurs engage themselves in the process of production. They own a part of the companies and the factory sheds, they control production but they cannot quit production in an irrational manner. As a result, the economic agents of production are supposed to be rational and profit seekers. The other part of the ownership of the production process is with the workers: the system incorporates an equitable view point where in the workers and capitalists, both possess a share in the ownership of capital. The producers obtain capital in form of equities and debt. Equity capital is subscribed to by capitalists as well as workers. This equity capital may be assumed to be in the form of a 0% preference share which pays no dividend and

paying it off to its owners is out of question as rationality forbids liquidation. The debt is subscribed to by the producers in the course of their daily activity of production and they require these lines of credit in order to reduce their cost of capital. Debt also provides them gains from financial leverage by making their interest costs tax deductible. We can assume safe firms to begin with in the sense that their debt-equity or capital leverage ratio can be assumed to be 1:1. Such firms are not said to be highly levered firms! The next question is what are the sources of financing for the entrepreneurs? The workers invest and subscribe to the equity capital, but since they themselves may be risk-averse, they could be assumed to invest in safe bank deposits as well! This assumption of risk-averse workers is not necessary and can be altered in any manner. The workers obtain wages and invest the savings in equity and deposits depending upon their propensities to consume and their risk appetites. All this while, we are talking in terms of credit money. It is now worthwhile to provide an explanation to the sources of lines of credit to the entrepreneurs. The workers are assumed to save in form of deposits as well. As a result, we are compelled to introduce a banking system explicitly. This compulsion is not merely because the workers are saving in form of deposits; it is also due to the fact that producers are ready to buy these deposits in form of credit. Therefore, a necessary market for translating the deposits from workers to credit to producers has to be provided for. This role is necessarily the role of a developed banking system which is never dormant and undertakes the activity of collecting deposits and disbursing loans. Being an economic banking activity, its sole rational objective would also be profit seeking. The banking sector also would require capital in form of chairs, furniture, computers et al and that it would be convenient to assume that the banking system is owned by all the producers. The regulated banking system functions under the directives of the banking mandates and it is not possible for producers to usurp all the deposits in form of loans. In such a scenario, the various parties between themselves have a fixed economic relationship. These relations can be explicitly demonstrated in form of the balance sheets of each of the economic individuals.

Balance-Sheet of Firms

Liabilities		Assets	
Equity:			
Workers' Eqy	30		
Capitalists' Eqy	170	Cash	150
Debt	450	Assets	500
Total	650	Total	650

Balance-Sheet of Workers

Liabilities		Assets	
Wealth	480	Cash	50
		Savings: Deposits	400
		Savings: Equity	30
Total	480	Total	480

Balance-Sheet of Banks

Liabilities		Assets	
Capital	50	Loans to producers	450
Reserves	10	Other assets	10
Deposits	400		
Total	460	Total	460

It should be noted here that the total capital requirement of the firms is 650. The workers own a net wealth of 480 of which, depending on their propensities save in form of deposits and equities. They also retain a small portion of their wealth in the form of cash. The banks receive 400 of the deposits from workers and raise another 50 as their own capital. Thus, the banking system is able to make a loan advance of 450 after also keeping its own asset base intact. The producers require these loans since they receive only 200 worth of equity-30 from the workers and 170 from the capitalists' wealth. Thus, the remaining 450 for the production system is obtained from the banking system in the form of loans. These loans are

necessarily interest bearing loans and as explained above, they have defined maturities. The banking system or a stable money market would exist when the demands for money and supply of money are equated by tatonnement. In this system, the rate of interest and the rate of profits are absolutely different. The rate of interest is determined from a banking-financial system using the matching of deposits to loans or credit that is demanded by the producers. The producers demand loans of various time-periods and maturities at the beginning of every time period. It would be necessary to articulate here the nature of loans in this manner. Though deposits are time dated, interest on deposits and loans accrue at the end of the period. As a result, it would imply that producers obtain loans at the beginning of every period. These loans are as under: One period loans are repaid and renewed every year, two and three period loans are renewed every period and accordingly, loan requirements are determined. The deposits are held by workers through various maturities and in doing so, the banks compensate the deposit holders by paying them interests. It would be safe to assume that interest paid and interest received by banks are the same. Alternatively, assuming a spread of convenient basis points, one can always determine bid rates and ask rates for the banking system. In this case, the system mentioned herein would solve for mid-rates. Let that be! The banking profits would be an addition to the total incomes of the capitalists since the banking system since the banking system is owned by the all the producers. Now comes the deposit part of the story! The deposits held by banks for the public can be withdrawn at any point in time as these are assumed to be held in the form of demand deposits. Time deposits are expensive for the bank to use for loan disbursement. Demand deposits therefore always carry a contingency claim on them and these causes the banks to set aside an expected amount of withdrawal from their entire deposit base. Consider the scenario like this: assume that the banks have a deposit base of 100. Against these deposits, the banks face a demand of loans for 80. Assuming that out of the 100 worth of deposits, 30 happen to be immediate demand deposit of maturity zero! In such a case, banks have two options. The traditional operations manager would make a disbursement of loans worth only 70 (100 minus 30) and thus would crowd out

loan demand worth 10. For this manager, the interest rate schedule would be higher since he would always have a situation wherein demand would exceed supply. This in turn affects the banks profitability since it is paying interest on 100 worth of deposits and obtains interest on only 70 worth of it. Now consider the other case. If the banks know that it expected withdrawal (even considering the zero period immediately due demand deposits) is only 20, it can effectively raise its disbursements, match loan demands and thus maintain a higher profitability. Thus, ideally banks would do this: ascertain likelihoods or probabilities of withdrawals and develop operational reserve system depending upon these. They would always meet all the loan demand using this risk management system and hence would be more profitable than the conventional bank without this risk management! Assuming a given withdrawal matrix, we would have a defined reserve system for the banks of the following form:

<i>Period</i>	0	1	<i>l</i>
0	p_{00}	p_{10}	p_{l0}
1	$1 - [(1 - p_{00})(p_{01})]$	$1 - [(1 - p_{10})(p_{11})]$	$1 - [(1 - p_{l0})(p_{l1})]$
<i>k</i>	$1 - [(1 - p_{00})(1 - p_{01})(p_{0k})]$	$1 - [(1 - p_{10})(1 - p_{11})(p_{1k})]$	$1 - [(1 - p_{l0})(1 - p_{l1})(p_{lk})]$

In short, the reserves can be described as $R_{lk} = 1 - \prod (1 - p_{l-1,k}) p_{lk}$. Using these reserves and the matching conditions for the deposits, the interest rates can be determined. The theory of interest rates proposed here is an operational theory of loans and deposits wherein the interest rates are determined by the behavior of investors and the behavior of borrowers; behavior here in described in terms of withdrawal probabilities and technological coefficients. Both of these are known and given to all the economic agents at all points in time and as such, no uncertainty is involved in any manner whatsoever. A pure monetary theory of interest rates is proposed here. Necessary within this system is the need to define incomes and the share of distribution in such a system. Incomes become important because they govern two important decisions in any economy: consumption and savings. In our capitalist monetary economy, incomes determine consumption, savings, investments and hence the sustainability of the economy

per se. In a pure monetary economy with no taxes and no intervention of government, the incomes can be easily defined as under

$$Y_k = r * E_k + I_b + \sum_{i=1}^t \sum_{i=1}^t \mu_i i_t D_t$$

$$Y_l = r * E_l + w * L + \sum_{i=1}^t \sum_{i=1}^t (1 - \mu)_i i_t D_t$$

The capitalists earn rate of profits on their equity capital along with I_b which is the

banking profits and can be expressed as: $\Pi = \sum_{i=1}^{banks} L_t^a i_t - \sum_{i=1}^b i_t D_t$. The share of ownership in deposits of the capitalists or the producers is μ whereas the workers share would be necessarily $(1 - \mu)$. The μ 's in the system can be determined and need not be given⁴³. The ratio of one period holding of the capitalists or producers to the total one period deposit (sum of workers and producers holding of one period deposit) would be μ . Thus, the monetary system simultaneously provides a theoretical foundation to the theory of income distribution. Shares in income are determined by the current economic conditions in terms of the prices, rates of profits, rates of interest and the various value relations. In a true monetary economy, value and distribution of income happen simultaneously and none can preclude the other! In an economy where production, consumption and all the economic activity is conducted in pursuit of money, the distribution of income and before that, the determination of income would also involve the discussion around money. It is after all, the valued output that needs to be distributed: and for valuing output, the value of money needs to be known. Thus in a monetary economy, the distribution of monetary assets and the shares of ownership of various assets only would govern the principle of income distribution. So be it! Once the distribution of income is known, marginal propensities to consume and Stone's linear expenditure systems would determine the level of consumption in the economy. Linear expenditure system provides for using the closest form of an

⁴³ However, here the $\mu_{ik} = \{(1 - e_k) D_i\} / \sum_i D_i$. In simple terms, the share of capitalists in one period deposits is determined by their propensity to save in one period deposits. A similar case holds for μ_{iw}

empirical demand function. Any other demand function would just do the same purpose. It is worthy however to note again that in a monetary economy, incomes only would determine demand. This is the case since goods would be traded not for their satisfaction or utilities but for their intrinsic worth: money! Money assumes the central role in monetary economy and determines income distribution, savings, investments, consumption and in the process since is a medium of exchange, determines prices as well. However, its role is obviously not limited to determination of prices. The marginal propensities to save determine the level of savings. Along with determination of prices, income distribution and consumption facilitation, money also determines a number of other things in the monetary economy. Money, since is involved in the discussion on personal distribution of income, also becomes an integral part of functional distribution of income. It is this functional distribution of income that determines the level of national income in the economy. The level of national income in a monetary economy cannot be determined without determining the level of money supply in the economy. The omnipresent nature of money makes it necessary to first determine how much is the intrinsic worth of the economy in terms of the purchasing power of money. The level of national income thus needs to be known along with money supply in order to determine several policy variables like the velocity of circulation of money and the relation between money and prices. Only then, we can state that the enormous work of creating the formal synthesis of money and value is complete⁴⁴. Money, interest and prices just happen to be the corner stones of integrating monetary and value theories. The net national product in this economy would be the valued sum of total outputs less the valued sum of inputs in the economy. This is net national product at market prices. Net national product at factor costs would then be the sum of profits, wages and interest in the economy. NNP at factor costs divided by the total money supply gives the income velocity of money and NNP at market prices divided by money supply gives the transaction velocity of money. It is important to note the fact that unless the entire macro-economic equilibrium is attained, it is impossible to determine the velocity

⁴⁴ I hope to make this remark right at this stage. The reason would become clear soon for the first reader.

of circulation of money. Though ideally it may sound like one, velocity of circulation of money is not always a flow variable. Instead, it is akin to a yardstick which the monetary regulator in the economy may employ to gauge the level of inflation or the purchasing power of money. In this respect, to use a quantity theory like equation in the model would not help. The national income is an important variable in the model of a monetary economy since once the value of national income is known, other values like consumption, savings and more importantly investment are known. Consumption is as always, governed by Stone's functions, savings is a residue after consumption, the last but yet an important variable is investment. To determine all these variables, various parameters have to be introduced in the system. We would now start providing a list of these parameters that help in determining various other variables that are necessarily connected to the national income.

- kp_t refers to producers or capitalists' propensity to invest in period t deposits
- kw_t refers to workers or labourers' propensity to invest in period t deposits
- k_e refers to producers or capitalists' proportion of wealth saved in equities
- W_k and W_l refer to wealth coefficients of capitalists and workers respectively
- D refers to a fixed initial value of deposits

Similarly, using these modeling parameters, various other variables are obtained. Also, the delta rule or rule of changes is applied using these parameters itself. For e.g. the addition to deposits is defined as $\delta D_t = kp_t S_k + kw_t S_w$. This defines the savings relation in the economy as well. Similarly, other necessary variables are developed. Consistent with theories of general economic equilibrium, this monetary theory of value provides roles, rationales and theories of determination of arbitrary economic relationships. The most arbitrary economic relationship is the relation between the rate of profit and the rate of growth in the economy. The other arbitrary relationship is the relationship between money supply and prices. These two relationships in isolation would require a separate chapter. I would propose to cover these in a nutshell and only to the extent relevant for this synthesis. As described earlier, the rate of profit is the surplus of outputs over

inputs and other costs of administration. It is a pure accounting term in this economy. On the contrary, rate of growth is the standard Harrod-Domar relation between savings and investment. Using these two relationships, the growth profit frontier in this monetary economy can be obtained as:

$$r = \frac{((g * M_s) + \Delta Currency - (1 - \beta)(Y_{Labourer} - Su.Cons_{Labourer}) - (1 - \alpha)(Y_{Capitalist} - Su.Cons_{Capitalist}))}{(1 - \beta) * Equity_{Labourer} + (1 - \alpha) * Equity_{Capitalist}}$$

Here, M_s is the money supply, $Su.Cons$ is the subsistence consumption of each of the economic classes and α and β are the marginal propensities to consume of the capitalists and the labourers⁴⁵. The relation between prices and money supply in a monetary theory is of the non-quantity theory type of a relationship. The total money supply in a monetary theory should cover the current and the future needs of the entrepreneurs and hence the production sector along with meeting requirements of deposit holders as well. This is in fact the closing equation of the entire system and happens to be the equation of exchange. In a monetary economy, the capital inclusive of money stocks is an important element and this capital times the rate of growth plus the current capital requirements should be met by the total supply of money. The determination of savings, investments, national income and money supply through wage-price determination leads to determination of the growth rate in the system. Technically so, the growth rate is defined as the ratio between savings and capital. Hence, it is imperative in this system that all the variables are known and identified in the system. In a subsequent chapter, we would take currency and deposits together to investigate the properties of this system. The monetary theory of value presented in the previous chapter consists of various smaller models in itself and the equilibrium in each of these models simultaneously would determine the macro-economic general equilibrium. These smaller models or sub-systems of this economy consist of a production-price system, a banking system, output system, consumption system, investment system and savings system. The consumption and savings system are interlocked in one another and the investment system determines the growth profit relation in the economy. The production system rests

⁴⁵ The terms labourers and workers are used interchangeably, so are the terms capitalists and producers as well.

on the augmented Sraffa style of production equations. These equations exhibit a uniform rate of profits across all industries. This may be thought of as a modeling assumption or a depiction of reality. In the long run, it is observed that the rates of profits tend to equate across industries and over a still longer run, rates of profit across industries would tend to equalize. With the rates of profits equalized across industries and the rates of growth assumed to be equalizing across industries, it provides and ensures for capital reallocations and flight of capital in the system. Capital allocation and labour allocation are carried out in the process of this search for equilibrium. Moving on, the consumption technology is governed by Stone's linear expenditure system. These are empirical demand functions and are used here because in the current set-up, subjectivity based demand systems would torture the validation of the model. All said, it should be added that the choice of demand functions as convenient to the user can be made. However, enough care should be exercised to endogenize the demand functions and remove arbitrariness from the system. The income determination and determination of consumption and savings is an important sub-system in the model as will be seen shortly. The economic equilibrium is dependent on clearing of the consumption goods industries. Therefore, it may not be wrong to add that a market exclusively for consumption goods industries is created. The capital goods industries also need to clear and their demand supply matching also leads to price and quantity formulation. Thus, commodity markets are adequately created. Another set of equations is the system of output determination. In this system, the growth rate is also determined. This system also rests on Sraffa's standard system concept. However, we do not intend to create a standard system but would use Sraffa's concepts of multipliers and system's own rate of maximum profits- this rate we have dubbed as the growth rate of the system. There is another set of equations which are the closing equations in each sub-system. These are called as closing equations because they help in providing a mathematical solution to the system. More so, the closing equations have economic implications as well. In the system of output determination, we use the labour conservation equation- the rationale being that the entire level of employment in the economy is conserved; however,

this does not preclude the fact that labour is mobile. In fact, the labour conservation equation enables the labour to decide which best industry to stick to. However, it also implies that in so doing, no labour is out of his job. The production price system uses its own closing equation. In accepted theory, the solution to the prices in absolute terms is obtained using an equation of the quantity theory type. However, in this model, we will have to move away from the received doctrine considerably. The quest of a monetary closing equation is the crucial link in integration of monetary and value theories. Preliminary investigations with the quantity theory have yielded us surprising (and absolutely useless) conclusions ranging from yielding no solutions to multiple solutions. This, we believe has been an issue haunting many economists following the track of integrating monetary and value theories. As an important conclusion, therefore what we observe is that monetary and value theories as a union is inconsistent with quantity theory⁴⁶. That does not, in any manner, ask the question: *How to make money appear without making standard theory disappear?*⁴⁷ – or there are also statements of the fashion: *the most serious challenge the existence of money poses to the theorist is this- even the best developed models of the economy cannot find room for it*⁴⁸. We may however like to conclude this debate on the following note: if we need to make money appear, we need to get out of the standard theory- the standard theory may find no role for money. That however does not preclude money from having an important role in the economy. That role is not about *price determination* but is of *value determination*. In effect, if the quantity theory has to be abandoned at the cost of a pure theory of money and value, we do not mind taking the route. We would also provide an overview of a quantity theory disequilibrium in a short while. In summary, the entire set of equations can be collapsed in a nutshell so as to provide a concise monetary theory of value:

⁴⁶ Refer the annexure for a discussion on the failure of solutions in the system with quantity theory equation

⁴⁷ Ostroy, 1973

⁴⁸ Hahn, 1982

$$\alpha \left(\Psi_i p_i B_i + \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} S_{ij} p_j \right) r + (1-\alpha) \sum_{t=1}^b \left\langle \left[\partial_i \left(\Psi_i p_i B_i + \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} S_{ij} p_j \right) \right] i_t \right\rangle + \sum_{i=1}^{m+n} \sum_{j=1}^{m+n} A_{ij} p_j + wL_i = p_i B_i$$

(I)

$$\sum_{i=1}^n \sum_{j=1}^m \Psi_i p_i B_i * (1+g) = M_s = Deposits + Currency + Equity \dots\dots\dots$$

(II)

$$\sum_{l=k=0}^b R_{lk} + \sum_{k=1}^b D_{0k} + \sum_{t=1}^b \sum_{l=k=1}^b D_{lk} (1+i_t)^t = L_t^a i_t \dots\dots\dots$$

(III)

$$\alpha_i wL + \beta_j (rS + I_b) = B_i p_i \dots\dots\dots$$

(IV)

$$r = \frac{((g * M_s) + \Delta Currency - (1-\beta)(Y_{Labourer} - Su.Cons_{Labourer}) - (1-\alpha)(Y_{Capitalists} - Su.Cons_{Capitalists}))}{(1-\beta)*Equity_{Labourer} + (1-\alpha)*Equity_{Capitalists}}$$

(V)

$$\left(\sum_{j=1}^m \sum_{i=1}^m S_{ji} x_i + \sum_{i=j=1}^n S_{ji} \right) (1+g) + \left(\sum_{j=1}^m \sum_{i=1}^m A_{ji} x_i + \sum_{i=j=1}^n A_{ji} \right) = B_i x_i \dots$$

(VI)

$$\sum_{i=1}^m L_i x_i = L \dots\dots\dots$$

(VII)

Equations I through VII represent a set of various equations formally detailing out the monetary theory of value in the form explained in previous chapters. The term R_{lk} in equation III is the reserves part of the banking sector which are determined using withdrawal probabilities. This form, as we shall see later is the most basic model and is explained in detail since if the foundations are clear; the rest of the theory would be smoother. This model referred to is a model of a monetary economy employing money in the form of credit and deposits along with currency. The sum of deposits and currency therefore would be the total money supply in the economy as seen in equation II. Equation II closes the set of

production relations along with demand equations. It is our replacement for the quantity theory of money. As will be shown, the Walras' law does not hold in a monetary economy. It would be important to reinstate the fact that in a monetary economy, Walras law has no role. The way the economic relationships are depicted, it is clear that commodity markets exist, a market for banking services exists and also the markets for money per se exists. The model of this economy lacks an important explicitly determined market- the market for labour. Employment is determined in the system using the output system and commodity market conditions. It is assumed that all forthcoming labour is the only labour in the economy. Explicitly, labour demand and labour supply is not introduced. The model, even without such a depiction seems complete economically and in terms of specification. As we detail out the entire model, it becomes imperative to provide a list of parameters and variables: those which are always given in the model and those which are modeled- explicitly or implicitly. The model assumes a given set of technological coefficients implying a set of production equations and the factor input proportions at the beginning of every period. All the producers are assumed to know their requirements of capital and stocks at the beginning of the period and their engineer workers help them develop an understanding about the quantities of inputs. In short, the production technology and input-output relations are known and given. Economists and consultants like us guide the producers to determine the exact level of outputs at the beginning of the year. The banking system is also assumed to know the matrix of probability withdrawals expressed in the theory of interest rates above so that it may calculate its reserve requirements as and when required. The wealth proportions are known at the outset, which clearly state the quantity of currency and deposits of various maturities that each producer and labourers holds in his portfolio. This also implies that marginal propensities to consume and hence to save are given. The asset choices for parking the savings are also assumed to be exogenous to the system. These portfolio determining variables are given; in short it would be safe to say that the proportion of assets held in the portfolio by each agent is known. Each worker and producer starts in the system with a known and fixed quantum of

wealth which is also a non-zero quantity always. Additions to wealth through savings are determined using the model and the given portfolio decisions. The model determines real and monetary variables explicitly. In the process, it also helps us determine the national income, personal distribution of national income, transaction and income velocities of money, investment gap, level of employment and the growth rates on various monetary assets considered: here namely currency, equity and deposits (credit). To summarize, in the general form of the model that will soon be introduced, we can group variables in three distinct classes- the economic variables namely the prices, outputs, profits, wages and growth; secondly the parameters namely the individual wealth holding, the propensities to consume and hence, the asset-wise propensities to save; lastly, we would have a distinct breed of variables which would be policy variables, namely the amount of public expenditure, the public debt, deficit financing, CRR, OMO etc. which when tweaked often provide vital relationships of interest underlying the motivation of this thesis. Our aim of this synthesis is exploring the role of money in these policy variables and ascertaining the essential properties money and interest have in determining, affecting and impacting every other variable. With enough discussion dedicated to the nature of variables, it would merit some attention to pen-down the number of variables. This is a necessary step as it will be seen that the model can conveniently be categorized as a computable general equilibrium model. In CGE models, often the consistency of the model is shown through the equality of number of equations and variables. It would therefore not sound a waste of energy in doing this. The production-price sub-system that is employed consists of m capital goods equations and n consumption equations. The n consumption or consumption goods are consumed through n demand equations or the consumption system. The output system comprises of m equations. The closing equation involving the relation between money and prices provides closure to the production-price relationship. The output system is closed using the labour conservation equation. For the banking sector, there would be t interest rate equations in t interest rates depending upon the maturities of loans and deposits. Here, the index t would depend on what maturities do these loans

and deposits have. The profit growth relation determines is one of the most important equations for the monetary economy. These equations solve for $m+n$ prices and an equal number of outputs, rates of profits, growth and wages. Thus, the model of the monetary theory of value is a model in $2m+2n+t+3$ equations in as much number of unknowns. The monetary economy revolves around the price-production block, the banking sector block, the output-growth block and the consumption-saving block. General macro-economic equilibrium would be ideally a combination of equilibrium in all these sectors, needless to say, the equilibrium be simultaneous. The banking sector provides a logical starting point to the system⁴⁹. We advance in our quest for exploring the monetary economy with the demand and the supply of loans. The demand for loans is the vertical summation of time-designated debts of the production system. The supply of deposits is the savings habit of capitalists and workers, also in various time designated deposits. A specially designed algorithm is used where in banks match the deposits to various loans and determine the lending options in terms of the harmonization of their lending matrix, deposits matrix and the profitability matrix. This allocation would be optimal in terms of balancing deposits and savings. Given that the pattern of loan financing by the banks is determined, the next step is to determine the reserve requirements using the withdrawal probabilities. With this optimal allocation of deposits and loans the bank sets up its operational equations equating the reserves, receipts and payments. These would take the form of equations III in 19 above. These equations equate the interest rates on loans, which the banks would receive, to the interest rates on the deposits that the banks need to pay. As a result, the interest rates in the system are determined. This is a theory of interest rates. Once the theory of interest rates determines the money rates of interest, the interest value of the debt can be known using the debt portion of capital for each industry. It is important to note that this is still an

⁴⁹ It would be immaterial if we were to choose any other point to start exploring the system. The results would just remain the same. It is worthy to note here that, given the dynamics of the entire economy, a starting point per se is not only immaterial but also irrelevant. This I say because of the fact that in a monetary economy of this stature, it would be impossible to place a finger on any sub-section of the economy and say with confidence that the economic operations start at this point. We are assuming that the banking sector is a reference point just because it becomes easier to explain the system this way. After all, “interest” is the ultimate variable of interest in a monetary economy.

unknown value debt, since prices are yet to be determined. We start exactly in determining so. An arbitrary rate of profits is chosen⁵⁰ and using this, prices and wage rates are determined: money prices and money wages are determined. Once the prices are determined in the economy, ideally we would move to determine consumption; more so whether consumption at the determined prices is viable or not. We would more often than not discover that at the prices just determined, none of the consumption equations balance. As a result, using the prices, we would now have to determine new demands that the consumer's pockets can back. Moving the supplies towards the demands, the production equations of the consumption goods industries need to be rescaled depending on the new demands. It would be seen that this would imply certain consumption goods industries increasing in size in terms of their absolute outputs and certain others would shrink in size. Those of the first types would be industries with excess demands; the other type would be the ones with excess supplies. Similarly, for the capital goods sector, equations of the form VI and VII would determine absolute outputs and hence, all of the system readies itself to go through a new round of iterations. This process would stop when equilibrium interest rates, equilibrium wages and prices would generate equilibrium incomes exactly sufficient to meet consumption and hence, savings requirements. As we begin iterating the system, new interest rates would be determined using the new loans and deposits. The trial value of rate of profits need not be used now and equation V will be used instead of the trial value. As the deposits and loans are matched again, it would be observed that the gap between the deposits and loans would reduce and interest rates would reflect the changes in the set up and moving marginally upwards as there would be a pressure on the deposits to make available more loans as the economy grows. In the price-production block, industries with excess demands in the previous iteration would exhibit an increase in prices and industries with excess supply would exhibit a reduction in their prices. At the same time, industries with excess demand would increase in size and those with excess

⁵⁰ Yet again, the system is insensitive to the choice of initial rate of profits. This choice is necessary since it must be remembered that Sraffa system in its pure form without numeraire is even indeterminate!

supply would contract. This would be determined from the output-growth and the consumption pattern in the economy. As there would be inflationary pressures in the economy due to rising interest rates and increased prices, the consumption spends would be increased supported by increases in the real wage rates. As a result, the addition to deposits compared to the previous iteration would be lower and the loan demand would be relatively higher. As this adjustments happen in the banking sector, in the production system, industries having excess supplies previously now shrink in size and industries with excess demands increase in size. As a result, there would be instances of excess demand industries getting transformed in to excess supply ones and the vice-versa. As a result, a whole set of iterations take place and determine the macro-economic equilibrium in this manner. This in itself is the summary of the monetary theory of value! The growth rate in this system is that rate which equates and determines a unique rate of profit across all the industries. As a result, it would be important to study the properties of this variable in the process of determination of equilibrium of the system. It would be seen that certain capital goods industries would be in excess supply and certain other in excess demand or deficient supply. As a result, the growth rate would aim to achieve co-ordination amongst all the industries to ensure that a. all industries enjoy a uniform rate of profits and b. all industries enjoy a unique rate of growth. Hence, as a result, industries with excess supply would witness flight of capital to those where there would be deficient supply. This notion confirms with the economic idea of capital finding its own way to profitable ventures; moving out from those where it is less profitable. This process would continue till a point where the rates of profit are equalized across industries and this flight of capital would stop. Similar factors determine the movement of economy from disequilibrium to equilibrium phases. Changes in production-price equations also have an impact on the equilibrium state of the economy. The debt component of this set is an input to the banking system as the demand for loans. Due to the changes dictated by the output-growth system, the nature of the technological coefficients undergoes changes and with a debt-equity ratio present, the loan demand also changes drastically. The banking system

attains its equilibrium not only when the demand for and supply of loans and deposits is equalized but also when the sum of technological coefficients valued by their respective prices equates the loan demand for individual time periods. To put this mathematically, the following two conditions must be met for equilibrium of the banking sector:

$$\sum_{t=0}^n Deposits_t = \sum_{t=0}^n Loans_t$$

$$\prod_{t=1}^n \left(\sum_{i=1}^n \sum_{j=1}^n \delta_i p_i S_{ij} \right) = Loans_t$$

With these conditions fully met, the banking sector would be in its equilibrium. Though this is defined as the equilibrium of the banking sector, it must be noted that this is not an equilibrium purely determined by the monetary factors alone. The equilibrium is characterized by the presence of the second condition which is a real-economy condition and as a process; the synthesis drops the difference between the real economic forces and the monetary economic forces and presents the picture of the economy as a whole and a non-dichotomized entity. Coming to the important variable, the prices and as explained, the prices try to achieve equilibrium in the real sector. Unlike the normal phenomena where the real sector is a given and economic prices have to be determined, in this model, prices determine the real sector and in the process are determined themselves. The only important factor is that the prices are not determining the real economy alone. In fact, no variable is solving the system all by its own! At the same time it would be crucial to add that as each variable teams up with certain other variables, the variable under observation exhibits key features that define the properties of the system as a whole. Here, as the prices determine (along with the growth-output system) and are determined by the real sector, adjustments happen through the empirical demand functions that are used in the model to determine the levels of consumption and the capital goods in the economy. This process further feeds into the growth-profit relation and determines the starting variable for the subsequent iteration: the rate of profit. As prices of certain goods increase, the prices of certain others would fall and these changes happen due to the output size

contractions or expansions are dictated by the price-output-growth patterns of the previous iterations. Needless to add, industries with excess demand would have shown lower prices and outputs in the previous iteration when they would have been in excess supplies and so on. Lastly, the rate of profit changes cause changes in to the wage rate since with only two factors of production, the wage-profit frontier is also defined in this economy. Therefore, as prices rise due to higher levels of output and higher interest rates, rate of profits rises and also the wage rate. As a result the incomes of the people rise and the demand for commodities and deposits also rise, causing an increase in demand for loans and a further increase in the outputs by expanding capital needs. In the whole process, the economy begins with lower values of GDP and NNP and these increases over iterations as the outputs and the prices change. At the same time, the banking sector achieves absolute equilibrium with the demand for loans being exactly equated to the deposits and no excess reserves existing with the banking system. The interest rates would now be the equilibrium interest rates consistent with the rates of profits, wage rates and the output system which would in turn be aligned with the demand and the consumption patterns which is fine tuned with the saving patterns and therefore with the banking system to complete the cycle. The economy remains stable in this phase unless acted upon by any external influences or radical changes in parameters which have been assumed to be constant in the entire process of equilibrium determination. The algorithm of progression from disequilibrium to equilibrium can be outlined as:

- Step 1: Start with trial value of rate of profits. Determine the unique allocation of loans to deposits and determine interest rates. The banking system helps determine this by completing the markets for deposits and loans.
- Step 2: Determine money prices and money wage rates using the trial values of rate of profit and calculated interest rates. It needs to be seen whether at these prices commodity markets for consumption goods clear or not. Evaluate the national income, use the known propensities to consume on each commodity and define consumption expenditures on

every commodity. Determine excess demands and/or excess supplies by ascertaining the exact demand quantities

- Step 3: Alter the equations by moving the supplies in the direction of demands and determine outputs and growth rates as in the case of currency money
- Step 4: Apply the multipliers to the production system in order to obtain a new set of equations.
- Step 5: Along with this, determine new savings channelized with new deposits, new loans and hence a new set of interest rates.
- Step 6: Determine the new rate of profit from the growth-profit relation and begin from step 1.

As we outline the theoretical process of exploring economic equilibrium in a capitalist monetary economy characterized as above, it is imperative to ask ourselves this question: Can we attain equilibrium in this system? The plain and simple answer to this rather complicated historical debate is NO! But it is not terrible. Not terrible because we can exactly identify the nature, causes and sources of this disequilibrium. Currency money as endogenous money to the economy also highlighted a similar property. The monetary disequilibrium can be easily corrected using the device of deficit financing of the sorts we had introduced in the chapter on currency money. It will soon be concluded that this happens to be unique property of the monetary economy.

As we try to explore the prominent question raised towards the end of the previous chapter, it would be prudent to analyze the system in a purely computational model.

16. We begin this analysis by introducing an indicative numerical example for an economic system that fits the properties of the theory described above. The sum of the loans is used to determine the optimal allocation of loans to deposits, which thus make up the banking system equations. The equations that we use are intended to explicitly describe an economy towards an understanding in our analysis. We would like to assume that the real economy would more or less behave in terms of its relations in a manner proposed by the theory, albeit the

scale of the system would be of course different. It should be noted that here, we are assuming the most general case of an economy; this would mean that the number of capital goods industries and the consumer goods industries are almost equal- we have two consumption goods industries and three capital industries. Let us revisit the workings of the full macro-economic monetary model as it graduates from disequilibrium to equilibrium. In this sense, consider an economy at time period t . At this juncture, the initial wealth endowments are given. The capitalist and the workers decide the level of deposits they intend to keep with the banking system and accordingly invest in deposits of varying maturities. These in our simple structure are primarily four- savings account deposits bearing no interest, period one, period two and period three deposits. These are determined by fixed percentage ratios in the model. The sum of these savings is less than unity for both capitalists and workers, indicating that both these economic agents also participate in the consumption activity in the economy. Along with deposits, these agents also invest in equity capital of the industries available in the economy. Therefore, we would have the following ratios: kw_0 implying proportion of workers' income in savings deposits, kw_1 implying proportion of workers' income in period one deposits, kw_2 implying proportion of workers' income in period two deposits, kw_3 implying proportion of workers' income in period three deposits and finally kwe implying workers' contribution to equity capital. Similarly, for the capitalists we would have kp_0 implying proportion of capitalists' income in savings deposits, kp_1 implying proportion of capitalists' income in period one deposits, kp_2 implying proportion of capitalists' income in period two deposits, kp_3 implying proportion of capitalists' income in period three deposits and finally kpe implying capitalists' contribution to equity capital. It is worthwhile to note the following conditions hold for the Pasinetti Paradox:

$$\sum_{i=0}^3 kw_i + kwe = 1$$

$$\sum_{i=0}^3 kp_i + kpe = 1$$

The rest of the ratios cw_4 and cw_5 for workers and cp_4 and cp_5 constitute α and β together implying workers and capitalists propensities to consume as below

$$cw_4 + cw_5 = \alpha$$

$$cp_4 + cp_5 = \beta$$

Alternatively, cw_4 can be rewritten as α_4 and so on. We shall use the later

nomenclature to be consistent with the theory. The sum of $\sum_{i=0}^3 kw_i + kwe$ and α

would be unity and similarly, the sum of $\sum_{i=0}^3 kp_i + kpe$ and β would be unity. In

this regards, the equity and deposit structure can be determined with known initial endowments, Y_w and Y_p for workers and capitalists respectively. For example, the workers equity will be determined as $Y_w * kwe$ and shall appear in the production-price relations. The capitalists or the entrepreneurs in the economy require debt

capital as well. The total capital stock $\left(\Psi_i p_i B_i + \sum_{i=1}^n \sum_{j=1}^n S_{ij} p_j \right)$ is divided into debt

and equity in various industries. Denoting equity proportion of the capital as

ε and the debt proportion as δ we can rewrite the production-price equations as

$$\begin{aligned} &\varepsilon_{11}(\psi_1 B_1 p_1 + S_{11} p_1 + S_{12} p_2 + \dots S_{1n} p_n) r + (\delta_{11})(\psi_1 B_1 p_1 + S_{11} p_1 + S_{12} p_2 + \dots S_{1n} p_n)(1 + i_1) \\ &+ (\delta_{12})(\psi_1 B_1 p_1 + S_{11} p_1 + S_{12} p_2 + \dots S_{1n} p_n)(1 + i_2) \\ &+ (\delta_{1r})(\psi_1 B_1 p_1 + S_{11} p_1 + S_{12} p_2 + \dots S_{1n} p_n)(1 + i_r) + A_{11} p_1 + A_{12} p_2 + \dots A_{1n} p_n + L_1 w = B_1 p_1 \end{aligned}$$

$$\begin{aligned} &\dots\dots\dots \\ &\varepsilon_{n1}(\psi_n B_n p_n + S_{n1} p_1 + S_{n2} p_2 + \dots S_{nm} p_n) r + (\delta_{n1})(\psi_n B_n p_n + S_{n1} p_1 + S_{n2} p_2 + \dots S_{nm} p_n)(1 + i_1) \\ &+ (\delta_{n2})(\psi_n B_n p_n + S_{n1} p_1 + S_{n2} p_2 + \dots S_{nm} p_n)(1 + i_2) \\ &+ (\delta_{nr})(\psi_n B_n p_n + S_{n1} p_1 + S_{n2} p_2 + \dots S_{nm} p_n)(1 + i_r) + A_{n1} p_1 + A_{n2} p_2 + \dots A_{nm} p_n + L_n w = B_n p_n \end{aligned}$$

Here, Ψ_i is the money-turnover ratio or in simple terms, Ψ_i is the ratio of money holdings to total turnover of the particular i^{th} industry. This capital as explained is financed in two parts: debt and capital, with $\hat{\partial}_i$ being the debt equity ratio and correspondingly, ε being the equity portion and $\hat{\partial}_i$ being the debt portion. This

implies that loans of maturity t are available to the producers. The following relations would hold

$$kpe + kwe = \sum_{n=1}^{m+n} \sum_{t=1} \varepsilon_{nt}$$

$$\sum_{t=1}^t \delta_{nt} = (1 - \varepsilon_{nt})$$

With these two restrictions on the capital structure, the debt-equity proportions would be determined. Consider the following example for one hypothetical industry from an economic system with three industries.

$$\text{Capital} = (10p_1 + 20p_2 + 10p_3)$$

$$\varepsilon_{11} = 0.2; \delta_1 = 0.1; \delta_2 = 0.1; \delta_3 = 0.1$$

therefore,

$$\text{equity} = (2p_1 + 4p_2 + 2p_3)$$

$$\text{Debt}_1 = (1p_1 + 2p_2 + 1p_3)$$

$$\text{Debt}_2 = (1p_1 + 2p_2 + 1p_3)$$

$$\text{Debt}_3 = (1p_1 + 2p_2 + 1p_3)$$

Similarly, we can determine the equity and debt in various industries and thereby generate the production-price relations. In this case, if the output of the first industry was 30, we would have the production-price equation for this industry as

$$(2p_1 + 4p_2 + 2p_3)r + (1p_1 + 2p_2 + 1p_3)(1 + i_1) + (1p_1 + 2p_2 + 1p_3)(1 + i_2) + (1p_1 + 2p_2 + 1p_3)(1 + i_3) + (2p_1 + 4p_2 + 2p_3) + 5w = 30p_1$$

In this example, the total period one debt is 4, period two debts is 4 and period three debts is 4 units of currency as well. Similarly, summing over the debts for all industries across the three periods, we would obtain the total loan demand in the economy. After the prices are determined, we can determine the *value* of equity and debt capital and correspondingly determine the debt-equity ratio. Each of these loans would be matched by the deposits in the banking system and thereby the interest rates would be determined. An increase in loan demand would push the rates up and vice-versa. In the banking system, the banks face the risk of withdrawals of their deposits such that they may not have any funds left for advancing loans. In this sense, the banks maintain reserves, linked to the withdrawal probabilities that they estimate at the beginning of each period.

<i>Period</i>	0	1	<i>l</i>
0	p_{00}	p_{10}	p_{l0}
1	p_{01}	p_{11}	p_{l1}
<i>k</i>	p_{0k}	p_{1k}	p_{lk}

With the above as the probability matrix, we can generate a system of expected reserves for the banking system.

<i>Period</i>	0	1	<i>l</i>
0	p_{00}	p_{10}	p_{l0}
1	$1 - [(1 - p_{00})(p_{01})]$	$1 - [(1 - p_{10})(p_{11})]$	$1 - [(1 - p_{l0})(p_{l1})]$
<i>k</i>	$1 - [(1 - p_{00})(1 - p_{01})(p_{0k})]$	$1 - [(1 - p_{10})(1 - p_{11})(p_{1k})]$	$1 - [(1 - p_{l0})(1 - p_{l1})(p_{lk})]$

This reserve system is generalized for l period deposits and k period loans. In short, the reserve matrix looks like $R_{lk} = 1 - \prod (1 - p_{l-1,k})p_{lk}$. The theory of interest rates proposed here is an operational theory of loans and deposits wherein the interest rates are determined by the behavior of investors and the behavior of borrowers; behavior here is described in terms of withdrawal probabilities for deposits and technological coefficients for loans. Based on these conditions, we may now draw the production equations for the banking system, where the banks produce loans by means of loans- the deposits!

$$\sum_{l=k=0}^b R_{lk} + \sum_{k=1}^b D_{0k} + \sum_{t=1}^b \sum_{l=k=1}^b D_{lk} (1 + i_t)^t = L_t^a i_t$$

These determine the interest rates in the economy, that then feedback into the production equations. However, in the production equations, we have $m+n$ equations for m capital goods equations and n consumption equations. So far, we have concerned ourselves with prices and interest. The other important variables are output and employment, only then we would have a complete monetary theory of prices, interest, employment and output. The output system determines the outputs that are necessary in order to replace the system so that the production activity continues, after allowing for consumption in the system. In order to allow the system to be replaced, there should be adequate growth in the system itself;

also the labour in the entire system cannot be reduced and since no population increases are assumed, the best that can happen is that the labour be conserved in the economy. In this dual problem, we can expect flight of capital from one industry to another; industries that are profitable would see accumulation of capital and the vice-versa. The process continues till all rates of profits are equal and there is no incentive for flight of capital. An important point here is when we talk of unequal rates of profits, it is the own rate of profit that we are referring our analysis to, as against the (definitional) equal rates of profits as expressed in the production-price equations above. For instance, in the example cited above,

$$(2p_1 + 4p_2 + 2p_3)r + (1p_1 + 2p_2 + 1p_3)(1 + i_1) + (1p_1 + 2p_2 + 1p_3)(1 + i_2) + (1p_1 + 2p_2 + 1p_3)(1 + i_3) + (2p_1 + 4p_2 + 2p_3) + 5w = 30p_1$$

we can determine the own rate of profit as $\{30 - (2+4+2) - (1+2+1+1+2+1+1+2+1)\} / (2+4+2) = 1.25$. It can be seen that when we solve the entire system, the uniform rate of profits shall prevail. In order to therefore determine the outputs, the growth rate and more so, the labour or the employment in the economy, we need a system of equations that dictates this. This is the output system of equations.

$$\begin{aligned} (S_{11}x_1 + S_{21}x_2 + \dots S_{m1}x_m + S_{m1})(1 + g) + (A_{11}x_1 + A_{21}x_2 + \dots A_{m1}x_m + A_{n1}) &= B_1x_1 \\ (S_{12}x_1 + S_{22}x_2 + \dots S_{m2}x_m + S_{m2})(1 + g) + (A_{12}x_1 + A_{22}x_2 + \dots A_{m2}x_m + A_{n2}) &= B_2x_1 \\ \dots\dots\dots \\ (S_{1m}x_1 + S_{2m}x_2 + \dots S_{mm}x_m + S_{mm})(1 + g) + (A_{1m}x_1 + A_{2m}x_2 + \dots A_{mm}x_m + S_{m2}) &= B_mx_1 \\ L_1x_1 + L_2x_2 + \dots L_mx_m &= L_1 + L_2 + L_3 \end{aligned}$$

Therefore, we now $m+1$ output equations in $m+1$ unknowns- the m outputs and 1 growth rate. So far, we therefore have $2m+n+t+1$ equations and $2m+n+t+3$ unknowns- we fall short of 2 equations. The t equations are for t interest rates. However, in order to fill this gap, we must first concern ourselves whether the model is complete; we have determined outputs for capital industries, the outputs for consumption industries need to be determined. These will be done through the demand equations that solve for n outputs in n equations. These are Stone's linear expenditure systems

$$\alpha_i wL + \beta_j rS = B_n p_n$$

Thus, we now have $2m+2n+t+1$ equations and $2m+2n+t+3$ unknowns- still we are short of 2 equations. In order to solve this system completely, we require the closing equation for price system- an equation that most theories seek including the quantity theory- the relation between money and prices. We have discussed this equation before and would now present it here

$$\sum_{i=1}^n \sum_{j=1}^m \psi_i p_i B_i * (1 + g) = M_s = Deposits + Currency + Equity$$

The last equation is also the most crucial equation in the entire scheme of things. This is the monetary growth-profit relation

$$r = \frac{((g * M_s) + \Delta Currency - (1 - \beta)(Y_{Workers} - Su.Cons_{Workers}) - (1 - \alpha)(Y_{Capitalists} - Su.Cons_{Capitalists}))}{(1 - \beta) * Equity_{Workers} + (1 - \alpha) * Equity_{Capitalists}}$$

We thus have a complete system with $2m+2n+t+3$ unknowns in as many equations and the solution of this system shall exist! However, these solutions exist mathematically; in terms of economics, the solutions of a monetary economy do not exist until deficit financing is introduced as explained earlier. On attaining the equilibrium through deficit financing, new levels of income are determined- new savings are determined and using the growth rates from the system, the economy expands to new levels and a search for new equilibrium begins!

Assuming that we also have public goods in the scheme of things, we would have one output equation for the public good and one equation for the financing of the said public good- the public good commands no price! Thus, with that we would have two additional equations in tow variables- the quantum of public good and the tax rate. Thus, it would then be a case of $2m+2n+t+5$ unknowns in as many equations.

Consider the example below that would enable us to understand the full working of the model. In this model, we would have currency and deposits simplicity.

Assume that we have the following initial matrices

$$S = \begin{array}{c} \left| \begin{array}{ccccc} 3 & 2 & 5 & 0 & 0 \\ 2 & 5 & 3 & 0 & 0 \\ 2 & 3 & 5 & 0 & 0 \\ 3 & 5 & 6 & 0 & 0 \\ 2 & 3 & 5 & 0 & 0 \end{array} \right| \\ \\ \left| \begin{array}{ccccc} 2 & 5 & 3 & 0 & 0 \\ 5 & 7 & 5 & 0 & 0 \\ 2 & 5 & 3 & 0 & 0 \\ 3 & 2 & 5 & 0 & 0 \\ 2 & 5 & 7 & 0 & 0 \end{array} \right| \\ \\ \left| \begin{array}{ccccc} 40 & 0 & 0 & 0 & 0 \\ 0 & 60 & 0 & 0 & 0 \\ 0 & 0 & 50 & 0 & 0 \\ 0 & 0 & 0 & 60 & 0 \\ 0 & 0 & 0 & 0 & 50 \end{array} \right| \end{array}$$

Here, S , A , and B are the stock, flows and output matrices respectively. In this example, we have assumed 3 capital goods good industries- that enter the production of every other industry- while 2 consumption goods industries are considered. Assume that the propensity of capitalists to consume, α , is 0.1 and that of workers, β , is 0.8. Further, assume the following – capitalists hold 0.05 of incomes in currency, 0.05 of income in deposits of period 0, 0.1 of income in period 1 deposits, 0.1 of income in period 2 deposits and 0.2 of income in period 3 deposits. Similarly, for the workers, assume that workers hold 0.1 of incomes in currency, 0.25 of income in deposits of period 0, 0.25 of income in period 1 deposits, 0.2 of income in period 2 deposits and 0.1 of income in period 3 deposits. Further, assume that the capitalists hold 0.5 incomes in equity and workers hold 0.1 of their incomes in equity. Assuming initial income/ wealth endowments of 500 and 250 for capitalists and workers, we may calculate the respective holdings in money terms for equity, deposits and currency. We would

also assume the money turnover ratio – the ratio of money held by producers in their capital as a proportion of output – as the following:

$$k = \begin{array}{|c} 0.25 \\ 0.5 \\ 1 \\ 1.5 \\ 0.25 \end{array}$$

$$L = \begin{array}{|c} 5 \\ 5 \\ 10 \\ 10 \\ 10 \end{array}$$

We have therefore the equity and the deposit pattern in the economy. It is important that with this, the share of equity in total holdings can be given by ε , the deposit-equity ratio. Using this, we can ascertain δ , the debt portion as $(1 - \varepsilon)$. Assuming a three period debt and that debt are equally spread across all the three periods, we can estimate the capital structure in the individual industries. Using this information and the assumption set, we can now draw the production- price equations. In this case, the deposits of capitalists are 225 and that of workers are 200. The equity held by capitalists is 250 and by workers are 25. The currency held by capitalists in production is 10; therefore in this case the ε is equal to $(275/710=)$ 0.4. Therefore, the δ in the economy would be 0.6, and when split across three periods, the debt portion in the capital turns out to be 0.20.

$$0.4 \left\{ \begin{array}{l} \left(\begin{array}{cc|cc|cc|cc|cc} 3 & 2 & 5 & 0 & 0 & 0.25 & 40 & 0 & 0 & 0 & 0 \\ 2 & 5 & 3 & 0 & 0 & 0.5 & 0 & 60 & 0 & 0 & 0 \\ 2 & 3 & 5 & 0 & 0 & 1 & 0 & 0 & 50 & 0 & 0 \\ 3 & 5 & 6 & 0 & 0 & 1.5 & 0 & 0 & 0 & 60 & 0 \\ 2 & 3 & 5 & 0 & 0 & 0.25 & 0 & 0 & 0 & 0 & 50 \end{array} \right) + \left(\begin{array}{c} p_1 \\ p_2 \\ p_3 \\ p_4 \\ p_5 \end{array} \right) (1+r) \end{array} \right\} +$$

$$0.2 \left\{ \begin{array}{l} \left(\begin{array}{cc|cc|cc|cc|cc} 3 & 2 & 5 & 0 & 0 & 0.25 & 40 & 0 & 0 & 0 & 0 \\ 2 & 5 & 3 & 0 & 0 & 0.5 & 0 & 60 & 0 & 0 & 0 \\ 2 & 3 & 5 & 0 & 0 & 1 & 0 & 0 & 50 & 0 & 0 \\ 3 & 5 & 6 & 0 & 0 & 1.5 & 0 & 0 & 0 & 60 & 0 \\ 2 & 3 & 5 & 0 & 0 & 0.25 & 0 & 0 & 0 & 0 & 50 \end{array} \right) + \left(\begin{array}{c} p_1 \\ p_2 \\ p_3 \\ p_4 \\ p_5 \end{array} \right) (1+i_1) \end{array} \right\} +$$

$$0.2 \left\{ \begin{array}{l} \left(\begin{array}{cc|cc|cc|cc|cc} 3 & 2 & 5 & 0 & 0 & 0.25 & 40 & 0 & 0 & 0 & 0 \\ 2 & 5 & 3 & 0 & 0 & 0.5 & 0 & 60 & 0 & 0 & 0 \\ 2 & 3 & 5 & 0 & 0 & 1 & 0 & 0 & 50 & 0 & 0 \\ 3 & 5 & 6 & 0 & 0 & 1.5 & 0 & 0 & 0 & 60 & 0 \\ 2 & 3 & 5 & 0 & 0 & 0.25 & 0 & 0 & 0 & 0 & 50 \end{array} \right) + \left(\begin{array}{c} p_1 \\ p_2 \\ p_3 \\ p_4 \\ p_5 \end{array} \right) (1+i_2) \end{array} \right\} +$$

$$0.2 \left\{ \begin{array}{l} \left(\begin{array}{cc|cc|cc|cc|cc} 3 & 2 & 5 & 0 & 0 & 0.25 & 40 & 0 & 0 & 0 & 0 \\ 2 & 5 & 3 & 0 & 0 & 0.5 & 0 & 60 & 0 & 0 & 0 \\ 2 & 3 & 5 & 0 & 0 & 1 & 0 & 0 & 50 & 0 & 0 \\ 3 & 5 & 6 & 0 & 0 & 1.5 & 0 & 0 & 0 & 60 & 0 \\ 2 & 3 & 5 & 0 & 0 & 0.25 & 0 & 0 & 0 & 0 & 50 \end{array} \right) + \left(\begin{array}{c} p_1 \\ p_2 \\ p_3 \\ p_4 \\ p_5 \end{array} \right) (1+i_3) \end{array} \right\} +$$

$$\begin{array}{c} \left(\begin{array}{cc|cc|cc|cc|cc} 2 & 5 & 3 & 0 & 0 & 5 & 40 & 0 & 0 & 0 & 0 \\ 5 & 7 & 5 & 0 & 0 & 5 & 0 & 60 & 0 & 0 & 0 \\ 2 & 5 & 3 & 0 & 0 & 10 & 0 & 0 & 50 & 0 & 0 \\ 3 & 2 & 5 & 0 & 0 & 10 & 0 & 0 & 0 & 60 & 0 \\ 2 & 5 & 7 & 0 & 0 & 10 & 0 & 0 & 0 & 0 & 50 \end{array} \right) + w \left(\begin{array}{c} p_1 \\ p_2 \\ p_3 \\ p_4 \\ p_5 \end{array} \right) = \left(\begin{array}{c} p_1 \\ p_2 \\ p_3 \\ p_4 \\ p_5 \end{array} \right) \end{array}$$

With this, the deposits in the economy are 435 and the loans are equal to 435 as well. We would need to match these as per the banking system rules. We have the banking system as under

<i>Period</i>	<i>Deposits</i>	<i>Loans</i>
0	97.5	
1	112.5	145
2	100	145
3	125	145

With this, we would have the following matching schedule:

$$D_{01} = 97.5; D_{11} = 47.5$$

$$D_{12} = 65; D_{22} = 80$$

$$D_{23} = 20; D_{33} = 125$$

The subscript “01” denotes zero period deposits used to finance one period loans and so on. Let us assume a banking probability matrix that assumes that immediate period deposits would have a higher withdrawal probability- on the vertical axis we have time periods 1, 2, and 3 while on the horizontal one we have deposit periods 0, 1, 2 and 3. Using such a probability matrix, we can create the reserve matrix using the formula above- $R_{lk} = 1 - \prod (1 - p_{l-1,k}) p_{lk}$

$$prob = \begin{vmatrix} .05 & .04 & .035 & .03 \\ .107 & .088 & .0736 & .06395 \\ .16951 & .1381 & .1152 & .1014 \end{vmatrix}$$

Using this reserve matrix, we can now estimate the reserves in the banking system for each period

$$R_1 = 6.775$$

$$R_2 = 11.608$$

$$R_3 = 14.979$$

Thus, we would now have the equations for the banking system as

$$6.775 + 97.5 + 47.5(1 + i_1) = 145(1 + i_1)$$

$$11.608 + 65(1 + i_1) + 80(1 + i_2)^2 = 145(1 + i_2)^2$$

$$14.979 + 20(1 + i_2)^2 + 125(1 + i_2)^3 = 145(1 + i_2)^3$$

The solution to this system would enable us to obtain the interest rates in the economy. These rates would be used in the production-price equations above. Using the propensities to consume for capitalists and workers, we can also create the demand equations for the consumption goods industries. We had assumed that the propensity of capitalists to consume, α , is 0.1 and that of workers, β , is 0.8. Let us assume that α can be further broken down to reflect propensities for individual consumption goods such that α_4 is 0.05 and α_5 is 0.01; whereas we can assume β_4 is 0.4 and β_5 is 0.4. Based on these assumptions and the income assumptions, we can derive demand equations as under

$$0.05(rS) + 0.4(wL) = 60p_4$$

$$0.05(rS) + 0.4(wL) = 50p_4$$

Lastly, the output system can be developed using the relation

$$S'x(1+g) + A'x = Bx$$

$$L_1x_1 + L_2x_2 + L_3x_3 = L_1 + L_2 + L_3$$

All in all, we would arrive at the following initial equations for the system; the solutions for which are presented earlier:

$$\begin{aligned}
& (0.25p_1 + 3p_1 + 2p_2 + 5p_3)r + (0.66p_1 + 0.40p_2 + 1.02p_3)(1 + i_1) + (0.66p_1 + 0.40p_2 + 1.02p_3)i_2 + \\
& (0.66p_1 + 0.40p_2 + 1.02p_3)i_3 + (2p_1 + 5p_2 + 3p_3) + 5_w = 40p_1 \\
& (2p_1 + 0.5p_2 + 5p_2 + 3p_3)r + (0.40p_1 + 1.12p_2 + 0.61p_3)(1 + i_1) + (0.40p_1 + 1.12p_2 + 0.61p_3)i_2 + \\
& (0.40p_1 + 1.12p_2 + 0.61p_3)i_3 + (5p_1 + 7p_2 + 5p_3) + 5_w = 60p_2 \\
& (2p_1 + 3p_2 + 1p_3 + 5p_3)r + (0.40p_1 + 0.61p_2 + 1.22p_3)(1 + i_1) + (0.40p_1 + 0.61p_2 + 1.22p_3)i_2 + \\
& (0.40p_1 + 0.61p_2 + 1.22p_3)i_3 + (2p_1 + 5p_2 + 3p_3) + 10_w = 50p_3 \\
& (3p_1 + 5p_2 + 6p_3 + 1.5p_4)r + (0.61p_1 + 1.02p_2 + 1.22p_4)(1 + i_1) + (0.61p_1 + 1.02p_2 + 1.22p_4)i_2 + \\
& (0.61p_1 + 1.02p_2 + 1.22p_4)i_3 + (3p_1 + 2p_2 + 5p_3) + 10_w = 60p_4 \\
& (2p_1 + 3p_2 + 5p_3 + 0.25p_5)r + (0.40p_1 + 0.61p_2 + 1.02p_5)(1 + i_1) + (0.40p_1 + 0.61p_2 + 1.02p_5)i_2 + \\
& (0.40p_1 + 0.61p_2 + 1.02p_5)i_3 + (2p_1 + 5p_2 + 7p_3) + 10_w = 50p_5 \\
& (15.31p_1 + 23.12p_2 + 31.25p_3 + 1.875p_4 + 0.312p_5) = 725 \\
& 104.275 + 47.5(1 + i_1) = 145(1 + i_1) \\
& 11.608 + 65(1 + i_1) + 80(1 + i_2)^2 = 145(1 + i_2)^2 \\
& 14.979 + 20(1 + i_2)^2 + 125(1 + i_2)^3 = 145(1 + i_2)^3 \\
& 853 = B_4p_4 \\
& 848 = B_5p_5 \\
& (3.25q_1 + 2q_2 + 2q_3 + 5.73)g + (2q_1 + 5q_2 + 2q_3 + 5.73) = 40q_1 \\
& (2q_1 + 5.5q_2 + 3q_3 + 9.18)g + (5q_1 + 7q_2 + 5q_3 + 7.96) = 60q_2 \\
& (5q_1 + 3q_2 + 6q_3 + 12.59)g + (3q_1 + 5q_2 + 3q_3 + 13.68) = 50q_3 \\
& 5q_1 + 5q_2 + 10q_3 = 20
\end{aligned}$$

The above system has three capital goods industries, two consumption goods industries. It should be noted that production is carried out using capital in the form of equity and debt. Equity is subscribed equity from the workers and capitalists where their proportion of holdings in equities is given. As scaling happens in the production processes, production houses tap financial agents. The total capital requirement of the producers therefore is split in equity and debt. Debt, or loans are obtained from financial agencies, primarily, banks who provide these loans at a prescribed rate of interest. In this hypothetical example of the economy, we assume that there are loans of three maturities. Period one, period two and period three loans are available to the producers. The banks provide these loans from the deposits mobilized from the workers and capitalists who also invest in the banking system in form of deposits. Assuming the wealth of workers

to be 250 and that of capitalists to be 500⁵¹ and various wealth holding proportions- there would be four wealth holding proportions each for capitalists and workers- we would obtain the required period 0, period 1, period 2 and period 3 deposits in the system. It is necessary to provide for time deposits and demand deposits in the system. Period 0 deposits are demand deposits and banks do not have to pay any interest on these. However, banks use them as well in creating loans. Depending on a fixed withdrawal probability matrix, the reserve requirements are determined. These are not statutory reserves. These reserves are operational reserves that the banks decide to maintain for their solvencies. However, since these reserves depend on the withdrawal probabilities, these are expected reserves and would not be able to cover the bank in case of run on the bank deposits. However, such conditions may also imply a revision in the probability matrix.

Table V-A: Withdrawal Probability Matrix

Period	0	1	2	3
1	0.05	0.04	0.035	0.03
2	0.107	0.088	0.0736	0.06395
3	0.16951	0.1381	0.1152	0.1014

The above table is the assumed withdrawal probability matrix. It is precisely known to the bank, say, that the probability of period 1 deposits being withdrawn in the 0th period is 0.05. Accordingly, the banks may need to keep only 5% of the deposits and may use 95% in creating loans. The 5% that the banks decide to keep with it, idle and not earning, forms the part of reserves. For period 1 deposit being withdrawn in the first period, the reserves are $(1-0.05)*.04=0.038$. After periodic matching of deposits to loans, the banking system equations are obtained. These equations solve for three interest rates. Since we have shown that the conditions necessary to solve this system are met in terms of its mathematical determinacy, we would proceed to determine the solutions of this economy in detail. The temporal nature of the analysis must be described here. It should be noted that the

⁵¹ It would not be absolutely wrong to prefix these numbers with a currency unit, either Rs. or \$. In this theory, we are dealing only with absolute quantities and relative measures are not objects of desire in a pure theory of money.

economy depicted above starts its operations on a Monday, say, and ends on either Monday evening or Friday evening. The point being the analysis is intra-temporal and not inter-temporal at the moment- it refers to the current period only. The current period is defined as the period in which economy begins its operations and then tries to find equilibrium for that period. At the end of the iterative process expressed in the algorithms mentioned above, it becomes of interest to understand the final picture of the economy at equilibrium. The following table summarizes the results of the system just mentioned above.

Table V-B: Results of deposit money economy- interest rates

i1	i2	i3	Loans	Deposits
5.58%	9.38%	17.12%	475.93	475.93

The periodic matching of loans and deposits has been attained in this system. As described, the banking system is seen to achieve its equilibrium through matching of loans and deposits and accordingly the interest rates are determined. In normal conditions the probability matrix is well-behaved and convex. This means that under favorable economic conditions, people would behave rationally and this rationality produces a term structure of interest rates which is upward sloping. The interest rate structure is therefore not dependent only on demand and supply conditions of loans and deposits but also on the frequency and demand of own deposits. This theory of interest rates incorporates rightly the true nature of interest- its durability. It accords money its biggest property of *not being money*. Interest cannot be earned on money- else every one of us would have an ever swelling wallet. Interest is not earned on money- interest is paid for the characteristic of money of not being money. Using the input interest rates and the rate of profits determined using the growth profit relationships, the price equations solve for prices and wage rates. The following is results of price solutions.

Table V-C: Results of deposit money economy- Prices

R	g	P1	P2	P3	P4	P5	w
4.69	1.74	15.27	11.53	16.46	15.79	17.34	39.35

The outputs in this system are determined in the process of determining the general equilibrium and necessarily are a part of the general equilibrium itself.

Table V-D: Results of deposit money economy- Outputs

B1	B2	B3	B4	B5
30.95	50.14	59.76	48.45	43.54

As the economy progresses from the initial to initial period stability condition⁵², it in itself undergoes a lot of changes in terms of its technological coefficients and hence, in terms of its income, spending and consumption patterns. It would also be important to describe and articulate the “*tussle*” that the economy undergoes as it reaches its initial period stability condition.

At this stage, we would pause and also evaluate some more variables of *economic* interest: the net national product of the economy, the income and the transactions velocity of money, the Harrod-Domar rate of growth depending on the capital-output ratio, the important ratios of capital-labour mix, real wages in terms of consumption goods prices et al.

The net national incomes in this system can be determined, as should be the case, in terms of market prices and factor costs.

$$NNP_{mp} = \sum p_i B_i - \sum p_i A_i$$

$$NNP_{fc} = \alpha_i (\psi_i p_i B_i + \sum S_{ij} p_j) r + (1 - \alpha_i) (\psi_i p_i B_i + \sum S_{ij} p_j) i'_i + w \sum L_i$$

The NNP at market prices at the initial period stability conditions is 2784.865 in terms of the unit of account (for us, it would be Rupees). The NNP at factor costs is 2911.101. Notice the following

- The difference between NNP at market prices and NNP at factor costs arises in this model as well. This is the disequilibrium gap. This difference is 126.23

⁵² I am not calling this ‘initial period stability condition’ as equilibrium of the system. The reason will be evident shortly. But at this juncture, it would not be deemed to be incorrect if the reader intends to replace the phrase with ‘equilibrium’. I will still stick to the phrase!

- The difference between labour supply, 40 and labour actually employed, 36.7853 weighted by the current wage rate of 39.2523 is also 126.25
- Finally, the savings and investments also exhibit a difference of 126.33 (Check!)

The total money supply at the stable condition is Rs. 525⁵³. Therefore, the transactions velocity defined as NNP at market prices divided by money supply is 5.35 and NNP factor costs divided by money supply, 5.43 is the income velocity in the economy. The total capital in this economy is, being measurable, is 750 and hence the capital-output ratio is given by 3.74. Given this, we now can also determine the debt equity ratio of the system and along with a fixed money turnover ratio; it can also help us in determining the monetary properties of this system. The debt-equity ratio in the economy measures the amount of circulating debt and hence, the credit money in the system. The ratio of credit money to total capital gives the gross leverage ratio and the ratio debt-equity ratio therefore in this system is the usual leverage ratio. The debt equity for this economy is 1.7. The equity portion is 0.36 and the debt portion needless to say is 0.64! As we now understand that the economy is able to reach some sort of initial period stability condition, it would be prudent to explore how the economy attains this stability condition. It should be noted however, that this is not the final equilibrium for the period under consideration: an identity in terms of equality of NNP factor costs and NNP market prices is disturbed or more to say, is ridiculously lost! As a consequence, we still have not attained equilibrium. However, all the markets have cleared and it can be understood from the following. The following tables articulate the phases of the economy at various iterations in order to attain the stated stability condition. At the final iteration, the

⁵³ Yet again, we are at the crux of the monetary theory. The NNP under factor costs and under market prices do not equate automatically. There is something missing. We would have included that “missing” element at the outset itself. But remember, when we introduced the model as well, we said that the model was correctly specified in terms of equality of number of equations and variables. There was no scope for something to be missing. Yet it happens so. Therefore, this is not a mistake of overlooking something and hence we are presenting it as a case in monetary value theory.

equations of the economy change and so do the solutions. What do not change are the physical properties of the system!

Table V-E: Clearing of commodity markets

Iteration	P1	P2	P3	P4	P5
1	9.22	7.23	12.55	10.79	13.52
2	8.22	6.34	10.18	9.12	10.88
5	11.10	8.45	12.85	11.89	13.63
10	13.16	9.98	14.89	13.93	15.77
20	14.07	10.68	15.84	14.86	16.75
40	14.14	10.73	15.91	14.94	16.84
50	14.14	10.72	15.91	14.93	16.83

As can be seen from the table above, the economy moves along a steady growth path and there are at times cyclical turns in the prices and wages and ultimately it reaches more or less its long term equilibrium positions. It should be noted that since the prices are determined in this system, the commodity markets have cleared and no commodities have either excess demand or excess supplies at the 70th iteration. We can also observe the important three variables and their trajectory- the rate of profits, wages and growth

Table V-F: Iteration-wise rate of profits, growth and wage

Iteration	w	R	g
1	51.39	1.68	1.32
2	35.07	1.98	1.33
5	37.77	3.02	1.45
10	41.22	3.65	1.52
20	43.08	3.88	1.55
40	43.30	3.89	1.55
50	43.30	3.89	1.55

It should be noted that wages increase in this economy. There is no case of a wage rate having only uni-directional flow. At times it increases and at times it falls. It is now important to understand as to why the economy stops at the 50th iteration. It is so because the economy stops its search operations for optimal prices and

optimality of other variables till a point where markets clear! The money and the economic conditions should hold in such manners that at those levels, the producers and consumers are ultimately in equilibrium. The incomes of the workers should be able to cover the supply of goods at a price the exchange relations demand dependent upon the interest, money supplies and a host of other factors!

Table V-G: Iteration-wise interest, loan-deposits and employment

Iteration	i1	i2	i3	Deposits	Loans	Employment
1	6.95%	11.72%	23.7%	435	435	43.05
2	5%	6.27%	6.45%	467	305	42.97
5	5%	6.38%	6.56%	465	318	40.63
10	5.2%	7.94%	10.38%	472	425	39.29
20	5.55%	9.25%	16.12%	475	471	38.93
40	5.58%	9.39%	17.12%	475.93	475.93	38.93
50	5.58%	9.39%	17.12%	475.93	475.93	38.93

Ultimately, the banking sector, the production sector and the consumption goods industries attain simultaneous equilibria, however, it should be remembered that this is not the ultimate general macro-economic equilibrium; an identity is lost in the process!

As the economy progresses from its initial stage to this stability stage, the outputs undergo cyclical fluctuations amongst themselves. It should be noted that the commodity markets clear, the consumption and savings are balanced and the banking system has cleared after a series of 50 iterations. We now to set to simulate the system through changes in various parameters of the system. This we do to investigate the three classical doctrines in monetary economics, real economics and finance. These relate to the relevance of “Neutrality of money”, “Kaldor- Passinetti paradox” and lastly the “Modigliani-Miller irrelevance theorem” to the framework of this model and hence to the working of an actual monetary economy. Lastly, we aim to explore the impact of changes in technology coefficients on the economy and its characteristics.

Changes in money turnover ratios: As a first step, we aim to determine the impacts of changes in money turnover ratios on the various macro-economic variables of the system. The money turnover ratio is the proportion of sales/turnover to money balances held by the

industrialists in their daily production processes. These also determine the current account deposits in the banking system, which along with current accounts of households determine zero period deposits. These zero period deposits are necessary to determine the allocation of loans along with deposits of other maturities. In effect, changes in money turnover ratios would have impact on the entire economy which can be observed through changes in a.) The real economy through the price equations and b.) The monetary economy through the deposit-loan system. The following table illustrates the impact of changes in money turnover ratio, which we call it as “ k ”, on various economic variables. The equilibrium pictures of the economy are only sketched here. The “ k ” represented here are same as the Ψ 's explained in the basic model of monetary economy

Table V-H: Impact of changes in money-turnover ratio on prices, wage and profit rates

Parameter of Change	Impact compared to AS-IS case	P1	P2	P3	P4	P5	w	r	Real Wage (W/P4)	Real Wage (W/P5)	Diseq. Gap
k1=0.25 k2=0.5 k3=1 k4=1.5 k5=0.25	<i>As Is</i>	14.14	10.72	15.91	14.93	16.83	43.30	3.89	2.90	2.57	126.23
k1=0.5 k2=1 k3=1.5 k4=2 k5=0.5	<i>All k rise simultaneously</i>	14.28	10.88	16.05	15.06	16.86	42.16	4.09	2.8	2.5	144.06
k1=0.15 k2=0.25 k3=0.5 k4=1 k5=0.15	<i>All k fall simultaneously</i>	14.07	10.64	15.74	14.77	16.84	44.10	3.73	2.99	2.62	111.63
k1=0.25 k2=0.5 k3=1 k4=2 k5=0.5	<i>Only k in consumption goods industries rise</i>	14.35	10.87	16.03	15.31	17.09	42.79	4.08	2.79	2.5	146.86
k1=0.5 k2=1 k3=1.5 k4=1.5 k5=0.25	<i>Only k in capital goods industries rise</i>	14.08	10.74	15.93	14.71	16.62	42.67	3.91	2.9	2.57	126.26

It can be observed from the above table that all the money turnover ratios rise, all the prices in the economy rise with a corresponding rise in the rate of profits. However, a look at the column of real wage rates exhibits that the real wages in terms of prices of either commodity falls. Inflationary pressures on the economy are experienced all round in terms of absolute magnitude but in terms of real wage, the economy may not look at a better level. An even worse case scenario is observed when all the capitalists decide to hold lesser

current account deposits and all of them reduce their money turnover ratios. In this case, adverse deflationary pressures cause the economy to get caught in the wage-price spiral and the real wages fall considerably. The only case where an improvement in the standard of living of the labourers (since only labourers receive wages) is seen to improve is when the capitalists increase their current holdings in the capital goods industries. Thus, we can conclude that if the capitalists increase their money turnover ratios, the rate of profits reduces (or remains constant), wages increase (*here*, marginally) and real wages increase with a deflationary impact on absolute prices. Changes in the money turnover ratios impact the monetary sector as well though marginally. We present the monetary side of the economy in the following table.

Table V-I: Impact of changes in money turnover ratios on interest rates

Parameter of Change	Impact compared to AS-IS case	i1	i2	i3
k1=0.25 k2=0.5 k3=1 k4=1.5 k5=0.25	<i>As Is</i>	5.58%	9.39%	17.12%
k1=0.5 k2=1 k3=1.5 k4=2 k5=0.5	<i>All k rise simultaneously</i>	5.04%	8.46%	14.84%
k1=0.15 k2=0.25 k3=0.5 k4=1 k5=0.15	<i>All k fall simultaneously</i>	6.17%	10.40%	19.81%
k1=0.25 k2=0.5 k3=1 k4=2 k5=0.5	<i>Only k in consumption goods industries rise</i>	5.34%	8.99%	16.08%
k1=0.5 k2=1 k3=1.5 k4=1.5 k5=0.25	<i>Only k in capital goods industries rise</i>	5.23%	8.80%	15.65%

Changes in money turnover ratios impact the monetary side of the economy as well. We will explain one case which comes out as a better depiction of the economy and others can be inferred from the table. Consider the third block in the above table. If all the money turnover ratios fall simultaneously, there is a pressure on the deposits to match the loans required by capitalists. This is due to the fact that reduction in money turnover ratios necessarily implies that the current deposits of capitalists would decrease causing the overall deposit matrix to

reduce in size and with this reduction, the deposits reduce. This causes lesser disbursement of loans and at higher interest rates. At the same time, since increases in interest cost push up the outputs of the industries as it is evident from the values of outputs not presented here. With increased interest cost, the profits reduce which is seen from the table of prices at 3.73 compared to the base figure of 3.89. This causes further pressure on the capitalists to sell a higher output with increased costs and lower profits. Not only this, an overall reduction in money demand or money-turnover ratios causes interest cost to rise as seen, and hence the labour is preferred as a better option in production activity. The absolute wage rate rises in this case. With expenses rising, the only option the capitalists have to sell output is that they have to adopt an overall reduction in prices which is what exactly happens and in equilibrium, the interest rates are higher, the prices of commodities, wages and profit rates are lower thereby reducing the sizes of GDP and NNP. Thus, it may be concluded that changes in money turnover ratio influence the equilibrium positions of the economy considerably by impacting the real and the monetary sectors. With all these effects, *money cannot be neutral*.

Changes in propensities to consume: Propensity to consume determines two important aspects in any economy- the consumption behavior and the investment activity through the savings behavior. In our economy, workers and capitalists both can consume and both can save. The workers save in the form of deposits and any changes to MPC affects these deposits inversely and hence also interest rates and hence prices and profits. Thus, changes in MPC make it convenient to study changes in the entire economy in a way. The intention of including this simulation in the study is to investigate the existence of Kaldor-Pasinetti paradox in a monetary economy. Starting with a similar reasoning as above, we present the picture of the economy at its final equilibrium under different assumptions for MPC of both capitalists and workers. Here, “*a*” is MPC of capitalists and “*b*” is MPC of workers.

Table V-J: Impact of changes in MPC on prices, wage and profit rates

Parameter of Change	Impact compared to AS-IS case	P1	P2	P3	P4	P5	w	r	Diseq. Gap
b4=0.4 b5=0.4	As Is	5.21	5.75	18.84	12.59	2.32	19.81	0.97	126.23
a4=0.1 a5=0.1 b4=0.4 b5=0.4	Capitalists and Workers both consume	5.56	5.98	18.69	13.23	2.38	19.16	1.33	124.71
a4=0.15 a5=0.05 b4=0.5 b5=0.3	Capitalists and Workers both consume, but MPC of commodity 4 rises and MPC of commodity 5 falls	4.77	5.3	17.6	11.59	2.15	18.64	0.88	132.11
a4=0.05 a5=0.15 b4=0.3 b5=0.5	Capitalists and Workers both consume, but MPC of commodity 4 falls and MPC of commodity 5 rises	6.43	6.74	19.8	15.06	2.63	19.59	1.79	117.67
a4=0.2 a5=0.2, b4=0.45 b5=0.45	Capitalists and Workers both consume, but MPC of commodity 4 and 5 both rise Capitalists MPC is greater than workers' MPC: Violation of Pasinetti-Kaldor condition	7.27	7.26	17.97	16.61	2.69	15.86	3.1	118.37
a4=0.4 a5=0.4 b4=0.5 b5=0.2	Capitalists and Workers both consume, but MPC of commodity 4 and 5 both rise Capitalists MPC is greater than workers' MPC: Violation of Pasinetti-Kaldor condition	12.53	14.53	11.50	35.65	3.95	-3.42	12.80	NA

Table V-K: Impact of changes in MPC on interest rates

Parameter of Change	Impact compared to AS-IS case	i1	i2	i3	B4	B5	GDP	NNP
b4=0.4 b5=0.4	As Is	5	5.2	5.75	44.13	239.67	2621	1648
a4=0.1 a5=0.1 b4=0.4 b5=0.4	Capitalists and Workers both consume	5	5.2	5.75	43.36	241.79	2674	1690
a4=0.15 a5=0.05 b4=0.5 b5=0.3	Capitalists and Workers both consume, but MPC of commodity 4 rises and MPC of commodity 5 falls	5	5.2	5.75	59.6	188.37	2505	1543
a4=0.05 a5=0.15 b4=0.3 b5=0.5	Capitalists and Workers both consume, but MPC of commodity 4 falls and MPC of commodity 5 rises	5	5.2	5.75	28.94	288.42	2843	1834
a4=0.2 a5=0.2, b4=0.45 b5=0.45	Capitalists and Workers both consume, but MPC of commodity 4 and 5 both rise	5	5.2	5.75	39.81	246.2	2938	1898

Proceeding similarly as in case of money turnover ratios, we can present our analysis on a similar line of thought. A reduction in the MPC of any commodity causes a reduction in its demand and as such, the producers would have three options in this case. The commodity for which the MPC has declined may be produced in lesser quantities, its price may be reduced or a combination of both may be employed. As we can see in case 3 above, there is a decline in MPC of commodity 5 but that of commodity 4 rises. A decline in demand for commodity as commodity 5 which contributed 22% to the GDP in terms of its value causes far-reaching effects on the economy. The output of commodity 5 reduces in size as a result of reduction in its MPC and the reverse is true for commodity 4. At the same time, the prices of commodity 5 decline marginally and that of commodity 4 rise due to demand pressures. This causes the demand for capital as well and any positive changes in MPC would cause demand for capital and hence all other prices also rise. This can be seen clearly from the observation that when MPC of both commodities rise, the prices of all 5

commodities rise as well. However, the changes in MPC are so minuscule for the entire economy that the interest rates do not reflect them very well. However, when MPC rises, interest rates also rise and the converse is also true. This is due to the reduction in deposits that is caused due to reduction in deposits and since MPC is rising, there is demand for new goods and hence more loans are required. Hence, on one hand, there is a fall in deposits and on the other, the loans are increasing. This causes the interest rates to rise further. We would pause to revisit the famous Kaldor- Pasinetti paradox in the context of the model built. The model fails to produce equilibrium if the propensities to consume of capitalists exceed that of the workers. This is more so because it is the saving behavior of the capitalists and also the workers that influences the equilibrium path in the economy. This fact is validated in the last row of the above tables by the reason that when MPC of both, the capitalists and the workers rise, the economy coefficients undergo a significant change. The Kaldor-Pasinetti paradox is thus a reinstatement of the fact that workers should save either equally or more else the capitalists would appropriate all the profits leaving less for workers. It still remains a paradox since if all capitalists keep consuming, still their profits keep rising! As a result, all that capitalists need to do is only increase their consumption and appropriate all profits in the economy. This will keep happening till wages can go negative as well. *This validates that the Kaldor- Pasinetti paradox holds good in a monetary economy.*

Changes in debt-equity ratio: The debt-equity proportions in the economy are decided by the income holding parameters or the wealth distribution coefficients. These coefficients are constant and held to be that way. We would now provide a picture of the economy if these coefficients undergo a change and hence produce a change in the debt-equity proportions. The debt-equity ratio for the economy is determined as the ratio of industrial loans to industrial equity. Industrial equity is arrived at using the parameter of capitalists' proportion of wealth held in the form of equity. This as a percent of total capital base is the equity portion in the economy and 1 minus this proportion is the debt of the economy. This is what we refer to by the debt-equity ratio. The following tables summarize the simulated results under varying debt-equity proportions.

Table V-L: Impact of changes in debt-equity ratio on prices, wage and profit rates

Debt-equity ratio	P1	P2	P3	P4	P5	w	r	g
0.31	5.21	5.75	18.84	12.59	2.32	19.81	0.97	0.67
0.43	5.21	5.75	18.84	12.59	2.32	19.81	0.71	0.67
0.18	5.21	5.75	18.84	12.59	2.32	19.81	1.59	0.67
0.3	5.21	5.75	18.84	12.59	2.32	19.81	0.95	0.68
0.43	5.21	5.75	18.84	12.59	2.32	19.81	0.71	0.66
0.23	5.39	5.94	19.46	13.03	2.4	20.45	1.21	0.7

Table V-M: Impact of changes in debt-equity ratio on interest rates

Debt-equity ratio	i1	i2	i3	B4	B5	GDP	NNP
0.31	5	5.2	5.75	44.13	239.67	2621	1648
0.43	5	5.2	5.97	44.13	239.67	2621	1648
0.18	5	5.2	5.69	44.13	239.67	2621	1648
0.3	5	5.69	8.15	44.13	239.67	2621	1648
0.43	5	5.4	7.5	44.13	239.67	2621	1648
0.23	5	5.8	9.22	43.41	237.28	2641	1666

As the equity proportion declines, taking the case presented in the third row as our demonstration sample simulation, we see that the immediate impact is seen on the rate of profits. This variable increases compared to its base value of 0.97. This happens due to the fact that now there is less of capital available in form of equity and more loan capital is to be sought. As a constraint on these owned funds, the cost of these funds increases and hence the profit rates rises. Similarly, as a consequence, the demand for owed funds increases and hence, the loans increase. Thus, this causes a pressure on the deposits and causes the interest rates in turn to rise. However, these changes in the debt-equity ratio do not cause any changes in the values of real macro-economic variables like money prices, money wage rates, outputs and GDP and NNP coefficients. This happens due to the fact that as equity rises, there is a proportionate fall in debt and the converse is also true. *This is the validation of the Miller-Modigliani theorem or the famous leverage irrelevance theorem.* Having explored all of this, it should be also noted that all these simulations are

conducted on an economy which is primarily out of equilibrium. We need to close the gap before we can claim that an equilibrium is finally attained. The following points handle this case. At the current point, it should suffice to know that even if the economy is out of proportions, all other properties of a monetary economy hold good with this economy. We are an inch away from developing the final monetary theory of value. It is now important to handle the relationship between equilibrium and the initial period stability condition described in the previous section. At equilibrium, not only do markets clear but all equations are met; *identities* included. In fact, the question of not meeting an identity does not arise: identities are always true and a theory that dissatisfies this fact is not a theory in any sense; it is a fraud! Not even an intellectual fraud! This is exactly the nature of disequilibrium in this system. Notice that the NNP at factor cost is 2911.10 and NNP at market prices is 2784. The approximate gap between these two values is 126.32; this gap in itself should not be required to be measured if the theory were complete and correct. We say that the theory is correct and with regards to its completeness, it is complete with respect to all the agents being assigned their individual roles and all markets clearing in due sense. But still we see a gap: let us call this gap as the disequilibrium gap. This gap is a measure of the extent of an identity distortion. This may sound funny but it is logical if we read it along with the next point. But for now, it should suffice to say that this is a disequilibrium gap. More importantly, the gap between NNP factor costs and NNP market prices can be tracked down in our model. The value of this gap is exactly equal to the value of the difference between savings and investments⁵⁴. Also, this gap is also equal to a unique variable in the economy: the gap between labour shown to be employed and labour actually employed in the economy. We would take each of these one by one⁵⁵.

- a. The relevance of difference between NNP at factor costs and market prices being exactly equal to the gap between savings and investments is

⁵⁴ In this economy, investments are measured as $\sum_{i=1}^{m+n} (B_i - A_i)p_i$.

⁵⁵ We would like to add here that the explanations provided are mere conjectures at this point in time. The object of this thesis is merely to explore the monetary theory. In the process, if we have found disequilibrium, we would like to keep the theory of monetary disequilibrium away from this work. We are not however denying provision of our explanations to the described phenomena however. But it should be again noted that these can at best be only conjectures requiring theoretical analysis in detail. It is this analysis that we intend to keep away.

astonishing. Nowhere in the theory or its articulation in terms of mathematical equations have we introduced this condition; there is no such condition that we know. The gap may only be seen because of the gap in the employment, explained in b below. It can only be said that the savings are greater than investments. As a result, a remote possibility of a shortfall in savings causing this gap to occur can be the case. But still it does not provide a necessary explanation towards the breakdown of an identity of such standing.

- b. The second cause of the monetary disequilibrium is even dangerous than the previous one; and even funnier. The economy is seen to behave like a bad consultant; it charges for a higher manpower but secretly a lesser manpower is actually employed. In the nation's wage bill and wage accounts, the amount of labour shown and billed is 40, but the production equations show only 36.78. It could only be concluded that the economy is able to produce its desired outputs using 36.78, but the employed 36.78 are selfish and they charge for 40, though all 40 are not employed at all. Note that this is similar to Keynesian under-employment. However, a minor difference exists. In the Keynesian case, only 38.93 were employed and exactly 38.93 were billed in the national accounts. Here, however, 38.93 are employed but 40 are billed. That is the primary difference from the Keynesian case. The value of this gap (40-36.78) in terms of wages is exactly equal to the identity distorting disequilibrium gap. This gap will always exist since more demand would be required to make the 36.78 workers believe that things are beyond their control and they need more hands actually. It may be the case that all this while, there may be contracts between 36.78 employed and remaining 3.22 unemployed towards revenue sharing, since all 40 will consume and save. Therefore, the physically unemployed would also need money for survival. As a result, there would always be some labour in the economy that would refrain from work and may be happy to receive $.25^{56}$ of the wages they

⁵⁶ These proportions may have been decided between 36 working and 4 non-working

would have received if they were in physical employment. Also, who are these 3.22 and 36.78 would be determined by the purely the preferences and substitutability relations that the individuals would have between money, leisure and work. It also may happen that the savings desire of a person is fulfilled and he needs no more money to save; his future expectations vanish. He would no longer require full wages. But those in employment may not like him going off the payroll. They would maintain his name, have him sit at home and provide him an agreed money sum. The question is how to create more demand to stimulate the 36 to make the 4 work! However, if more demand is created, it may have inflationary pressures and hence, may reduce employment even further. Thus, a nature of demand that creates money with a multiplier macro effect is required. Money creation is necessary since the purchasing power of money should not be affected. The nature of this “gap” does not improve when the conditions are reversed. Under specific cases, we do observe a “gap” reversal where the employed resources i.e. labour happens to exceed the actual available employment levels. We would examine the causes and the nature of this gap therefore in a short while.

Given the nature of this monetary disequilibrium, it can be safely concluded that in a monetary economy, there are limits to the extent of monetary activity. Money and its existence cannot clear everything with ease. In this model of the monetary economy, it should be noted that nothing has been attributed to rigid wages, liquidity traps or any kind of frictions that normally explain the existence of a monetary disequilibrium. It is far beyond true that in a theoretical monetary economy, disequilibrium is the only equilibrium. It is the quest for all these years to exactly show this disequilibrium. In the process, we have come almost close to answering this question. We have shown the nature of monetary disequilibrium without assuming any real balances, money-in-the-utility functions, or any other classical postulates. It is often said that construction of a theory is often more difficult than its criticism and it is in this note that we do not intend to keep this item open as well. It is important to answer another important question about the

disequilibrium in a monetary economy. Money is fully introduced on this system in form of currency and credit. It could well be introduced in any other form as well, but the result is going to be same. The new problem at hand now is this: in a monetary economy, monetary activities have their own limits! But though money played out its role in the economy, the fiscal activity can always help maintain the balance in the monetary economy. Hence it can be rightly said that all this while, we were operating in a government less economy and going forward, we are going to drop the assumption of a *laissez-faire* state. It is therefore evident that government has an important role in a monetary economy. As a result, it would be imperative to rephrase our result: In a *laissez-faire* monetary economy, disequilibrium is always seen. More importantly, in a *laissez-faire* economy, terms like disequilibrium and equilibrium make little or no sense at all: an identity is getting lost in such a system. Hence, at this moment, it would not be wrong to state that a non-*laissez-faire* economy is the object of consideration. We necessarily provide for the role of government. The government, once it sees any discrepancy in the functioning of the economy would normally aim to remove and clear the economy of this discrepancy. It can do so in a numerous ways: if its objective were to tackle investments, it would bring out taxation changes, if it were related to growth, it would resort to policy planning and allocation of budgetary sanctions; in this and the most important case of tackling labour market or employment, it normally resorts to deficit financing. It should be noted that there would be ways to clear this (Keynesian) gap and in the following chapter, we would present a few of them through a mixture of policy interactions.

However, the following conclusions apply from this chapter:

- a. A simultaneous increase in all money holdings leads to, among all other results, an overall increase in the disequilibrium gap
- b. Reduction in propensity to consume increases the disequilibrium gap and the vice-versa. However, a mere reallocation of spending across the consumption basket has negligible impact on the gap

With this in the perspective, we set out on the last leg for this work- the elimination of this gap