

Aggregate demand, income, debt, and all that

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Balance Sheet	Households	Firms	Banks	Sum
Capital stock		$+PK$		$+PK$
Deposits	$+H_D$	$+F_D$	$-H_D - F_D$	0
Loans		$-F_L$	$+F_L$	0
Sum (net worth)	V_h	V_f	V_b	$+PK$
Transactions		current capital		
Consumption	$-PC_h$	$+PC$	$-PC_b$	0
Investment		$+PI$ $-PI$		0
Accounting memo [GDP]		[PY]		
Wages	$+W$	$-W$		0
Interest on M	$+r_D H_D$	$+r_D F_D$	$-r_D H_D - r_D F_D$	0
Interest on L		$-r_L F_L$	$+r_L F_L$	0
Financial Balances	S_h	Π $-PI$	S_b	0
Flow of Funds				
Capital Stock		$+PI$		$+PI$
Deposits	$+\dot{H}_D$	$+\dot{F}_D$	$-\dot{H}_D - \dot{F}_D$	0
Loans		$-\dot{F}_L$	$+\dot{F}_L$	0
Column sum	S_h	Π	$\dot{F}_L - \dot{H}_D - \dot{F}_D$	$+PI$
Change in net worth	S_h	$\Pi + \dot{PK} - \delta PK$	S_b	$\dot{PK} + \dot{KP}$

Table 1: Balance sheet and transactions flow matrices for Keen 2011 model.

From the table above, define the following flows of income:

$$Y_h^{in} = W + r_D H_D \quad (\text{household income}) \quad (1)$$

$$Y_f^{in} = \Pi = PY - W - r_L F_L + r_D F_D \quad (\text{firm income}) \quad (2)$$

$$Y_b^{in} = r_L F_L - r_D F_D - r_D H_D \quad (\text{bank income}) \quad (3)$$

Similarly, define the following flows of expenditure:

$$Y_h^{ex} = PC_h \quad (\text{household expenditure}) \quad (4)$$

$$Y_f^{ex} = PI \quad (\text{firm expenditure}) \quad (5)$$

$$Y_b^{ex} = PC_b \quad (\text{bank expenditure}) \quad (6)$$

The budget constraints for each sector are:

$$(W + r_D H_D) - PC_h = \dot{H}_D \quad (\text{household budget}) \quad (7)$$

$$\Pi - PI = \dot{F}_D - \dot{F}_L \quad (\text{firm budget}) \quad (8)$$

$$(r_L F_L - r_D F_D - r_D H_D) - PC_b = \dot{F}_L - \dot{H}_D - \dot{F}_D \quad (\text{bank budget}) \quad (9)$$

Rearranging the terms in the budget constraints we find that for households

$$PC_h = (W + r_D H_D) - \dot{H}_D \quad (10)$$

$$Y_h^{ex} = Y_h^{in} + (-\dot{H}_D) \quad (11)$$

$$\text{household demand} = \text{household income} + \text{change in debt of households to banks} \quad (12)$$

Whereas for firms we have

$$PI = \Pi + (\dot{F}_L - \dot{F}_D) \quad (13)$$

$$Y_f^{ex} = Y_f^{in} + (\dot{F}_L - \dot{F}_D) \quad (14)$$

$$\text{firm demand} = \text{firm income} + \text{change in debt of firms to banks.} \quad (15)$$

In other words, for the combined private sector without banks we have

$$PC_h + PI = (W + r_D H_D) + \Pi + (\dot{F}_L - \dot{F}_D) - \dot{H}_D \quad (16)$$

$$Y_{f+h}^{ex} = Y_{f+h}^{in} + \dot{F}_L - (\dot{F}_D + \dot{H}_D) \quad (17)$$

$$\text{firm and household demand} = \text{firm and household income} \quad (18)$$

$$+ \text{change in debt of firms and households to banks.} \quad (19)$$

Conversely, for the bank we have

$$PC_b = (r_L F_L - r_D F_D - r_D H_D) - (\dot{F}_L - \dot{H}_D - \dot{F}_D) \quad (20)$$

$$Y_b^{ex} = Y_b^{in} + (\dot{H}_D + \dot{F}_D - \dot{F}_L) \quad (21)$$

$$\text{bank demand} = \text{bank income} + \text{change in debt of banks to firms and households} \quad (22)$$

So we arrive at the conclusion that in a two-sector economy, where sector A consists of households and firms and sector B consists of banks, both statements

$$\text{demand of sector A} = \text{income of sector A} + \text{change in debt of sector A to sector B} \quad (23)$$

$$\text{demand of sector B} = \text{income of sector B} + \text{change in debt of sector B to sector A} \quad (24)$$

are correct. However, by adding all the budget constraints together, we also obtain that

$$(W + r_D H_D) + \Pi + (r_L F_L - r_D F_D - r_D H_D) = PC_h + PI + PC_b + \dot{H}_D + (\dot{F}_D - \dot{F}_L) + \dot{F}_L - \dot{H}_D - \dot{F}_D \quad (25)$$

$$Y_h^{in} + Y_f^{in} + Y_b^{in} = Y_h^{ex} + Y_f^{ex} + Y_b^{ex} \quad (25)$$

$$PY = PY \quad (26)$$

$$\text{aggregate demand} = \text{aggregate income} \quad (27)$$