Understanding the Equation of Exchange from Accounting
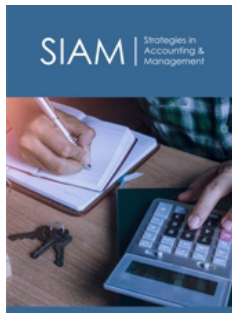
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Abstract

The macro accounting identity of the equation of exchange (MV=PY) is analysed from a four-actor, three-period economy´s balance sheet. It is shown how money flows via actors, ending up both as financial assets and real assets. A distinction is made between financial money flows financing the purchase of financial assets and real money flows financing the purchase of real, GDP affecting expenditures. Elaborating on the equation of exchange in growth terms gives the qualitative finding that the vast majority of total growth of money flows consists of financial money flows. The finding ows to the strong trend towards financialization over the past decades (increasingly more financial flows/assets relative to real ones) and the fact that financial asset prices exhibit more volatility than nominal GDP. From this is concluded the need for a new and developed statistical database over money flows and real and financial assets. Such a basis would enhance the knowledge of how the global real and financial economy functions as well as benefit central banks in better knowing what parts of the economy it can and cannot influence. The analysis gives rise to recommending a shift in monetary policy focus from the real economy to the financial economy. Monetary policy has not been overly efficient in controlling nominal GDP in recent decades at the same time as financial money flows have become increasingly dominant in terms of total money flows. The current policy set up risks missing out on serious financial stability risks. A shift in focus would aim at stabilizing financial money flows to the effect that risks of future financial crises are reduced.

Keywords: The equation of exchange; Macro accounting identities; Financialization; Financial money flows

Introduction

In macro economics, the equation of exchange, MV=PY, is the relation where, for a given period:

M is the total money supply in circulation on average in an economy

V is the velocity of money, that is the average frequency with which a unit of money is spent

P is the price level

Y is an index of real expenditures (on newly produced goods and services).

This paper about the equation of exchange aims primarily at elaborating on the equation, deepening the understanding of both the real and the financial economy. As specified above, the equation does not capture the financial economy as Y confines the economic sphere to the real economy (PY is the nominal GDP). However, before the current specification was established, T was used denoting real aggregate transactions. That is to say all transactions in an economy, real and financial. The approach in this paper is to divide total transactions into a real economy part and another financial economy part. Another aim is to spread the news of the equation as a macro accounting identity. This may seem obvious, the aim of an equation is to hold, but looking deeper into the matter it is found that a number of factors obscures the function of the equation as an identity. For example, in macro economic theory, the equation of exchange serves as a basis for the quantity theory of money. In such, assumptions are made as to the variables, such as the constancy of velocity, leaving the theoretical equations to be estimated rather than filled according to an identity relation. Another reason why money has fallen out of fashion in macro economics is that policy tried to set money as a way to steer nominal GDP in the 1970´s and 1980´s but the experiment failed, partly because the velocity

of money turned out to be volatile. The advent of inflation targeting central banks using the policy rate as its main instrument has by and large bundled off money as a central monetary policy variable to the rubbish dump of history. That is a pity, especially in times of rapid financialization, because the equation of exchange identity, encompassing both the real and financial sides of the macro economy, can provide knowledge and insights into how the actual, not theoretical, economy works and functions.

Understanding the equation of exchange from accounting

Table 1 shows a fictive, four-actor, three-period economy the aim of which is to link the equation of exchange to accounting, respecting accounting definitions and relationships described in notes 1-4. The very small and fictive economy constitutes the micro fundament building up the macro economic identity of the equation of exchange. Let us go through the events from period T=0 to T=3.

Table 1: A fictive, four-actor, three-period economy.

T=0 Outgoing Balance	Real assets	Financial assets	Liabilities	
Firm 1	0	0	0	
Firm 2	15	0	15	
Household	0	0	0	
Bank	0	0	0	
Economy sum	15	0	15	
T=1 Transactions	Real assets	Financial assets	Liabilities	NL(+)/NB(-)
Firm 1	0	0	0	0
Firm 2	0	100	120	-20
Household	0	20	0	20
Bank	0	120	120	0
Economy sum	0	240	240	0
T=1 Outgoing Balance	Real assets	Financial assets	Liabilities	
Firm 1	100	0	100	
Firm 2	15	100	115	
Household	0	20	20	
Bank	0	120	120	
Economy sum	115	240	355	
T=2 Transactions	Real assets	Financial assets	Liabilities	NL(+)/NB(-)
Firm 1	-100	100	0	100
Firm 2	85	-85	0	-85
Household	15	-15	0	-15
Bank	0	0	0	0
Economy sum	0	0	0	0
T=2 Outgoing Balance	Real assets	Financial assets	Liabilities	
Firm 1	0	100	100	
Firm 2	100	15	115	
Household	15	5	20	
Bank	0	120	120	
Economy sum	115	240	355	
T=3 Transactions	Real assets	Financial assets	Liabilities	NL(+)/NB(-)
Firm 1	0	50	50	0
Firm 2	0	0	0	0
Household	0	0	0	0
Bank	0	50	50	0

Economy sum	0	100	100	0
T=3 Outgoing Balance	Real assets	Financial assets	Liabilities	
Firm 1	0	150	150	
Firm 2	100	15	115	
Household	15	5	20	
Bank	0	170	170	
Economy sum	115	340	455	

Note 1. NL(+)/NB(-) is net lending (+) / net borrowing (-) calculated as financial assets minus liabilities in transaction terms for each actor

Note 2. The economy sum of NL(+)/NB(-) is zero given the assumption of a domestic economy

Note 3. Outgoing Balance (T) + Transactions + Revaluations = Outgoing Balance (T+1). Revaluations are not explicitly stated in the table

Note 4. Total assets = Liabilities in balance terms

Period T=0 is assumed to have zero economic activity apart from Firm 2 owning a real asset valued at 15. In T=0 Firm 2 thus constitutes the whole economy.

In T=1 firm 1 produces a real asset worth 100 without selling it. That shows up as no transaction but as real asset in balance terms. Total assets are equal to liabilities as the unsold asset is booked as a revaluation of own capital (positive value to the firms´ owners). Firm 2 borrows 120 from the bank. For the bank the loan is a financial asset transaction of 120; for firm 2 it is a liability transaction. As the loan immediately becomes a deposit, it represents a financial asset transaction for firm 2 visavi the bank. In economic terms, the money supply (M) of the economy has increased by 120 seen by the boost of the balance sheet of 120 on the part of the bank and firm 2. The money supply boost is so far confined to the financial economy, to which the item deposits pertain. No change in net lending (+) / net borrowing (-) has taken place as financial assets and liabilities have been boosted by same amount for both engaged actors. Finally, firm 2 pays its employee the household 20 in salary. Such an income distribution shows up as financial asset transactions but not as liability transactions (only liability revaluations). That is why it affects the net lending (+) / net borrowing (-) between firm 2 and the household.

In T=2 firm 1 sells its real asset to firm 2 for 100 and firm 2 sells its real asset to the household for 15. Firm 1 is booked with a -100

real asset transaction and a +100 financial asset transaction, the reason of which is that firm 1 is paid 100 for the real asset by firm 2. In terms of net lending (+) / net borrowing (-), the rule that appears here is that sellers of a real asset, i.e. a GDP affecting transaction, end up as net lenders (think money into the counter/deposits) whereas buyers of the same asset (the other side of the GDP transaction) end up as net borrowers (think money out from financial asset items). Firm 2 is booked with a +85 real asset transaction and a -85 financial asset transaction. These numbers are in net terms as its real assets in / money out are the sum of two gross transactions: real assets 100-15; money -100+15. The household ends up as net borrower of -15. Note that GDP increases by 115 in T=2, made up by two transactions (value 100 and 15 respectively). GDP corresponds to the real part of the equation of exchange: real PY. For the identity to hold, real MV also has to be 115. Real MV constitutes the money/financing side of the real GDP transactions. To disentangle real MV from real PY it is necessary to disentangle buyers from sellers and hence net borrowers from net lenders. This is shown in Table 2. The trick is to disentangle the dual roles that firm 2 plays in T=2, both as buyer and seller of real GDP affecting transactions. It is clear from Table 1 that firm 1 is solely a real asset seller and net lender whereas the household is solely a real asset buyer and net borrower. But since firm 2 plays both roles, its role as net borrower needs to be added to that of the household and its role as net lender needs to be added to that of firm 1. That is done in Table 2 in the last row denoting the whole economy. The transaction value (GDP = real PY) of the whole economy is 115 (100+15). This equals real MV seen from the financing angle in that firm 2´s net borrowing (-) 100 plus the household´s net borrowing (15) equal 115. However, given the fact that a transaction is two-sided, this means that the definition of real MV as financing given by total net borrowing (-) must equal real MV as money received on the part of sellers and total net lending (+). Nonetheless, for both economic and pedagogical reasons, it is advised that real MY be interpreted as the buyer financing side of real product/asset purchase.

Table 2: Explaining real MV = real PY in T+2

	Transaction Value	Firm 1 NL(+)	Firm 2 NL (+)	Firm 2 NB (-)	Household NB (-)
Firm 1 sells to firm 2	100	100		100	
Firm 2 sells to household	15		15		15
	Transaction value	NL (+) firms 1+2	NB (-) firm 2 + household		
Economy sum	115	115	115		

Note. It would probably be even more correct to use gross lending and gross borrowing instead of NL(+)/NB(-). As for firm 1 and the household, their only transaction makes their respective gross and net values equal. However, for firm 2 which makes two opposite transactions, the NB(-) of 85 ought to be seen as the sum of gross borrowing of 100 and gross lending of 15. Hence, the net value should be the sum of all gross transactions.

In T=3, firm 1 borrows 50 from the bank and invests the loan in a risky financial asset. The accounting story is the same as in T=1 when firm 2 borrowed 100 from the bank. Note also that from that follows that net lending (+) / net borrowing (-) is not affected, neither on actor level, nor on the economy level as all transactions remain within the financial economy with a 1-1 relation between financial asset and liability transactions. However, the money supply boost in T=3 differs from that in T=1 in two respects, not visible in Table 1. First, as the firms´ liabilities correctly increase in both cases, the loans have different aims in terms of financial assets. In T=1 firm 2 borrowed in order to buy a real asset in T=2. Due to the time lag, firm 2 booked the loan as a financial asset deposit in T=1. In terms of the equation of exchange, the booking in T=1 amounts to a financial MV = financial PY expansion. However, the deposit item though being financial in an accounting sense can not be interpreted as financial in an investment sense. Fundamentally, deposits may either be an intermediary station before money ends up in its final aim or it remains as deposits in lack of either real or financial investment opportunities. Viewed from this point of view, the T=3 money supply boost is fundamentally financial in that it ends up in a risky financial asset (note that the intermediary station in terms of deposits is not booked as it took place within the same period as the transfer from deposits to risky asset). That is another way of saying that book keeping conceals lots of economic gross events.

In Table 3 the values of the equation of exchange is derived from the Table 1 example. In T=1 the increase in money supply (120) is the only event on the macro level as income distribution between actors do not affect the economy as a whole and as the velocity is 1. T=1 is identical in terms of flow and growth as T=0 was set to zero. In T=2 we already know that MV=PY=real PY=115. Out of the 120 M in T=1, the T=2 outcome is the sum of Firm 2´s purchase of 100 (Firm 2 MV=100*1) and the household´s purchase of 15 (Household MV=15*1). In T=2 no money boost was made as the T=1 boost was used for real asset purchases in T=2. That is 115 out of the 120 boost. That is an example of a withdrawal in the form av saving on the part of here the household of 5. At the close of T=2 firm 1 is cash rich having sold its real asset to firm 2. Firm 1 saves all its cash in T=3 and borrows 50 from the bank. The 50 finances a purchase of a risky financial asset. In balance terms, firm 1 ends T=3 with cash assets (deposits) of 100 corresponding to own capital on the liability side of 100 and 50 in risky financial assets corresponding to 50 in debt on the liability side. So far the simple number examples were made to highlight the difference between the real and the financial economy: in T=1 money went solely to the financial economy, in T=2 solely to the real economy and in T=3 solely to the financial economy. In Table 4 a more complex economy is captured highlighting that money for a given period flows to both the real and the financial economy and that money velocity (V) is not zero or one. Let us first expand the original equation of exchange in flow terms such that:

MV = (MV real + MV financial) = PY = (PY real+PY financial)

MV real = PY real

MV financial = PY financial

Table 3: The equation of exchange derived from table 1.

	MV	PY	of which is PY Real	of which is PY Financial
T=0	0	0	0	0
T=1	120	120	0	120
T=2	115	115	115	0
T=3	50	50	0	50
	d MV	d PY	of which is d PY real	of which is PY financial
T=1	120	120	0	120
T=2	-5	-5	115	-120
T=3	-65	-65	-115	50

Table 4: A fictive and more complex economy satisfying the equation of exchange.

FLOWS	M	V	M*V	MV real = PY real	MV fin = PY fin
T	10 000	20	200 000	60 000	140 000
T=1	11 000	22	242 000	90 000	152 000
T=2	13 000	19	247 000	85 000	162 000
Growth, %	dM	dV	d M*V	d MV real = d PY real	d MV fin = d PY fin
T=1	10	10	21	50	9
T=2	18	-14	2	-6	7

As concluded in Bergström [1] the macro economic value added of the equation of exchange is in growth rather than flow terms. This owes primarily to the fact that in flow terms total income finances total expenditures. That is to say that money has no value added function besides income as the money that pays for the expenditure is a reflection of income. In growth terms the story is the opposite. Total income is not enough to finance the growth of expenditures in the next period. For that to happen money (MV) defined as the activation of purchasing power over the balance sheet is necessary. Let us therefore show how to calculate d M*V from its respective real and financial parts.

T=1: d M*V = 21 percent, d MV real = d PY real = 50 percent, d MV fin = d PY fin = 9 percent

The d M*V is a weighted average of its respective real and financial parts. The weights are given by the flow shares in T.

MV real/MV=60 000/200 000=30 percent

MV fin/MV=140 000/200 000=70 percent

T=1: d M*V = 21 percent = 0,3*50 percent + 0,7*9 percent

There do not exist offical statistics of the equation of exchange components. However, some of them exist from other sources. The most obvious one is the d PY real which is given by nominal GDP growth. The d PY financial could be estimated by a range of financial aset prices weighted by their respective strength in terms of financial asset volumes. Solving d M*V would then require actual, real world flow shares. To be clear, establishing such shares would involve a significant degree of rough estimation. One could for example use broader trends of global financial assets and GDP to get a hint of within which percentage intervals such shares would lie. The increased attention directed towards the concept of financialization, i.e. the growing financial economy relative to the real economy, facilitates such a persuit. The growing, global financial economy since the 1980´s implies recent "financialization flow shares" in the vicinity of real economy 25 percent – financial economy 75 percent rather than 50-50 percent. Unlike the example in Table 4 in T=1, the real world d PY financial is bigger and more volatile than its real counterpart. Let´s assume that d PY financial is 10 percent and d PY real is 5 percent. We can now solve d M*V:

d M*V = 0,25 * 5 percent + 0,75 * 10 percent = 8,75 percent

Why is this very roughly estimated number interesting? Because of the respective shares building it up. This example renders the financial money flows (d MV financial) 86 percent of the total change in money flows (7,5/8,75) leaving only 14 percent of money flowing to the real economy. So even correcting for the rough estimates involved would not turn financial economy dominance into weakness vice versa. Besides, real world experience points to financial flows triggering financial crises which is why it is equally important if not more to account for the financially triggered downturns in d M*V (key word here the volatility of d PY financial). The former chairman of the UK Financial Services Authority, Lord Adair Turner [2], gave in 2010 his analysis on the Asian financial crisis of 1997–98 and the 2008–9 crisis: "But despite these major differences, the two crises also have strong common features, and in particular both were rooted in, or at least followed after, sustained increases in the relative importance of financial activity relative to real non-financial economic activity, an increasing "financialisation" of the economy."

So far PY has been dealt with as a product solely. However, depending on whether the product pertains to the real or financial economy, its composition is generally radically different. Remember that real Y is an index of real expenditures on newly produced goods and services. In Bergström [1] it was found empirically that economic growth is triggered by business firms´ financing of capital spending, which is then multiplied out to the economy. In easier parlance, firms borrow in order to spend. Borrowing amounts to accessing purchasing power over the balance sheet (money not income financing). The link runs from real M to the new and real Y. As for purchases of financial assets, the opposite goes. Financial assets are not new in the sense of newly produced goods and services. The vast majority of financial assets is existing contrary to new. Therefore, in the financial economy the link runs from financial M to financial P.

Conclusion

In macro economic theory, the need and virtue of applying micro foundations have been a dominant theme within the discipline over the past 30-40 years. This paper is not about theory but about accounting, more specifically about macro accounting identities. The equation of exchange is typical but often disregarded macro accounting identity. The approach in this paper is to use accounting as the micro foundation for the equation of exchange. One may well talk about an opposite relationship between macro economic theory on the one side and macro accounting identities on the other side. Identities have the virtue of describing and explaining how the actual economy works and functions. Theory tries to do the same by simplifying and holding key variables constant. In terms of the equation of exchange, it once served as the basis for the quantity theory of money and that is perhaps a more common association made when hearing about the equation than the association of it being a macro accounting identity. The theory, applied in practise in the name of monetarism, broke down partly because the velocity of money proved to be everything but constant. That is a strong argument in favor of using and developing macro accounting identities. They capture the behavior of firms and households. Understanding macro economy is a wider matter than trying to link policy to a target macro variable by holding very much else in the economy constant (think the ceteris paribus argument).

It is found that decades of increasing financialization coupled with the greater volatilty of financial assets has led up financial money flows accounting for the vast majority of total money flows (d M*Y). This is primarily a qualitative conclusion which is recommended to be tested by compiling time series of money flows and the equation of exchange. Thus, a pass to central banks and statistical bureaus. If the conclusion is corroborated quantitatively as well given a new and fully developed statistical database over money flows and real and financial assets at hand, central banks would benefit substantially in better knowing what parts of the economy it can and cannot influence. Three circumstances point

already towards recommending a shift in monetary policy focus from the real economy (nominal GDP and especially CPI inflation) to the financial economy: policy efficiency, financial money flow dominance and opposite PY composition. First the policy efficiency factor. Lots of ad hoc news and information loom over us questioning the central bank control over nominal GDP. Does the Phillips curve behave as it was meant to do? Shouldn´t the Fed´s substantial monetary policy tightening in 2022-23 have set off a weaker labor market? The four 2024 non-farm payroll reports weren´t exactly weak. That is not to say that monetary policy is inefficient in affecting real economic outcomes. It surely has control over some parts, such as housing investments. The question is rather if such control is wishful. Take the case of Sweden over the past decade for example. A strong boom-and-bust cycle in the housing market set off by ultra low policy rates followed by the recent year of sharp interest hikes. Housing investments are collapsing. Such financial stability risks would most likely have been mitigated had the policy rate behaved more normally, such as following the growth of the real economy rather than acting upon guesses of future inflation. As for other parts of the real economy, business firms not central banks are in control of money flows via their balance sheets. Summing up, there seems to be little scope within the real economy where the central banks can control the macro economy as it was meant to do, i.e. pursuing stabilization policy. Add the keyword little to the finding in this paper that the share of money flows to the real economy is very small relative to the money flows to the financial economy.

Second the financial money flow dominance. Think about financialization and volatile financial asset prices underpinned by lots of leverage. It´s risky and causes financial crises according to experts such as the former chairman of the British Financial Services Authority. If the absolute majority of money flow growth is financial in nature wouldn´t it be natural to mandate central banks to do whatever it takes to control and stabilize potentially financial crisis triggering money flows? The Swedish boom-and-bust housing cycle over the past decade is merely one example of the deficiency of macro prudential policy in containing financial stability risks. Third the way money flows are directed towards output in the real economy and prices in the financial economy. The vast majority of money flows finances financial assets resulting in significant price volatility, not seldom underpinned by leverage and derivatives. Herein lies also a reason behind the financial stability risks mentioned in the paragraph above.

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