Chapter 12

Finance in a Theory of Money

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The idea that economic fluctuations can be explained mainly by changes in the quantity of money rose to prominence during the inflation of the 1970s, buoyed by the failure of then prominent Keynesian theories, which had themselves displaced less money-centric explanations in the 1930s. The monetarist theory was a great deal simpler than the Keynesian theory it replaced and was able to gain prominence in large part because of new monetary aggregates that had just started to be reliably collected in the previous few decades. It was a mechanical theory with a few simple equations, but, based as they were on rational expectations, they did not rely on *individuals* behaving mechanically, as the Keynesian theory did.

Then, in the 1980s, monetarism lost currency nearly as quickly as it had gained it in the 1970s. The Volcker disinflation was a high-profile win for monetarism against rival theories of inflation, but in the following years, monetary aggregates started to lose power as predictors of aggregate economic activity. In principle, monetarists could chalk this up to changes in velocity—that is, in the demand to hold money—but in practice it was hardly possible to use the money supply as a policy instrument without stable velocity (Friedman and Kuttner 1992). Monetarism, though never dealt a fatal theoretical blow, was rendered at least empirically nonoperational.

The mechanical nature of monetarist theory, like the mechanical nature of Keynesian and Ricardian theory before it, proved to be its undoing. But rather than content ourselves with the postmonetarist discretionary inflation-targeting regime, which despite a strong start in the 1990s has performed rather poorly since 2008, this chapter aims to reforge the conceptual building blocks of monetary theory in an *ecological* mold. As Wagner (2020, 65) argues, "Observed spending is an output of a plan, and changes in patterns of spending reflect changes in the plans of economizing agents. To understand the macro-level properties of an economic system, it is necessary to understand the properties of the ecology of plans out of which economic observations derive." The basic argument of this chapter is that the same is true of the money supply, *especially* in financially developed economies, where the same asset can be demanded for both liquidity and investment purposes. Monetarist theory was not wrong to note the causal importance of monetary aggregates for the plans that constitute aggregate economic activity: even if that causal line was not necessarily explicit in the formal models, monetarists had a story in the back of their minds where money's role in coordinating economic plans was the key mediating link (Friedman [1969] is a canonical parable). Instead, monetarists failed to note that *money itself was also the output of an ecology of plans* and not simply a policy given.

This chapter draws on more recent work in monetary aggregation to explore the relevance of the network structure of economic agents in the construction of monetary aggregates, especially across countries. This approach enables us to disentangle the link between liquidity and investment, *even when the same asset often serves both purposes*. After the conceptual groundwork is laid in the following two sections, we argue that theoretically crucial details about this network structure, oft ignored by monetarists but not by other heterodox perspectives, are captured in a Divisia-type aggregate but not in simple-sum aggregates like M2. While work on Divisia aggregation has already resolved a number of apparent paradoxes in monetary theory, the final section uses the network structure of the economic agents involved in creating liquidity both within and between countries to resolve the more recent empirical puzzle that domestic inflation seems to depend more on global liquidity than on domestic liquidity.

THE ECONOMIC MEANING OF THE MONEY SUPPLY

Aggregation is not an illegitimate enterprise in economics. But it is crucial to be clear on *what* is being aggregated. In the first place, no meaningful aggregate can be constructed from unlike elements. Two pounds plus five miles is simply two pounds plus five miles. To add together two quantities, they must first have the same units. Theoretical work on index numbers and aggregates must be understood, not as finding a way to add together unlike elements, but as *finding the commonality* in apparently unlike elements such that they can be meaningfully summed.

In the case of monetary theory, to call something "money" is not to make a statement about the good itself, but about the expectations in a community that might lead individuals in it to employ the good at a certain juncture in their plans. To wit, when an individual holds a good not because it provides any direct utility or financial return, but because of a prevailing expectation that the good can be alienated in exchange for a good desired at some point in the future, that good is money. The usefulness of money in this capacity is called liquidity services. A "unit" of money, in its economically meaningful sense, is a value unit of liquidity provision.

This is a circuitous way to express the common claim that "money is a medium of exchange," but it is vital for the question of aggregation that we peel back the "veil" of essentialist language, so to speak. Notice that in defining money we have not started with "what is money?" and built up (i.e., with the money good); rather, we have started with "what is a monetary economy?" (i.e., with the plans and expectations that constitute it) and worked *down* to the question of a "unit" of money. The money supply can never be "atomized"—that is, it cannot be considered as individual units in isolation. To posit one unit of money *presupposes* a quantity of other units sufficient to ensure general acceptability in the population. Singular items cannot be considered to provide liquidity services, as the very definition of liquidity entails a widespread market for a homogeneous good.

A macro aggregate like "the money supply," in order to be economically meaningful, must therefore preserve the meaningfulness of the micro concept of money. Such an aggregate would carry the meaning of "the total nominal value of the liquidity services being provided in an economy." While this value itself may or may not factor directly into the plans of economic agents in a money economy, any failure of the market for liquidity to clear—if quantity supplied exceeds quantity demanded, or vice versa—will impinge on individuals' plans with respect to exchange using money, which is to say, nearly all of their economic plans.

In order to preserve this meaningfulness as we aggregate, several complications immediately arise that will take us beyond the textbook conception of the money supply. In the first place, there are goods that may provide liquidity services *in addition to* a financial return or direct utility. The monetary value of these goods, therefore, will reflect their *joint* services and must be treated as a composite good consisting of (1) direct utility (consumption), (2) the present discounted value of a financial return (investment), and (3) liquidity services.

Imagine, for example, a noninflationary economy with three financial assets: a "pure" money (call it cash), valued entirely for its liquidity services; a "pure" bond, valued entirely for its financial return; and a hybrid asset, one that provides a rate of return but is also valued to some extent for liquidity services. Standard portfolio balance theory dictates that, on the margin, consumers must be indifferent between holding each of the three assets. This being the case, the price of bonds will be bid to the level at which their rate of return is equal to the implicit liquidity return of cash (Gurley and Shaw 1960), hence the familiar short-run interest rate effects of monetary policy: a scarcity of liquidity services raises their value on the margin, therefore also raising the rate of return on bonds. But provided that the quantity of cash demanded equals the quantity supplied (that is to say, once prices of goods have adjusted to a level consistent with long-run spending plans), the rate of return on bonds—and the implicit value of liquidity services on the margin—will tend to be determined in the usual Fisherian way as the relative valuation of present and future consumption.

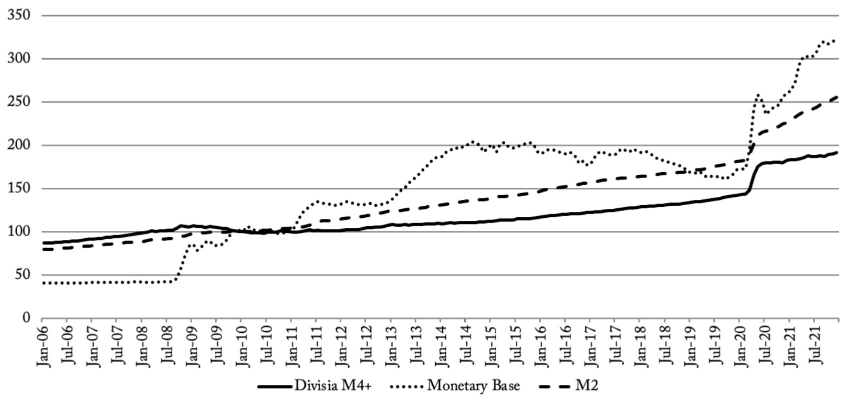
But what of our hybrid asset? Clearly it too must be bid to a price where consumers are indifferent between it and the other two assets. Its explicit return, however, will be lower than that of the bond, as its liquidity services induce consumers to bid its price beyond that of the bond. This difference, the explicit return given up on an asset as a compensating differential for its liquidity services, is its *user cost* (Barnett 1978).

Such hybrid assets make up a not inconsiderable fraction of a modern financialized economy's liquidity services. Money market mutual funds, for example, are one such semiliquid asset. Consider now the aggregation problem. An aggregate that takes the money supply as simply the quantity of cash in the economy will understate the liquidity services being provided. A broader aggregate that simply adds together the quantity of cash with the total value of our hybrid asset, on the other hand, will overstate the liquidity services. A simple-sum aggregate like M2, therefore, will both overstate the liquidity contribution of a number of its component assets *and* miss entirely the contribution of a variety of less liquid assets—for example, the use of Treasury bonds as collateral. This problem becomes more severe (1) the wider the variety of such hybrid assets and (2) the more complex an asset-liability structure they form, meaning that the reaction of the *actual economic total* of liquidity services to a change in the quantity of cash may be quite different from the reaction of a simple sum aggregate, *especially if the liquidity services being provided by some of these assets vary over time*.

Correcting these problems is the purpose of a Divisia index of monetary services (Barnett 1980). Essentially, a Divisia index[1] identifies a risk-free "benchmark asset" like the pure bond[2] and estimates the liquidity services of other assets by their user cost in relation to the benchmark (see Barnett et al. 2012 for details). This can then be used to construct an index of monetary services that reflects the *actual meaning* that money has in economic agents' plans, rather than simply summing up the value of a variety of incommensurable assets.

Using a Divisia index in place of the standard simple-sum aggregates resolves a number of apparent paradoxes where experience seemed to

Figure 12.1. Divisia M4+ Compared to the Monetary Base and Simple Sum M2



Note: From Jan 2006– Dec 2021, normalized to January 2010 = 100

Source: Monetary base and M2 data from FRED; Divisia M4+ from the Center for Financial Stability.

contradict theory, most importantly, the connection between monetary aggregates and economic activity (Barnett 2016; Belongia and Ireland 2019; Harwick 2019), which had seemed to falter after the financial deregulation of the 1980s.

Correlating figure 12.1 to the events of the past 15 years in the United States makes it clear how much more closely a Divisia index accounts for the place of money in people's economic plans than does the monetary base or M2. In the first place, the quintupling of the monetary base following several rounds of quantitative easing, even the relatively steady increase of M2 throughout the 2008 financial crisis, masked a contraction in broader monies, a liquidity crunch, and therefore a classic spending crash (Beckworth and Hendrickson 2012).

Second, the 2017–2019 economic boom was occurring at the same time that the monetary base was *declining*. Nevertheless, private suppliers of liquidity were expanding more than enough to compensate. And finally, the more recent inflation of 2021–2022 is no surprise in light of the fact that the dramatic expansion of the monetary base in 2020 *did* have a material effect on the Divisia aggregate, unlike in 2008. As the growth rate did not rise, however (5.08 percent in 2021 vs. 6.67 percent in 2019), we can expect a one time jump in the price level rather than permanently higher inflation—though perhaps one that takes time to work its way through the economy as the demand for money returns to normal, pre-pandemic levels.

A COORDINATIONIST PERSPECTIVE ON LIQUIDITY

The individual perspective on liquidity does not, of course, exhaust its economic meaning: while our explanations must be *reducible* to individual plans, all the real interest in economics is in discerning patterns that arise out of these which *no one* intended (Wagner 2010, ch. 3). This dualism between individual and overall perspectives has been a recurring feature of monetary theory since its inception (Yeager 1997). It will be worth briefly considering what our individual perspective on liquidity entails about the role of *aggregate* liquidity in the pattern and coordination of resource use in an economy from a bird's-eye view.

The availability of liquidity services in an economy—that is, of money—is, functionally, a way for money holders to coordinate their use of resources (Horwitz 2008; Harwick 2018b). This is not to say that money is, as the classical economists put it, a "veil" over some more fundamental relationships that might be understood as isomorphic to a barter economy. Rather, money *constitutively coordinates* resource use in a way that would not be possible under alternative coordinating mechanisms (and recourse to "frictionless" barter is question-begging with respect to the question of alternative coordinating mechanisms for reasons we will explore later).

Essentially, monetary coordination takes advantage of the law of large numbers to allow individuals to make plans as if production and consumption were separate (I can consume very different things from what I produce, and I can save consumption potential in liquid form for later), even as production and consumption *overall* are mostly synchronous (nothing can be consumed that has not been produced, and in normal circumstances, little time elapses between the production of a resource by someone and its consumption by someone else). Liquidity, in other words, is the creation of *optionality* in consumption through improved coordination.[3]

Consider premonetary economic coordination. When exchange is rigid and mostly stereotyped, it will be necessary to carry large buffer stocks of goods in order to weather potential shocks. In a small economic community, a drought can be fatal without a well-stocked granary. Stocking said granary requires abstinence from consumption in normal times. But in a larger economy, coordinated by monetary exchange, shocks are less likely to affect the entire economic community. A local drought, in this case, induces economic agents to import grain from elsewhere. They may spend down existing balances that have been built up from providing goods or services to others in the past, or they may borrow with a promise to repay by providing goods or services to others in the future. But in either case, they do not have to abstain from the consumption *of grain*. Their ability to provide *other* services in exchange, whether past or future, improves their option set dramatically versus being forced to store up or repay *in grain* (and it is this crucial point that Ricardian wage-fund/corn-economy models elide; see Harwick 2018a).

In this sense, the significance of money's optionality for economic welfare is that the marginal utility of money diminishes much more slowly than the marginal utility of any particular good, simply because money can be used to purchase *any* good (de Jasay 1985, 152). From the perspective of the rest of the economic area, the demand for grain rises, bidding up its price, inducing those in grain-rich areas to restrict their consumption, an imposition voluntarily taken on by those most willing to suffer it rather than being forced on the community beforehand or afterward. Not only do no stocks of grain need to be accumulated before or after, by the affected community or by anyone else, but the drought-stricken community will even consume *fresher* grain than if it had stored up its own grain from previous surplus. In essence, a large market coordinated by monetary exchange improves welfare by *allowing buffer stocks to be reduced*.

Thus far we have been considering liquidity in its orthodox sense, as "money" simpliciter. But now consider how this argument is affected by considering liquidity in all its variety of forms, not only money but also the huge variety of semiliquid assets available in a financially developed economy that a Divisia index takes into account.

Imagine a financial innovation that increases liquidity. To take the most basic example, compared to a world with only cash, the ability of fractional-reserve banks to issue nearly perfectly liquid liabilities on the basis of illiquid and idiosyncratic loans increases both the availability of credit (an asset to the bank, and a liability to the borrower) and the availability of liquidity (a liability to the bank, and an asset to the holder). From the consumer's perspective, both of these increase optionality: when wealth can be more easily converted from one form to another, more exchanges can be made on demand, as opposed to requiring past or future abstinence. From an overall perspective, this increase in the real availability of liquidity represents an intermediary's use of the law of large numbers to squeeze an increase in optionality from the existing plans of economic agents, to coordinate them more effectively, and thus to allow additional buffer stocks to be used for present consumption—a "free lunch" from improved coordination. From the perspective of the consumer-investor, this is a windfall reduction in the price of liquidity in terms of foregone consumption.

Moving further toward the financialized present, and by analogy to the use of fractional-reserve banking to issue circulating liquid liabilities by pooling (largely) business loans, a great deal of financial innovation over the past few decades has consisted in the issue of standardized semiliquid liabilities on the basis of a great variety of risky, illiquid, and otherwise nonstandardized assets. For example, the securitization of risky and idiosyncratic mortgage loans increased their liquidity both by standardizing them and by reducing their overall risk through diversification (Coval, Jurek, and Stafford 2009), allowing both mortgage borrowers and securities holders to maintain a greater degree of optionality in their plans while in fact committing more resources to present use.[4] Fundamentally this is simply a generalization, with the same economic significance, of the same operation that orthodox monetary theory has long appreciated in the concrete form of fractional-reserve banking. Similarly, in terms of concrete reductions in buffer stocks, it is no accident that the use of just-in-time inventory systems, which aim to minimize buffer stocks in the course of production and distribution, rose to prominence around the same time as the explosion in financial innovation from the 1970s to the 1990s.

This perspective allows a straightforward comparison between the process of financial innovation and the process of a spending boom caused by an increase in the nominal money supply, both of which initially increase the real supply of liquidity. In the former case, the real demand for liquidity services rises pari passu with its supply, reflecting the provision of liquidity in different and more desired forms, and allowing buffer stocks to be permanently reduced. Thus financial innovation will not generally be inflationary, provided it does indeed result from a real improvement in coordination. In the latter case, a spending boom has the same initial effects of reducing buffer stocks. The difference is that without real improvements in coordination, economic agents will eventually desire similar buffer stocks of real goods, bidding up their price, driving inflationary pressure and—per orthodox monetary theory—a return to the initial real supply of liquidity services.[5]

The reduction of buffer stocks might be thought of as an economy's "leverage," the analog in terms of real resources to a financial intermediary's balance sheet in monetary terms. As a bank subject to less predictable withdrawals will require a higher reserve ratio, an economy subject to more unpredictable shocks will be able to support a lower real supply of liquidity compared with an otherwise equivalent economy with more predictable shocks. In this sense an overprovision of liquidity (whether from unexpected monetary expansion or from overoptimistic financial innovation) makes the economy less resilient to shocks that might deplete its now-scarcer buffer stocks. The 2008 financial crisis was plausibly the result of this sort of overoptimistic innovation in housing securities, not, apparently—again contrary to some hardline Austrians—the inevitable result of previous monetary expansion. The turn from boom to bust, therefore, must be understood not as illusory (as Friedman [1993] would have it) and not as inevitable and mechanical (as Hayek [1933] would have it), but as stochastic, through increased vulnerability to unpredictable shocks.

The "coordinationist perspective" on macroeconomics that Wagner (1999) called for can, therefore, be reconciled after all to the bulk of orthodox monetary theory, provided that we are sensitive to the role of the variety of concrete liquid and semiliquid assets that facilitate consumers' spending plans. A Divisia index, because it represents the economic meaning of money in terms of money holders' plans and ability to buffer economic shocks, points us to a full view of the ecology of liquid assets in a financially developed economy, and a rather more subtle perspective on monetary shocks and the real-nominal distinction than simple-sum aggregation allows.[6]

NETWORK STRUCTURE AND THE MONEY SUPPLY

So far, we have focused on the aggregation problem from the perspective of consumers' plans to acquire and dispose of liquidity, plans that are constitutive of the assets' liquidity. But the provision of these assets is itself the outcome, not merely of policy choices, but also of an ecology of interlocking plans by providers of financial services.

Liquidity, as we have argued, is an abstract composite good, the demand for which is satisfied by a number of partially substituting assets to varying degrees. The supply of and demand for liquidity is an abstraction, taking into its purview certain similarities that various financial assets have in consumer plans. We must, therefore, carefully distinguish between the supply of and demand for *particular assets* (including cash) and the supply of and demand for *liquidity in general*—a distinction that monetary theory usually neglects in talking about the supply of and demand for *money*. A change in the demand for a particular asset can affect not only the price and quantity of that asset but, depending on the reasons for that change, the liquidity of that asset too, and therefore the *entire supply schedule for liquidity.*

Harwick (2019), following Mehrling (2012) and Hayek (1937), conceptualized the supply side of the market for liquidity as an inverted pyramid, with cash at the base, reflecting the asset-liability structure of financial assets as promises to pay. The pyramid shape indicates leverage ratios, in that bank deposits (for example) may be issued by banks as promises to pay cash, but in quantities exceeding the quantity of cash. Further securities may in addition be pyramided atop bank deposits and upon other securities, in value quantities far exceeding their "backing" under conditions of reasonably predictable flow redemption demand.

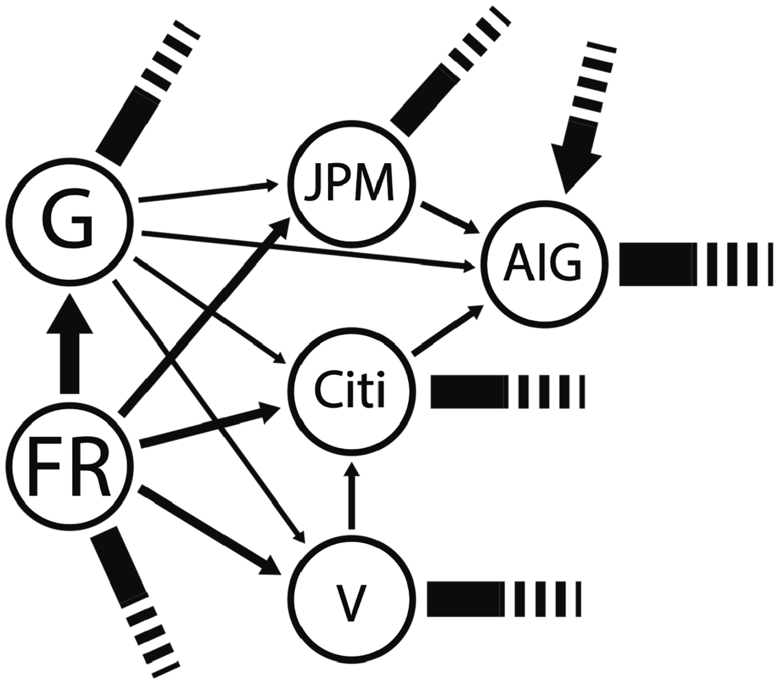
The pyramid, however, is a rather blunt metaphor. It collapses a rich and open-ended asset-liability structure into a diagram with only a continuous quantity dimension and a discrete "layer" dimension indicating how many redemptions must be made to return to cash. Complex securities, however, may securitize arbitrary sets of other assets, and—as Harwick (2019) noted—an asset's liquidity does not necessarily bear a simple relation to the layer dimension. We can better capture this richness by replacing the pyramid metaphor with a directed and weighted network, with financial firms as nodes, their liquid liabilities as outbound nodes, and their liquid assets as inbound nodes. A firm with a leverage ratio greater than one, a net liquidity *creator*, will have a total outbound weight greater than its total inbound weight.

In figure 12.2, the Federal Reserve (FR) issues base money, which is held by the government (G), various financial institutions, and the general public (dotted lines). The government issues Treasury bonds as a promise to pay base money. The first three private banks hold a mix of base money and Treasury bonds on the asset side of their balance sheets, and issue deposits to the general public as a promise to pay cash. Some of these assets are held by further financial institutions, such as the fourth (AIG), which in this example securitizes assets (e.g., mortgages) held by the general public and issues its own assets (e.g., mortgage-backed securities), which may be more liquid than the originating assets. These may also be collateralized by assets originating with financial institutions further back in the network, or with Treasury bonds.

Conceptualizing financial markets with this kind of diagram gives us a straightforward way to think about the effects on the money supply—and therefore on economic agents' plans to hold and dispose of liquidity—of various kinds of economic shocks, starting from the most conventional to the least.

1. For starters, take expansionary monetary policy. The central bank purchases a less liquid asset by issuing a more liquid asset, easing the liquidity constraint on financial firms that can then increase their own issues, and so on throughout the network. This is the standard "money multiplier" effect. The ultimate effect on output (in the short run) and prices (in the long run) of a given expansion depends on the *liquidity differential* between cash and the asset purchased by the central bank.

Figure 12.2. A Sample Network of Liquidity Services



Source: Author created.

2. But now take the issue of government debt. In a pure monetarist story, debt-financed fiscal policy should have no stimulative effect: if neither money supply nor money demand is changed, any increase in government spending can only displace private investment spending (i.e., Treasury bonds must outbid private investments in risk-adjusted rate-of-return terms). But to the extent that Treasury bonds serve a liquidity role—in particular, to the extent that they are more liquid than the private investments they displace—government bonds *can* increase the supply of liquidity in the economy, though not to the full extent of their value. This is the basic logic of the "safe asset" argument for government debt, at least in countries (particularly the United States) where government debt is indeed regarded as sufficiently safe to serve a liquidity purpose (Caballero, Fahri, and Gourinchas 2017).

   To what extent this increased liquidity indeed improves coordination like financial innovation versus gets washed out in inflation like monetary expansion is a complex question. On the one hand, the fact that the revenue stream behind government bonds is derived from future taxation and/or monetization means that a government's ability to float increased debt should not ordinarily be presumed to improve coordination, and may therefore be inflationary to the extent of that debt's liquidity. On the other hand, *the creation of a market* that would not otherwise exist or would otherwise be illiquid—for example, one for safe assets—may be classed with welfare-enhancing liquidity provision and will therefore *not* be inflationary.[7]

3. As noted in the previous section, financial innovation that increases liquidity through an improvement in coordination allowing buffer stocks of real resources to be reduced will be a windfall in the sense of a "free" increase in optionality from the perspective of any given consumer and will thus not ordinarily be inflationary.

4. A change in consumer-investor demand for the issues of any particular issuer will have different effects depending on how the change figures into consumers' plans with respect to the asset. If consumers become more willing to accept the asset in payment or as collateral for other assets—even holding total demand constant—its liquidity premium will increase, along with its contribution to the money stock for a given value (Beckworth and Hendrickson 2018).

   Imagine what kinds of situations might lead to such a change: not simply an increased willingness to hold the asset (as might result from an increase in its return, all else equal) but an increase in the perceived *marketability* of the asset or its issuing institution, including the availability of productive investment opportunities. This can also be the case during a speculative boom: an increase in the perceived safety of the financial system *as a whole* increases the liquidity of existing assets. Separately, a decline in systemic risk expectations can also lead financial institutions to increase their leverage ratios and thereby increase the quantity of assets. These effects can compound each other and lead to an inflationary boom even in the absence of expansionary monetary policy (Harwick 2019). This boom may then turn to bust if those perceptions turn out to be unwarranted and it becomes necessary to reaccumulate buffer stocks, which will manifest as a scramble for liquidity.

5. The failure of a node can initiate what has been called a "multiple contraction"—that is, a deleveraging from the perspective of the

> financial system as a whole. Holders of a failed firm's assets must now hold substitute assets, either assets from other firms redeemable for the same assets as the original or those assets for which it was redeemable. The total quantity, however, will as a rule be lower, at least in the short run. All else equal, this creates an opportunity for competing firms to satisfy the demand by expanding their own issues, and to the extent that the failure is isolated and that other nodes can provide close substitutes, there will typically be no wider ramifications in consumers' liquidity plans. But if the failure is part of a general downturn, if the failure causes investors to update their expectations of the safety of other firms, then the process in (4) can reverse: consumer-investors refuse to accept some assets in exchange or as collateral, their value comes to reflect purely on their return, the liquidity premium falls, and consumers who held these assets for liquidity purposes will need to find other sources, raising the price of liquidity in terms of foregone consumption.

A network perspective may also contextualize the relevance of more exotic theories of financial downturns, such as Bernanke and Gertler's (1995) "credit channel" of monetary policy transmission, and reconcile them to orthodox quantity-theoretic approaches. In the credit channel story, internal and external finance are imperfect substitutes owing to informational imperfections—the same sort of imperfections that financial intermediaries are supposed to smooth over. When a node fails as in (5), its credit relationships cannot be easily taken up by rival firms, thus impairing its ability to satisfy the liquidity demands of its erstwhile customers. That is to say, the coordination managed by one firm cannot necessarily be easily taken over by another, and the aggregate supply of liquidity will be correspondingly lower until a similar level of coordination can be reestablished. It is not that the aggregates are irrelevant (as many advocates of detailed microstructure models might argue), nor is it the case that monetary aggregates are the end of the story (as strict quantity theorists might argue), but rather that the aggregates *emerge from the network microstructure* as an important indicator of individuals' abilities to accomplish their economic plans in a monetary economy.

GLOBAL LIQUIDITY AND LOCAL MONIES

A plan-centric network perspective on liquidity provision and consumption also gives us a useful angle from which to explore the puzzle that, as Ciccarelli and Mojon (2010, 524) observe, "inflations of 22 OECD countries have a common factor that accounts for nearly 70% of their variance [. . . including] fluctuations at business cycle frequencies." This idea was popularized by the president of the European Central Bank in a speech in 2015, noting that "in a globalized world, inflation is becoming less responsive to domestic economic conditions, and is instead increasingly determined by global factors" (Draghi 2015), and a mostly DSGE-inspired cottage literature has sprung up, with output gaps as the mediating variable, to explore implications for monetary policy (Kabukçuoğlu and Martínez-García 2018; Dur and Martínez-García 2020, Martínez-García and Wynne 2021).

The approach taken here suggests that it is not so much that we should replace domestic liquidity with global liquidity in our models, but that the relationship between global liquidity and domestic liquidity is more complicated than existing models have accounted for. In other words, it is not that domestic liquidity fails to predict domestic inflation, but that we have *failed to adequately measure* domestic liquidity (which is operationalized in these papers as simple-sum M2) and that the relatively better predictive power of global liquidity is an artifact of that failure. In any case, we are more interested in a *mechanism* than mere statistical prediction.

Unfortunately, micro data sufficient to construct the necessary Divisia indices in a wide variety of countries are lacking, hence the use of simple-sum M2 for availability reasons. So here I will only suggest a plausible and plan-centric mechanism by which the availability of global liquidity might dominate domestic monetary policy as a predictor of domestic inflation, and leave a more rigorous empirical investigation to future research.

In the first place, we must be clear as to what will be a satisfying explanation, and why foreign expansion under normal circumstances does *not* cause domestic inflation.

1. Under a fixed exchange rate regime where the domestic currency is pegged to a foreign currency, foreign expansion can force domestic expansion: as the foreign currency depreciates, investors will want to exchange it at the fixed rate for new domestic currency, which will expand its issues passively until the arbitrage opportunity is eliminated. Under a gold standard, therefore, it was sensible to talk about global liquidity (i.e., the supply of gold) as a direct determinant of international inflation. There is *no* analogous mechanism today under a regime of floating exchange rates, and so we cannot have recourse to this explanation.

2. Currencies that are *close substitutes* can have pecuniary externalities on one another and diminish each other's value through expansion. In the limit, if consumers make no distinction between two or more currencies, its value is a commons that any issuer will have an incentive to deplete through expansion. Selgin (1988, 42) considers this a reductio ad absurdum that establishes that consumers *must* distinguish between different issuers, even those denominated in the same currency. Or consider the proliferation of "altcoins" in the crypto market in recent years. No doubt some amount of substitutability among coins in the long tail has kept their price down. On the other hand, *lack* of substitutability has staunched any inflationary pressure that this proliferation might have had on the larger players such as Bitcoin or Ethereum.

   Such an explanation might be a viable explanation for the global liquidity observation in a regime of floating exchange rates *if* consumers were relatively indifferent to holding domestic versus foreign currency—that is, if domestic and foreign currency provided subjectively identical (or at any rate close) services. Empirically, this is certainly not true of investors, who distinguish between currencies based on risk and rate of return; it is not true of consumers in border towns who may desire to hold both currencies for mostly disjunct sets of transactions but do not regard them as substitutes; and it is certainly not true of ordinary consumers who face prices denominated in one unit of account, and for whom foreign currency has essentially no liquidity value.

Note that both of these explanations involve only a (public or private) liquidity issuer and a representative consumer. If neither of these explanations is adequate to account for the observed relationship between global liquidity and domestic inflation across a variety of countries, a disaggregated network view of liquidity provision might hold promise.

In the first place, the purported failure of domestic liquidity to predict domestic inflation in the United States is remedied when using a Divisia index rather than simple-sum M2 (Hendrickson 2013; Barnett 2016). Financial development, which increases both the variety and the complexity of liquid assets available to consumers, vitiates the usefulness of simple-sum measures of liquidity in any reasonably financialized economy. In the United States in particular, a "decoupling" of M2 from economic aggregates followed the financial deregulation of the 1970s. This decoupling led to a spurious rejection of monetary aggregates from the usual conduct of monetary policy, not because liquidity became a worse predictor of economic activity, but because the orthodox measure of liquidity became less reliable.

In light of the continued adequacy of our more economically meaningful liquidity aggregate, it still remains to explain why global liquidity would predict domestic inflation *better* than a highly imperfect measure of domestic liquidity (but not better than our improved measure of domestic liquidity). This implies that a Divisia index will track global liquidity more closely than M2 does.

A network perspective helps explain why this might be the case. For starters, note that there is no requirement that inbound edges share the same unit of account. That is, a firm's issues may be "backed" by liquid reserves, illiquid loans, or semiliquid assets from other issuers, including issuers in other countries. Indeed, larger financial firms—especially those operating in multiple countries—will find it advantageous to diversify away from exchange rate risk by holding foreign assets. Some of these may be relatively liquid in the sense that they can be reliably used in exchange or as collateral with a subset of other nodes in that country or that deal with nodes in that country. Note that this does not mean that consumers have to deal with foreign currencies, and it does not mean that foreign assets are a *substitute* for domestic assets—certainly not perfect substitutes. Indeed, they may be complements in a well-diversified portfolio.

In short, more abundant global liquidity eases the balance sheet constraints of domestic issuers of liquidity who hold foreign assets. Consider the scenarios from the previous section across international borders:

1. Suppose the European Central Bank engages in expansionary monetary policy. The supply of liquidity increases, European bonds become more liquid, and their rate of return falls. This represents a windfall to holders of European bonds, including American financial firms, which may now—without any expansion on the part of the Federal Reserve—safely expand their own issues for a given level of risk tolerance.
2. An increase in the supply of "safe assets" in Europe through the increase of government debt might have similar effects on the liquidity of American firms holding European bonds, particularly to the extent that the legal definition of "safe asset" for the purposes of financial regulation is standardized internationally, as in the Basel accords.
3. Models of crisis contagion generally focus on currency risk in fixed exchange rate scenarios, when the failure of one fixed exchange rate

raises doubts about the viability of the fixed exchange rate commitment in other countries, as during the Asian financial crisis of the 1990s. But the global financial crisis of 2008 highlights the extent to which even countries with floating exchange rates are linked, not through a base money channel, but through liquidity issuers holding portfolios of international assets. Major shocks in one country can force financial firms in other countries that hold its assets to contract liquidity there too.

4. Exchange rate movements can similarly constitute balance sheet shocks in either direction, inducing expansion or contraction of liquidity quite independently of both domestic monetary policy and the direct effect of a terms-of-trade shock on consumption.

To see why these effects would show up in a Divisia index but *not* in M2, consider the portfolios of the issuers whose assets are included in a Divisia index but not in M2. Issuers of checkable deposits and money market mutual funds included in M2 are commercial banks issuing monies of near-zero risk and near-perfect liquidity. The asset side of their balance sheets, therefore, must be relatively safe and insulated. It is only those less-but-still-partially-liquid assets included in a broader Divisia index but not in M2, particularly where rate of return considerations begin to play a role (though not a dominating role), whose issuers will be more exposed to foreign shocks.

Several implications of this transmission mechanism for both monetary policy and monetary regimes suggest themselves. First, in terms of the Mundell trilemma,[8] if vulnerability to foreign shocks can enter "through the back door" via free capital flow rather than through a fixed exchange rate, one crucial purported advantage of floating exchange rates—namely, insulation from foreign shocks—is muted. This will tip the balance of costs and benefits toward fixed exchange rates on the margin.

Second, the fact that domestic liquidity *providers* satisfy their own liquidity demands with systematically different assets than consumers do can lead the former to propagate shocks that the latter are ill-equipped to accommodate. In other words, the fact that consumer nodes generally connect only to nodes issuing liquidity in their domestic unit of account, while producer nodes are linked transnationally, forces domestic consumers to respond in socially unproductive ways to foreign liquidity shocks. By orthodox optimum currency area logic (Mundell 1961), this linkage through liquidity providers should tip the balance on the margin toward larger rather than smaller currency areas. In addition, while end consumers are likely to continue satisfying their demand for liquidity in a single unit of accounts for reasons of calculative convenience, provided that liquidity providers are allowed to diversify across currency boundaries (and there are good reasons for them to continue being able to), barriers to consumers being able to do the same should be removed.

CONCLUSION

Too often coordinationist-process and mainstream model-test approaches to macroeconomics find themselves at loggerheads: if a model's primitives do not correspond to real causal forces, or if empirical observations do not correspond well to variables of theoretical interest, what Bayesian would be moved by the bulk of empirical literature? But this quite valid concern must be understood as a call for *better* quantification, and theoretically informed aggregation, not as a call for giving up on quantification or aggregation. In particular, we must aggregate with the commonality among the underlying plans firmly in mind.

This chapter has argued that a Divisia index is such a theoretically informed aggregate, on both theoretical and empirical grounds. Unlike the predominant strategy of simply choosing a list of liquid assets and adding up their values, a broad Divisia index is faithful to the *ecological* nature of both the provision of and the demand for liquidity. While this by no means opposes us to the bulk of orthodox monetary theory, firmly anchoring to an ecological perspective provides us with a path through the murky forest of monetary theory, the subtle contours of the border between the "real" and the "nominal" sides of the economy, and where they might interpenetrate each other.

NOTES

With apologies to Gurley and Shaw (1960).

1. A Divisia index can be proved to track a hypothetical Divisia quantity aggregate, without needing to estimate certain parameters necessary to construct an exact quantity aggregate (Barnett 2012, 197). Thus, while the exact nominal value of the liquidity services of the economy is more difficult to estimate, the *rate of growth* can be estimated more easily and summarized as a chained index number.
2. Both simple-sum and Divisia aggregates ignore the possibility of direct utility from holding assets. While this may be an important factor in things like cryptocurrency valuation (Graf 2013) or "meme stocks," which became important during the GameStop incident of 2021, I am not aware of any dollar-denominated assets whose liquidity services would be greatly changed by considering direct utility.

3. This is a similar perspective to Lachmann's (1956, ch. 6) discussion of money's place in a firm's capital structure.
4. As with the *Titanic*, the fact that a portentous misestimation of risk famously put mortgage-backed securities at the center of a salient disaster should not overshadow the fruitfulness of the idea as an innovation.
5. Buffer stocks play a role here that is similar to that of "savings" in the classical Austro-Ricardian parable of inflation-led capital consumption, but it should be noted that the meaning of "savings" in that parable (real resources set aside for future consumption) is exactly what liquidity *obviates*: economic progress consists in the *reduction* of buffer stocks, not in the increase of "savings." If economic agents were perfectly coordinated, there should be no need for "savings" at all in that sense (hence the incoherence of telling a boom-bust story starting from a frictionless equilibrium).
6. In this, we pursue a line of questioning similar to—though perhaps less iconoclastic than—that in Bilo and Wagner (2015).
7. North and Weingast's (1989) argument that the establishment of the Bank of England as a market maker for government debt contributed to England's financial development seems another example of this latter phenomenon.
8. The Mundell trilemma states that an exchange rate regime can achieve at most two of the following: (1) free capital flow, (2) autonomous monetary policy, and (3) a fixed exchange rate. With free capital flow, a fixed exchange rate is conventionally regarded to expose a country to foreign shocks that could be better accommodated with a floating exchange rate.

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