

When the State Writes the Code of Money

Programmability, Fungibility, and the Calculation Problem Within the Unit of Account

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Theme: The Dynamics and Consequences of Digital Interventionism

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For as long as human beings have traded with people beyond the circle of those they personally know, they have depended on a quiet miracle: a thing that anyone will accept from anyone. Money did not arrive by proclamation. In Carl Menger's account it emerged spontaneously, as traders converged on whichever commodity was most readily resaleable, the good with the greatest *saleableness*, in his translated term, until one object became acceptable to all (Menger, 1892). What made that object world-shaping was not its substance but a property: every unit was the same as every other, and indifferent to the hands that held it. A coin did not ask who you were or what you intended. This indifference, fungibility, is among the most consequential social technologies ever discovered, because it let strangers who shared no language, faith, or sovereign cooperate through exchange alone. Niall Ferguson's financial history ties the ascent of money to the widening of trust toward people one will never meet (Ferguson, 2008); fungibility is what made that trust impersonal. I need not trust you, only the coin between us.

That homogeneity survived every later monetary revolution. Commodity money gave way to minted coin, coin to paper claims, paper to state fiat, and fiat, within living memory, to entries in a database. Through each transformation the defining rule held: a unit was a unit, interchangeable with any other, usable by anyone for any lawful end. Mises, extending Menger's foundation into a full theory of money, treated this universal acceptability as the essence of the thing itself (Mises, 1912). But digitisation does something no previous monetary form could. For the first time, conditions can be written into the unit itself, so that money can be made to remember who holds it, where, and for what purpose. The continuity that survived coinage,

paper, and fiat is precisely what programmable money threatens to break, and that break, not surveillance, is the deepest danger this theme names.

The defining feature of digital interventionism is not that the state does more, but that it does it differently. Classical intervention operates from outside the thing it governs: a statute forbids, a tax penalises, a censor strikes a named title, each act discrete and external to the conduct it touches. Digital interventionism dissolves that externality. When compliance is written into a payment rail rather than imposed upon it, the rule no longer follows conduct; it constitutes the conditions under which conduct is possible at all. Freedom as the default gives way to permission as a privilege that must be affirmatively granted. Public anxiety about central bank digital currencies has fixed almost entirely on surveillance. That concern is genuine but analytically shallow, for it treats programmable money as ordinary money that merely happens to be watched. The deeper transformation lies elsewhere: programmability does not only make money observable, it makes money conditional, and in doing so it strips money of the homogeneity on which its most fundamental economic function depends.

To see why this matters, it helps to borrow Hayek's distinction between two things both called law. In *Law, Legislation and Liberty* he separates the abstract, general rules of just conduct that apply equally to unknown persons in unknown future situations — *nomos* — from the specific commands by which an organisation directs its members toward chosen ends, *thesis* (Hayek, 1973, chaps. 5–6). The general rule is purpose-independent: it does not know whom it will bind, or to what use they will put their freedom within it. The command is its opposite, addressed to particular agents and oriented to particular results. Money, until now, has belonged unambiguously to the first category. A unit of currency was governed by a rule of breathtaking

simplicity: a euro is a euro, acceptable to anyone, for anything lawful, regardless of who held it or why.

That simple rule is more than a convenience; it is the monetary expression of the rule of law itself. For Hayek, the rule of law is not merely that rules exist but that they take a particular form: general, abstract, and blind to the identity of those they bind (Hayek, 1973). Fungibility is that same form realised in the medium of exchange, one rule for every unit and every holder, indifferent to who they are and what they intend. The claim is not that money is literally legislation, but that homogeneous money and the rule of law are two instantiations of a single formal property: the application of one rule to all instances, irrespective of person or purpose. This is why programmable money stands to sound money as a bill of attainder, a law aimed at a single named individual, stands to general law: in each, the particular is smuggled back into a form whose entire virtue was its generality.

Programmable money breaks this coincidence by design. A programmable central bank digital currency is not merely a digital token; it is a unit to which conditional logic can be attached at the level of the ledger itself. It can be made to expire on a date, to work only with certain merchants, to operate within a geographic boundary, or to carry an interest rate, including a negative one, keyed to the identity or balance of its holder. These conditions are not external regulations layered onto transactions; they are properties of the units, enforced automatically by the protocol that issues them. To programme money is to attach particular commands to particular units. In Hayek's terms, it converts money from *nomos* into *thesis*, from a general rule applying identically to all into a structure of directed instructions that vary by user, transaction, and purpose. The euro held in one account is no longer the same instrument as the euro held in another, nor even necessarily the same as the euro held beside it.

The cost of this conversion appears most sharply against Mises's theory of economic calculation. Mises showed that the rational use of resources requires money prices, because only money prices reduce the irreducible heterogeneity of goods to a common cardinal magnitude (Mises, 1949, chap. 13). One cannot weigh a ton of steel against an hour of labour against a hectare of land in their own physical terms; one can weigh them only once each is expressed in a single common denominator. And for Mises these prices are not objective measurements but the ratios thrown up by real exchanges among owners of property; calculation does not measure value, it borrows the figures the market itself generates. The socialist commonwealth, lacking markets for the means of production, lacks those figures, and so production becomes a groping in the dark (Mises, 1920; 1949, chap. 26). This is the impossibility at the centre of the Austrian critique of central planning.

What that argument leaves unspoken is the property that allows money to perform the office at all. Money can serve as the common denominator of calculation only because it is itself homogeneous, because every unit is identical to, and interchangeable with, every other. The moment units cease to be interchangeable, the arithmetic of calculation loses its object: there is no longer a single magnitude called a euro to add, subtract, or weigh against alternatives. Programmable money does not reproduce the socialist calculation problem; it is not the same problem. Mises located that problem in the absence of prices, where there is no market, there are no prices, and calculation cannot begin. Programmable money attacks the same faculty by the opposite route: it does not abolish prices, it corrupts the unit in which every price must be expressed, so the figures the market still generates no longer share a common measure. Mises removed the inputs of calculation; programmability degrades its medium. The two belong to one family of pathologies, both disorders of monetary calculation; but the second lies a layer beneath

the first — one Mises never examined, because in his era the homogeneity of the unit was never in question.

A monetary theorist might object that the unit of account need not share the fate of the medium of exchange: history knows abstract units of account that floated free of any circulating coin, and a pure numéraire can price heterogeneous instruments without itself being corrupted. The objection holds in a world of competing monies. It does not hold here: the defining feature of a central bank digital currency is that the state mandates calculation in the programmable unit itself, with no legally privileged alternative in which to keep the books. When the conditioned unit is also the compulsory unit of account, instrument and measure are welded together by law, and the degradation of one is the degradation of the other.

The most serious objection remains that none of this is new. Food vouchers may be spent only on food; gift cards only at one retailer; capital controls forbid moving funds abroad; subsidies arrive earmarked for narrow purposes. If restricted money has always existed, programmable money looks like a more granular version of a familiar tool, a difference of degree, not of kind.

The objection fails because it mislocates where existing restrictions operate. In every conventional case, the restriction sits at the boundary of a pool that remains internally homogeneous. A food voucher is a separate instrument; the money in one's bank account stays perfectly interchangeable with itself. Capital controls restrict a currency's movement across a border, but within it every unit remains identical to every other. What is restricted is access to a distinct instrument, or the flow of an otherwise-fungible mass; the unit's homogeneity is preserved. Programmability does something categorically different: it places the restriction inside the unit, so that two units held by the same person in the same account can carry

incompatible conditions. It does not constrain a fungible pool more tightly; it dissolves fungibility as such.

The gift card, far from being a counter-example, proves the point. A gift-card dollar is precisely not money, and no one treats it as such: no one adds store credit to a bank balance at par when reckoning their wealth, because everyone tacitly understands that the two are neither interchangeable nor commensurable. We instinctively segregate non-fungible value out of money, because it cannot perform money's work. The novelty of the programmable central bank digital currency is to inject gift-card logic into legal tender itself. Money's practical fungibility has in fact been eroding for some time: anti-money-laundering rules already render some balances harder to move than others, so that perfectly fungible money is already an idealisation. But this strengthens the argument rather than weakening it. Such regimes confine conditionality to a flagged periphery, applied to suspect accounts by exception; programmability moves it into the constitutive logic of every unit. It is the systematisation of an erosion already underway, the moment the periphery becomes the rule.

Defenders of these systems have a ready reply, and it is the strongest one: the designers insist that money will remain fungible. The programmability they envisage, they say, applies to transactions, not to the money itself. The International Monetary Fund's guidance is explicit that compliance features would leverage the programmability of transactions, "*not of CBDC itself, as money must remain fungible*" (IMF, 2023). The European Central Bank has likewise disclaimed programmable money for the digital euro (European Central Bank, 2023). Two things must be said. The first is that it concedes the entire theoretical premise of this essay: when the architects of the instrument volunteer that money must remain fungible, they confirm that fungibility is

load-bearing, the very property whose loss is analysed here. The foundation of the argument is not contested; it is affirmed by the institutions building the systems.

The second is that the line between programmable transactions and programmable money is far less stable than the reassurance implies. It is a policy promise, not a technical guarantee, and it is reversible by the same authority that issued it. A transaction layer comprehensive enough to vet every payment for permitted purpose reproduces, at the level of the holder's actual spending power, exactly the heterogeneity that fungible money was meant to prevent: it makes no practical difference to a calculating agent whether a euro cannot buy a forbidden thing because the euro forbids it or because the transaction is refused. The constraint is felt in the same place — the unit's loss of universal exchangeability. Nor is the harder case hypothetical. In the People's Bank of China's 2020 Shenzhen pilot, digital yuan distributed to the public was valid only for a few days, spendable only at designated merchants, and could not be passed between individuals (People's Bank of China, 2021), conditioned currency that behaved less like cash than like a voucher. Money that expires, and that may be spent only here and only now, is money that is not the same as other money, and it is being issued, not merely theorised.

It is worth being clear about what is, and what is not, the target of this argument, because programmability is not in itself an enemy of liberty. Conditional logic attached to money voluntarily, the escrow that releases funds when goods arrive, the smart contract two parties freely adopt, is an entrepreneurial achievement of exactly the kind the Austrian tradition celebrates. Such arrangements are chosen and revocable; they bind only those who consent, and they leave the underlying money fungible for everyone else. The danger is categorically different. It is conditional logic embedded in the monopoly unit of account an entire economy is compelled by law to hold, price in, and calculate with. Voluntary programmability is one more

option within a fungible monetary order; programmable legal tender abolishes that order's defining property for everyone at once. The distinction is that between a market innovation and a constitutional change in the character of money.

This theme stresses dynamics, and the calculation argument has a dynamic corollary that returns us to Mises's most practical insight: interventions propagate (Mises, 1940/1998). Once money is programmable, a prior question becomes unavoidable, who writes the conditions, and on what knowledge? At the scale of a national currency, conditional logic governing billions of transactions cannot be administered by hand; it must be delegated to algorithmic systems that classify transactions, holders, and purposes. This is the point at which the regulation of artificial intelligence ceases to be a neighbouring subject and becomes the administrative core of programmable money itself. The state no longer merely regulates AI as an external industry; it must cultivate and constrain the classifying systems on which a currency of particular commands depends, for those systems are now the rule-writers of the money. Monetary and algorithmic governance fuse.

Here Hayek's older insight returns with full force. The economic problem of society, he argued, is never merely how to allocate given resources but how to use knowledge that exists only in dispersed and fragmentary form, "*the knowledge of the particular circumstances of time and place*" (Hayek, 1945, p. 521). The information needed to coordinate an economy is not a stock of facts a central body could gather, but a flux of local, tacit knowledge, held by the person on the spot and destroyed the instant one tries to centralise it. The legitimacy of any particular transaction is exactly this kind of knowledge: whether a payment is what it appears to be depends on a context no algorithm possesses. A classifier operating at national scale cannot hold those particular circumstances; it can only apply coarse proxies, and so it will err systematically,

blocking the legitimate and clearing the evasive. And the failure runs deeper than misclassification. Money whose permitted uses are fixed in advance cannot be redirected toward the opportunity no rule-writer foresaw, yet such unforeseen redeployments are precisely what entrepreneurial discovery consists in, and the source of the market's dynamic efficiency (Kirzner, 1973; Huerta de Soto, 2010). Conditioned money forecloses not just known alternatives but the discovery of ends not yet conceived. Such distortions are not incidental bugs; in the interventionist spiral they become the warrant for the next layer of control, finer classification, broader data, further conditions, so that each correction for the failures of conditional money demands yet more conditional money. The programmable unit and its algorithmic rule-writer are not two interventions but one, deepening itself.

The shift from freedom as default to permission as privilege is, in the monetary sphere, more than a slogan. It names an exact change in the character of money, from a general rule that asked nothing of the holder and applied identically to all, to a structure of particular commands that vary by person, purpose, and time. Through all of money's history, across every change of substance, the unit remained one homogeneous thing, and on that homogeneity rested both the impersonal justice of the rule of law and the possibility of calculation. What programmable money threatens is therefore not principally privacy, nor merely freedom in the abstract, but the integrity of the measure in which a society reckons value at all. Money governed by particular command is no longer a general rule; a unit that is no longer interchangeable is no longer fully a unit of account. When the state writes the code of money, it does not simply observe the economy or restrain it. It reaches into the instrument through which the economy thinks, and a people that cannot calculate cannot coordinate itself in freedom.

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