Understanding Money Using Historical Evidence

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Understanding money using historical evidence*

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Abstract

Debates about the nature and economic role of money are mostly informed by evidence from the 20th century, but money has existed for millennia. We argue that there are many lessons to be learned from monetary history that are relevant for current topics of policy relevance. The past acts as a source of evidence on how money works across different situations, helping to tease out features of money that do not depend on one time and place. A close reading of history also offers testing grounds for models of economic behavior and can thereby guide theories on how money is transmitted to the real economy.

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1 Exhortatio

Economists are not astronomers. We do not wish merely to describe, but also to counsel. The questions we ask are not only: "Why is this happening?" but also: "What can we do about it?" An economy is too complex to represent in its entirety, hence we analyze particular aspects using models. A model postulates coherent, functional relationships between economic and non-economic, or endogenous and exogenous variables (Marschak, 1953). Only within a model can causality be understood, as the outcome of a thought experiment: holding everything else constant, a change in x results (through a possibly complex functional relationship) in a change in y. Understanding means acquiring the ability to carry out thought experiments.

Deciding between theories and making quantitative assessments requires careful empirical work. The exact empirical counterpart of the thought experiment is a controlled experiment: with everything else in fact held constant, x is changed and y is observed. It is well-known that macroeconomics can rarely resort to controlled experiments. This is especially true for monetary economics, the focus of our essay, where scale and stakes prohibit true experimentation.

How, then, should we improve our understanding of money? A careful reading of history, we argue, is imperative. The past is exciting: its commonalities and its differences with the present make it invaluable for discovering the fundamental characteristics of money that are not particular to one time and place. It is a source of natural and policy (quasi-)experiments, in an area of research where such episodes are rare. It offers opportunities to test our theoretical assumptions of how money works. It is also a source of delightful surprises. But care is required, because money is a complicated object, for at least two reasons.

First, it is an asset, hence its valuation will depend on expectations: "causality" runs from the future to the present. Cagan (1956) made that point vividly in one of the classics of economic history (although the events took place only a few decades before it was written). During the hyperinflations he studied, prices and quantities of money had increased by orders of magnitude. From seemingly erratic data, he recovered a simple money demand function. His insight was an elegant formulation of expectations representing the future as distributed lags of the past. Sargent (1977) used this starting point to demonstrate the importance of cross-equation restrictions imposed by the model.

The second reason is that money, by longstanding legal tradition, is a regalian right: the right to define and manage money rests with public authorities. For economists, this means that policy is inherent to money. Choices, as seemingly innocuous as the size of a coin, have to be made and revisited when circumstances change. They will be made—if policymakers are to any degree purposeful—on the basis of some model.

This second reason interacts with the first. Since money is an asset, and its future value depends on future policy, expectations of policy inevitably arises. Ignoring them will vitiate any attempt at drawing policy implications from statistical regularities, however well they fit in sample (Lucas, 1976).

So, what can we learn, with care, from monetary history? Not just facts, but also forces at work, recurrent questions and evolving answers. Money has been part of economies for thousands of years, and it has mattered, and been thought to matter, for allocations and outcomes for nearly as long. Yet the forms that money has taken have varied considerably over the centuries and in different societies. The permanence of this social construct and the variety of its manifestations hints at a difficult task. There is always a delicate balance between generalization (or projecting our views into the past) and attention to historical detail, but in the end, generalization rather than enumeration is what economists do.

No model can be complete (or, in a trite formulation, all models are "false"), but some are

useful. Judgements about which features to include in a model are guided by the question at hand, the body of economic theory built up over decades—and a close reading of history. The "lessons" of history are not iron laws or broad generalizations, but clues to relevant factors and forces. Neglecting history leads to a narrow focus on the features of the moment rather than those that have come into play repeatedly even if not constantly.

Reading history yields insights that would not be possible to draw from an exclusive focus on the present. As examples we offer the following 4 questions.

1. Should we expect multiple monies, private and public, to compete with each other?
2. In the traditional trinity, are money's functions (medium of exchange, storage of value, unit of account) all equal or are some more important than thought?
3. Can (variations in) money affect output, to what extent and at what horizon, and if so why?
4. How does one keep the value of money stable (if it should be desirable)? How does monetary stability relate to fiscal policy and can the former ever be free of the latter?

We will return to these questions throughout our review and, at the end, summarise what we can learn from an approach embedded in history. To do so, in section 2, we start by giving background on the monetary systems of the past. Both the commonalities and differences to today's system make the past an exciting source for empirical evidence and for understanding mechanisms pertaining to money. In section 3 we we discuss methods for constructing and analyzing historical data. We highlight a particular advantage the past offers: the ability to study rare events, such as natural or policy experiments involving money. At the end, in sections 4 and 5, we circle back to the five questions listed above and collect the clues that we scattered throughout our review.

2 The past is not a foreign country

The past seems distant: how can it be useful? Studying a modern economy seems comparatively easier: we can rely on intuitions and knowledge accumulated from our personal experience, and it is possible to go out and collect more data. The present is right outside our door. The past is more distant — but, we argue, it is not foreign.

In this section we summarily review the monetary institutions of pre-modern economies which are the setting for the literature we review and the research we hope to see emerge. We first emphasize the similarities and continuities. Although money was most of the time on a commodity standard, it did not reduce to an irrelevant numéraire and was frequently fiduciary: by which we mean that its exchange value was significantly higher than the value of its content. This feature makes it closer to modern fiat money than might be expected. We also discuss forms of money other than coins, the precursors of central banks, and the sense in which monetary policy has always existed. We finally note that unusual or surprising features of the past can be as illuminating as commonalities with the present.

Let us start with an example to illustrate how, behind unfamiliar concepts and customs, recognizable (and sophisticated) arrangements can be analyzed. Since medieval times, exchange rates were carefully observed and recorded, because they were of great import. In the sixteenth and early seventeenth century the main currency market in Europe was held at quarterly intervals in northern Italy: the so-called Bisenzone fairs, financial descendants of the medieval goods fairs

(Pezzolo and Tattara, 2008). Over the course of a quarter, financial actors across Europe bought and sold, in their local currencies, claims on a unit of account, the *scudo di marche*, payable at the next quarterly fair. That unit of account did not have a physical representation, although it was tied to a set of five gold coins minted by various countries. At the fair itself dozens of actors or their proxies met in person to clear, net, and settle or roll over the claims to the next fair. The rates recorded in Denzel (2017) correspond to the settlement rates at the fair, the *ritorno*, but with luck one can also find the local prices of the claims ahead of the fair.

Figure 1 plots prices in the city of Genoa for claims on the next fair. The claims are priced in local units. Within each quarter, the price rises as the settlement date nears: the claims are in fact forward contracts on *scudo di marche*, whose value will be determined at the fair to balance international capital flows. Therefore, the price embeds a discount relative to the (expected) fair price, 'hiding' a short-term interest rate that can be recovered by comparing how the claims evolved as the fair date moved closer. This is very visible in Figure 1, where the upwards sloping quotes capture a short-term interest rate.[1] At a time where usury laws prohibited most forms of interest, the forward nature of the foreign exchange claims was a feature, not a bug: the fairs were simultaneously a currency and a short-term capital market, and at the time largely engaged in transferring metals from Spain to northern Europe and mobilizing European savings to finance the Spanish crown.

This example features layers of context-specific complexity—perplexing units of account, unfamiliar legal nature of the claims (Santarosa, 2015), an odd-looking proto-central bank, among others—that must be carefully parsed. Behind these layers we easily recognize markets, securities, interest rates, and familiar forces are at work. The most general force is loosening a binding constraint. If usury caps bind, ways will be found around them. If liquidity (of the metallic kind) is costly, arrangements will economize it. If shipping means of payment is risky, alternatives will be used.

Of course, economic phenomena are always embedded in social contexts which vary over time but are often abstracted away from our models. Basic concepts such as prices, markets, and contracts implicitly rely on beliefs, norms, rules, and laws. Nevertheless, once due consideration (on whose importance we insist) is given to the varying contexts, we can ask the same questions as today. What is money? Does it matter for allocations? If so, why, how, and what should be done with it?

2.1 Money in premodern economies

In standard price theory, no medium of exchange is needed and the choice of the numéraire good is innocuous. Historically that has not been the case: one or more commodity was used as a denominator of prices and, eventually, some of the available stock of those commodities was devoted to the production of media of exchange.

Standardized objects have been generally accepted in exchange for goods and services for thousands of years; prices and values have been expressed in terms of a common numéraire for even longer. Mesopotamian societies of the second millennium BC recorded prices of commodities as the purchasing power of a shekel (7g) of silver (Vargyas, 2001). The first metallic objects of standard sizes appear in the 7th century BC in Asia Minor (Velde, 2019).[2] From that point

[1] Using similar ideas, researchers sometimes managed to recover interest rates from bills of exchange for situations where usury laws prohibited certain transactions, which could be avoided by hiding the interest as part of the exchange rate on bills of exchange (Flandreau et al., 2009; Brzezinski et al., 2024).

[2] All parts of the world also have their own monetary history, of course. For convenience we focus mostly on Europe in this essay. See von Glahn (2016) for a detailed overview of the case of pre-modern

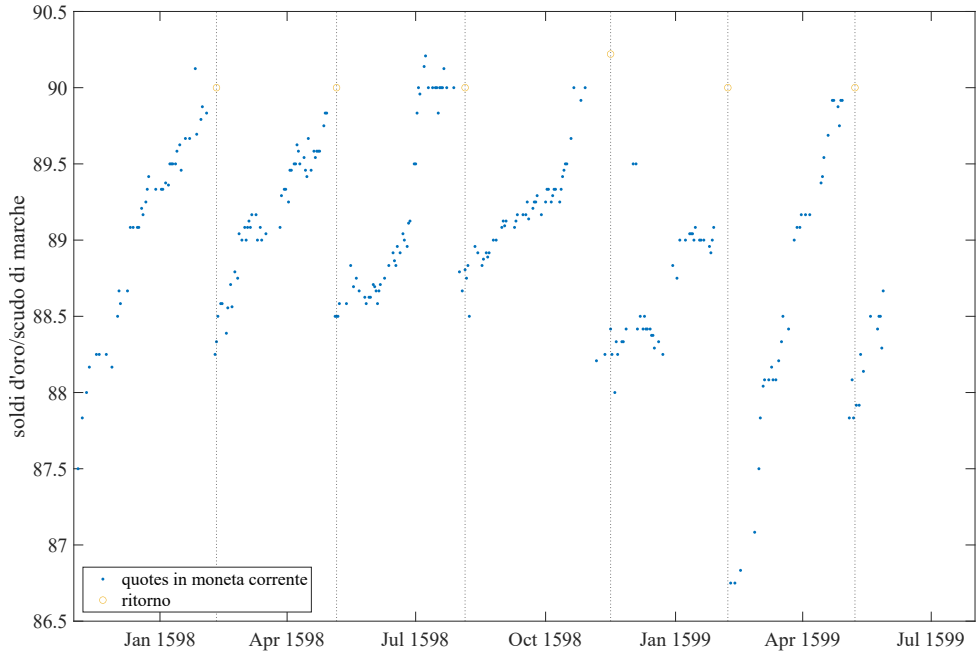


Figure 1: Prices of bills on Bisenzone fairs in Genova, 1597–99. Source: Archivio di Stato Napoli, Sommaria Attuari Diversi, fasc 413 f30-33.

on, European and nearby economies were mostly on a metallic monetary standard: that is, the monetary objects were in principle convertible into predictable quantities of a precious metal. In most cases the objects themselves (coins) contained the quantity which could be extracted by melting. Alternatively, the circulating medium (notes redeemable on demand, transferable balances on a banker's ledger) was a claim to a known quantity of metal. Either way, the monetary arrangement was a commodity money system, in which the value of money was bound below by the value of the (useful) metal. Whether it was bounded above depended on the manner in which money was produced.

At first sight this is the major difference between historical and modern money, one that would limit the relevance of the former to the latter. In the present-day fiduciary system, all monetary objects (coins, notes, transferable balances) are intrinsically worthless, and monetary theory pays no attention to the material support, but derives the value of money from the functions it fulfills such as a state-imposed requirement, liquidity services, and store of value.[3] But, in fact, fiduciary money is far from unknown in history. Remarkably, it was in place in China at various times between the 12th and the 15th centuries in the form of paper money (von Glahn, 1996; Guan et al., 2022). Even setting aside this case, historical monetary systems were often fiduciary, in two ways: either some elements of the system but not all were fiduciary, or the whole was but temporarily. Sometimes the former case led to the latter, i.e., the fiduciary components taking over the whole system. We review the two cases in turn.

Fiduciary subsets

Coined money usually consists of multiple denominations, or objects of different sizes and values, suitable for small or large transactions. This has been true from the very beginning. The range

China.

[3]In the case of small denomination coins such as pennies, the intrinsic copper content can in fact be non-marginal relative to their face value (Velde, 2007b).

of coins in the earliest coinage of 7th c. BC Asia Minor spanned two orders of magnitude, from 14g to 0.3g, all made of the same metal (Velde, 2019). It quickly proved more convenient to use metals of lesser value for smaller denominations, and the concurrent use of gold, silver, and bronze or copper has become standard in many monetary systems. This, in turn, allowed for some denominations to cease being strictly commodity money, when they circulated for significantly more than the value of their content. In such cases we may call the coin token, or less than full-bodied.

Bronze coins in Antiquity were partly token because they didn't weigh enough to be intrinsically worth their denomination. Egypt's monetary system in the Hellenistic period was, at some point, based on overvalued bronze coinage that eventually lost its value, the earliest known example of significant inflation (Reekmans, 1949). Copper was used again in medieval times, at first as an alloy for silver, when smaller denominations required inconveniently small quantities of pure silver. The content of the smallest denominations became progressively irrelevant to their value in many countries. From the 15th century token coinage was becoming common for the smallest denominations.

Another way in which parts of a monetary system can have a fiduciary character is when the values assigned to denominations are not in proportion with their contents. A monetary system consisting of multiple coins of different sizes, possibly different metals, requires a numéraire of its own. (Until the 19th century, coins only rarely bore inscribed numeric values.) Coins were assigned values relative to the unit – often the smallest coin – by markets, customs, and laws. One denomination or coin may be given a value in excess of its intrinsic content. For example, a government might assign value to a foreign coin and authorize it in payments and debt settlements. Alternatively, agents might accept a coin in payments for a face value above its intrinsic worth. A government might also reduce the content of a coin it produces but maintain the same legal value, or expect that it maintains the same market value (a so-called debasement). Medieval and early modern Europe is replete with such events (Spufford, 1988; Velde et al., 1999; Sussman and Zeira, 2003; Svensson and Westermark, 2020).

Fiduciary departures

Wholesale departures from a commodity peg have occurred at various times, usually when one fiduciary component of the money supply displaced the others. An early example occurred when fiat copper coinage was issued so massively by the government of Castile in the early seventeenth century that it displaced the regular silver coinage, and eventually lost value. Although the departure was not planned as such, it lasted for several decades, longer than other contemporaneous copper-based inflations (Sargent and Velde, 2002, chs. 13–15).

Soon after, the first examples of paper-based fiat money appeared in Sweden, Denmark, Austria, and Russia (Velde, 2020). They were also components of the monetary system, but at the opposite end of the denomination spectrum from small copper coins: notes were typically high-value payment instruments intended for wholesale transactions (like the ledger-based money of the Bank of Amsterdam). All were introduced for fiscal reasons and not intended to be permanent, although they lasted for decades. In France, the Banque royale of John Law in the 1710s and the revolutionary *assignats* of the 1790s were further monetary innovations neither of which survived for more than a few years (Velde, 2007a,b; Sargent and Velde, 1995). John Law, at least at some brief stage, conceived of the paper notes issued by his bank as representing the true monetary system, with gold demonetized and silver limited to subsidiary coinage. Conceptualizing a pure fiduciary paper was unusual, and the failure of his experiment ensured that it remained so.

The "Restriction Period" in Great Britain began with the Bank Restriction Act of 1797:

suspension of the convertibility of Bank of England notes, with the government's approval. It was a response to the Bank's dwindling gold reserves and happened against the backdrop of a landing of French troops in Wales. A large number of merchants signed and publicly announced declarations in which they promised to accept and keep using banknotes to avert a nationwide financial collapse (Shin, 2015). Following this, small denominations – which could even be used to pay weekly wages – circulated widely (O'Brien and Palma, 2020, pp. 408-9). The suspension was initially intended to last for a few months but in fact lasted until 1821. It became notable as the first fiat money system in world history that did not end in failure: paper money was the main medium of exchange (with small denominations) and unit of account, but mostly avoided depreciation and ultimately returned to convertibility at the original gold value (O'Brien and Palma, 2020). The Restriction Period turned debt into money, in the sense that the credibility of the Bank of England notes was guaranteed by the government debt held by the Bank as reserves. The credibility of the Bank of England notes hence indirectly dependend the fiscal credibility of the government. The result was for the most part not inflationary. The Restriction Period ushered in a new era on the march towards more modern and active central banks, and yet without compromising its independence from the executive (O'Brien and Palma, 2023).

The nineteenth century concluded with the worldwide dominance of the gold standard, but this commodity-based system retained a persistent fiduciary component (Bordo and Kydland, 1995). It was understood that authorities could and did abandon it during emergencies, with a promise to restore convertibility at the original gold price once the emergency passed (see Sargent and Velde 2002, 98, for a medieval version of the doctrine). Many countries at the time made great efforts to join the gold standard and gain the associated credibility (Bordo and Rockoff, 1996), but case studies suggest that long-term commitment to the gold standard was not always believed by international markets, and hence was often not sufficient to ensure a stable peg absent continued intervention by the national authorities (Esteves et al., 2009).

2.2 Banks, private and public

Money was not just coins. In addition to occasional private coinage (e.g., Selgin 2008; Edvinsson 2012), many forms of credit could and did act as liquid means of exchange, acting as a complement (not a substitute) to coins (Palma, 2018a). Financial intermediation in medieval Europe covered two broad type of activities: short-term financing for, e.g., long-distance trade, and money-changing. Merchant banking developed from the former and deposit banking from the latter. Deposit banking provided a new means of payment with several advantages. Payments made on ledgers left a written trace that could serve as proof of payment. Ledgers also recorded the circumstances of deposits and any contractual conditions attached to them, providing a useful infrastructure for more complex contracts. Deposits were also in principle liquid, i.e., demandable, and government regulations increasingly required bankers to redeem deposits on demand in coins promptly (e.g., Mueller 1997 for Venice).

There is still much to be learned about the quantitative importance of early private banks, in large part because their frequent failures led to loss of records. By the nineteenth century banknotes and deposits of private banks become substantial components of the money stock, but that was sometimes true in earlier periods. In the case of early modern Naples, the banking sector was private but owned by non-profit institutions. Its surviving archives show that bank liabilities circulated and were a major component of the money stock (Costabile and Neal, 2018).

The fragility of the private banking sector, and the difficulties with metallic coinage and multiple denominations, were factors leading to the creation of the ancestors of public banks, state-owned or state-sponsored banks which provided a reliable means of payment. Some of them ended up creating fiduciary money of their own, and we discuss this next.

2.3 Monetary policies in premodern economies

Monetary policy consists in state actors deliberately affecting the value of money. Price theory's one-time choice of units is a degenerate example. Historically, even in pure commodity money systems, governments had room for consequential monetary policy. Indeed, the Western legal tradition since Roman times made it their responsibility. Governments set the standard of money, i.e., which metals, in which quantity and fineness, were made into coins. This choice might seem a priori simple, akin to choosing a standard of length or weight – but it was not made only once but repeatedly over time, suggesting that it was not a pure matter of units (Karaman et al., 2020). Not only was this choice a sequence over time: with multiple denominations and multiple metals, it was a sequence of vectors, as each denomination required its specification. Finally, non-negligible production costs had to be allocated, and another parameter of policy was to decide who bore them: in other words, choosing the "mint price" paid for raw metal, or (equivalently) the tax on minting or seigniorage (Sargent and Velde, 2002).

Seigniorage was one avenue through which a fiduciary element could enter the monetary system. If the cost was born by the private sector, as was typical, then coins had to be overvalued relative to their content, at least at the time of their production, by that cost. This led to debasements and monetary policy more broadly construed, depending on the government's objectives at different moments in time, such as attracting metal or preventing export, improving liquidity and facilitating trade, or financing government spending. Two types of debasements (or monetary policy in general) existed: fiscal, designed to generate revenues, and "benevolent", driven by the desire to maintain orderly circulation of coins (Karaman et al., 2020; Sargent and Velde, 2002). In non-Western societies, mint policy and paper money also occasionally existed, but it was often the case that after a period of success, fiscally-motivated debasements in a context of warfare brought down the entire system via inflation (e.g. von Glahn, 1996, 2006; Guan et al., 2022).

Monetary policies of the modern sort appeared earlier than was long thought. The history of central banks was, until recently, seen through the lens of the Bank of England, a private profit-maximizing banking establishment that gradually enlarged its privileges but developed a public motive and took responsibility for monetary and financial stability. The notion that there was no central banking before Bagehot (1873) is now obsolete (Bindseil, 2019; Roberds and Velde, 2016a,c,b; Bignon et al., 2012; Ugolini, 2017; O'Brien and Palma, 2023).

Perhaps the most striking example is given by Quinn and Roberds (2007, 2014), who document how the Bank of Amsterdam eventually made its liabilities inconvertible and developed tools and policies (essentially open-market operations) to stabilize their market value (the *agio* or exchange rate between bank money and ordinary coinage). Bank money, principally used for large transactions and international commerce, were a fiduciary component of the Dutch and, more importantly, European monetary system, managed with goals (price stability) and tools (open-market operations) that are surprisingly familiar.

In sum, in the past there was such a thing as monetary policy, and though it was not conceptualized in the same way as today, some of the objectives and consequences were similar. We can still learn from what policymakers thought and did, and from how the economy reacted to their actions.

2.4 Not foreign, yet exotic at times

So far in this section we emphasized commonalities with the past. But we wish acknowledge that the past, while not wholly foreign, had exotic moments. We are used to fiat money being around

at all times, amply provided by authorities as needed. Commodity money imposes arbitrage conditions, and coins of a certain type could disappear at times (Sargent and Velde, 2002). We are also mostly used to a single currency per time and place. This took a long time to establish: until the 17th century it was common to authorize or tolerate the circulation of foreign coins. Before that, 'money' could in practice consist of a variety of objects with relative prices.

The fact that the past differed from the present may seem a limitation as to how much we can learn from it. However, we argue that these exotic aspects can be useful in guiding our thoughts; below, we offer two examples where this is the case.

When a single, seamless monetary object fulfills many functions at once, as it does today, it is harder to distinguish the potential importance of each. Does money's importance derive from its role as a medium of exchange, as the New Monetarist economics posits (Williamson and Wright, 2010)? Or is it its nature as storage of value or safe asset that matters? Or perhaps the last and most overlooked of the triad, the unit of account function, is the key? The past offers a way to separate the different functions of money and thereby to help answer these questions.

To that end, an interesting observation from the past when money was monies, and multiple objects of different sizes and metals coexisted, is the emergence of units of account. These were usually tied at their inception to a particular coin, but became disembodied over time — the "ghost monies" of Cipolla (1956). As long as coin X existed, using X as a unit of account was using it as numeraire in the Arrow-Debreu sense. But people often expressed prices and sums owed in X long after the coin had disappeared or ceased to have any intrinsic value. Values assigned to actual media of exchange, by custom or by law, would be expressed in terms of X. "Face value," in the literal sense of a number inscribed on the face of the medium of exchange, remains a rarity until the nineteenth century.[4]

Ghost monies are customs that spontaneously emerged, presumably to solve a problem. History also offers many examples of policymakers actively designing institutions to solve problems (Sargent 2008 warns us not to take either process as necessarily superior). The search for a better form of money took at times curious turns. The Scotsman John Law theorized in the early eighteenth century that a managed paper currency could improve upon the current commodity money system. He initially thought of land as asset to back his planned liability, but when he had an opportunity to implement his ideas in France, he had to deal with the risks posed to his currency by fiscal demands. One interpretation of the scheme that took shape in 1720 is that, by converting government debt into "government equity," he was disarming the fiscal theory of the price level (Velde, 2007a) and saving price stability from the demands of fiscal policy. It is thus a fascinating attempt at neutralizing the tension between the two.

2.5 Narrative arc

It is tempting (and we will not resist) to look back on the history of money for an encompassing narrative. The history of economic growth, dominated by the "hockey stick" graph of per capita income flat for millennia before taking off with the Industrial Revolution, neatly divides into "why not?" (before the break) and "how" (after). Monetary history does not seem so simple, although it might have, in earlier times. A scholar in 1913, where our review mostly ends, might have discerned a slow but sure evolution from multiple, disparate, and imperfect means of payment converging to a nearly-worldwide gold standard managed by efficient central banks following simple rules.

We know that the twentieth century disrupted this convergence, and perhaps turned the

[4]The experiment described in Velde (2009) was possible precisely because the unit of account was distinct from the medium of exchange.

story into the slow but sure emergence of multiple fiat monies.

We already discussed how coins circulated with a face value above their intrinsic value in some societies, hence having a fiat component. Paper money (sometimes, fiat) in medieval China lasted for longer than what it has so far lasted in the West.[5] In the early modern period, the Bank of Amsterdam discovered that it could separate the right to withdraw from the ownership of the deposit, and that it could manage the value of inconvertible deposits through open-market operations (Quinn and Roberds, 2014). From the mid-eighteenth century a number of European countries, such as Austria (Jobst and Kernbauer, 2016), learned to live with inconvertible paper money for decades. Convergence to the gold standard in the nineteenth century masked many discontents with the monetary system: John Maynard Keynes (1923, 172) decried it as a "barbarous relic" because of its resource cost and Irving Fisher (1911), like John Law and David Ricardo before him, thought that there were better ways to deliver price stability. Central banks were not merely following the "rules of the game" but engaging in domestically oriented stabilizing policies (Bazot et al., 2022).

Yet the past century and the current one don't quite give a sense of closure either. Hyperinflations appeared in the 1920s and haven't disappeared. The gold standard doesn't exist anymore, but attempts at establishing fixed exchange rates worldwide (the Bretton Woods system), region-wide (the euro and its satellites including French-speaking Africa), or locally (dollarizations, currency pegs) have persisted in a world of mostly floating rates, and the debate over the relative merits is not settled. This century has brought digital currencies and decentralized finance, with implications that are still unclear.

Perhaps, then, a better narrative than a progression from "monies" to "money", or the reverse, might be societies' constant search for the best form of money, combining safety, stability, and liquidity. Coins, having an intrinsic content, provide safety but often lacked liquidity, and were not always profitable to produce (Sargent and Velde, 2002). Many alternatives were explored over time, either by the private or the public sector, and much experimenting took place with the parameters of each alternative. The imaginary *scudo* traded at the fairs was more liquid than its physical counterpart. Credits on banks' ledgers also proved liquid, but to make them profitable safety had to be sacrificed, leading to the first public banks' attempts at combining the safety of coins and the liquidity of ledger money. One can hope that, along the way, knowledge has been built up from past experiences, but there is probably still more to be learned from the past.

3 What do we know, and how do we know it?

Monetary economists are guided by policy-relevant questions about real effects of money, transmission mechanisms of shocks, and effective monetary policy during crises. One way to address these questions, we argue, is by considering evidence from history—as the previous section established, this is not some remote and detached past, but *our* past, with instructive similarities and differences to today's monetary systems.

A first obstacle in consulting the past is the availability of information. Historical data may have been destroyed, lost, or stored in unknown corners of archives, relying on chance

[5]Paper money was widely used in the Sichuan province of China during the Song dynasty and during the Yuan it spread to the whole empire. Eventually silver convertibility was dropped, and hence money turned to fiat. This system worked with only moderate levels of inflation for decades, before fiscally-motivated monetary expansions did lead to high levels of inflation (von Glahn, 2006; Guan et al., 2022). Later, the Ming dynasty also had relied on paper and fiat money, albeit only for some decades before the system collapsed again, leaving China for several centuries without paper money (von Glahn, 2016).

for its discovery. Recently, however, a painstaking collection effort by historians and economic historians has led to a much improved availability of historical data.

To come to a better understanding of money based on historical evidence requires methodologies suitable to the topics under study. Here, history offers some unique opportunities. The usual starting point of modern monetary economics is that "real world experimentation is not an option. The only place we can conduct experiments is in structural models" (Christiano et al., 1999, p. 69). This quote is to be understood in the context of modern times, in which it is hardly conceivable that a central bank would experiment with its policy. Yet, history and fate sometimes colluded to provide unique (quasi-)experiments of a macroeconomic scale.

In this section we first review how macroeconomic data has been collected, and then review the methodologies applicable to the study of money in the past. Some of the methodologies are, in practice, almost exclusive to history. This includes occurrences of a quasi-experimental nature, which in principle can happen in the present, but in practice occur with such a rarity that the bulk is to be found in the past. Other methodologies are similar to those employed by papers that concentrate on the present or on recent history.

3.1 "Data"

We use the shorthand "data" for quantitative counterparts to economic concepts reconstructed from historical sources. The word literally means "that which is given," but data are not given: they are the result of hard work and assumptions. Constructing data is always conditional on theoretical choices, even if sometimes these are simple and in some cases not explicitly stated. An example is the use of interpolations or extrapolations for missing data. Using such pragmatic assumptions for historical data being reconstructed for the distant past is inevitable, and usually present to some degree in the reconstructions commonly used as outcomes, controls, or explanatory variables, such as real wages, GDP, population, or money supply.

Data is scarcer for the past than for the present, and more so for the further past, because sources disappear over time and because collecting the information that we would now need was then unfeasible or uninteresting. The idea of measuring the economy, as scientists measure physical phenomena, does not appear before the Enlightenment, systematic data collection only developed in the nineteenth century, and national income accounting in the twentieth. For earlier periods economic historians are constrained by what was collected and what survived. As a general matter, prices were more easily observed and readily recorded than quantities, and prices set in markets (such as those for commodities) in particular. Note also that, in the absence of statistical agencies, the taxman (and his auditor) is often the economic historian's friend.

Still, scholars are making steady progress: they discover new sources, use increasingly comparable methods, and put together long time series that extend modern concepts into the past such as real wages, GDP, population, interest rates, or money supply. But it is important to remember for what purposes the series were constructed and with what sources and assumptions, stated and unstated. The assumptions built into the construction may conflict with other assumptions made later in the analysis. Confidence may be safely placed in some features of the series but not others (e.g., levels versus variations). The precision or ambiguity of some concepts (wage, interest rate) may vary considerably with time and place.

For national income accounts, the Maddison Project Database (Bolt and Van Zanden, 2020) brings together multiple studies for individual countries, such as Broadberry et al. (2015) or Palma and Reis (2019). The data sources used by these studies include manorial records, probate inventories, and account books of long-lived institutions such as monasteries, hospitals,

universities, and landed estates. These can be used for reconstructing historical national income accounts over time. Two reconstruction methods have been used. Supply-side reconstructions use production data and take a value-added approach. Demand-side methods assume demand elasticities and flexible prices to estimate quantities from prices, wages, and rents. The latter demands less data but more assumptions, and has become popular. Fortunately, several studies such as Álvarez-Nogal et al. (2016) and Prados de la Escosura et al. (2022) in the case of Spain have confirmed the similarity of results from the two approaches.[6] Due to index-number problems, the levels of the national accounts series are in general less accurate than their growth rates over time.

Several studies have reconstructed money supply for past economies using a combination of data on flows, such as mint output, and stocks (Palma, 2018b; Kenny and Lennard, 2018; Chen et al., 2021; Karaman et al., 2020). For countries with a history of early centralization, it is at times possible to estimate both stocks and flows annually, using surviving information on recoinages, minting and printing (Guan et al., 2022; Chen et al., 2021; Palma, 2018b). Based on a variety of methods, Bonfatti et al. (2020) summarise several money stock estimates across early modern economies. This offers an insight into how money supply evolved across centuries, even though assumptions as those described above always need to be kept in mind, and data for some countries are more reliable than others. Nevertheless, it clearly emerges that money drastically expanded in the middle of the 16th century, when vast amounts of silver were imported by Spain from its colonies, dwarfing the amounts available to Europe before then (see also Palma, 2020a). Through trade and conquest, silver and gold made its way to other European countries in subsequent decades and centuries, increasing the money stock in particular of England, the Dutch Republic, and France. Gains in money stock were unequal across European states, and increased less in Eastern Europe than elsewhere.

Even with all its limitations, a glance at available long-run money, price, and output data allows for the immediate rejection of observational implications of certain models. For instance, in the case of England, price levels did not keep pace with money stock growth (Palma, 2018a). This challenges a naive interpretation of the quantity theory of money that prices move in tandem with money stock while everything else stays constant.[7]

3.2 Methods and Findings

So far we have described how we construct historical data from what the past has left us. To analyze the data we have constructed, we can use different methodologies. In this section we broadly distinguish between two types of approaches. Analysis of **natural and policy experiments**[8] turns sets of data into interpretable outcomes akin to those generated by experiments, under suitable assumptions. **Thought experiments and structural methods** impose eco-

[6] For a review of this literature and sources, see Jong and Palma (2018) and Palma (2020b).

[7] The equation of exchange MV = PY going back to at least David Hume is just an accounting identity. Assumptions give it content. Under the Cambridge cash-balance theory, for example, velocity is constant (at least in the short run) and hence so it is its inverse k=1/V, leading to a money demand formulation M = kPY which in equilibrium and assuming Y constant becomes equivalent to the quantity theory of money.

[8] We use the term "experiment" for simplicity of language. In the terminology of Dunning (2012, pp. 18-21), however, it would be more accurate to view them as quasi-experiments: the episodes we refer to are not caused by actual randomisation processes under the control of an experimenter, but instead by "as-if" randomness rooted in natural disasters or arbitrary differences in exposure to policy changes. Nevertheless, we stick to the term "experiment" for simplicity of language. These are, however, usefully distinguished from other techniques such as regression-discontinuity and instrumental-variables designs Dunning (2012, pp. 43-44).

nomic structure from the outset, although the degree of formalism can vary from loose narrative to full-blown estimable model. Within each type there is a lot of variation, and the boundary between the two is not sharp. What makes an assumption credible, for example, can depend to a large extent on our understanding of economic mechanisms: accepting an assumption as credible is a way of imposing some economic structure.

We see these approaches as complements to each other, in line with the view expressed in Nakamura and Steinsson (2018). Correlations evidenced in experiments can be interpreted as tests of models or even evidence of causal relations. Experiments may also, in some cases, allow estimation of parameters pertaining to a "sub-block" of the model. But models are needed to underpin our understanding of the transmission mechanisms behind observed events. They also allow quantification of effects and running counterfactuals. A policy cannot be assessed without comparing it to alternatives. We insist, however, that while the methods differ in their assumptions, neither is "model-free": experimental approaches, although rooted in data, rely on certain assumptions such as exogeneity, additivity of the error term, and specific stochastic distributions (see Monnet and Velde, 2021, for a discussion).

Natural and policy experiments

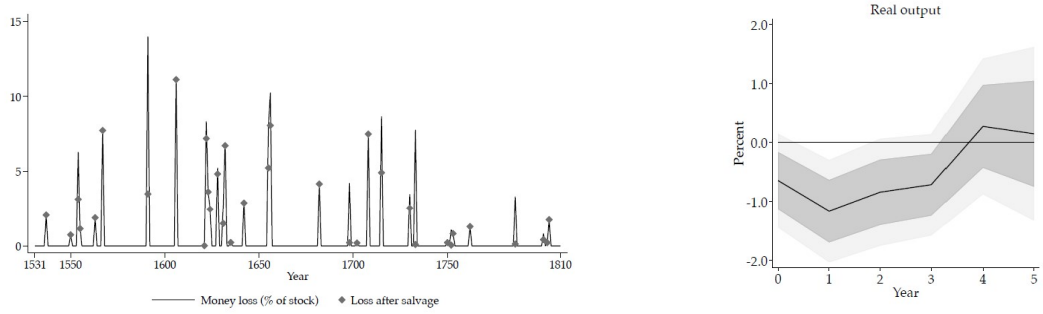
Experiments and quasi-experiments can be subdivided into natural experiments and policy experiments. Natural experiments are, in the best of cases, the product of nature itself, or at least the result of decisions made without economic considerations. Policy experiments result from deliberate actions of the (economic) policymaker, but can still be informative. Given that all that history gives us is observational data, natural or policy experiments exist only to the extent that economists and economic historians find plausible case-studies.

Natural experiments Conventional wisdom asserts that monetary economics does not admit natural experiments—monetary policy, and therefore the supply of money, is simultaneously a function of the (present and future) state of the economy, as well as a cause for changes in the economy. This statement rings true for modern economies: policymakers' control of the fiat money supply has few physical constraints (though one could imagine freak accidents destroying large amounts of paper money).

In the monetary systems of the past, money required precious metals. Their availability was subject to shocks. The large ones are famous: Diego Gualpa's finding silver on his hands after falling on the slope of a mountain near Potosi in 1543, James Marshall spotting gleaming nuggets of gold in a Californian stream in 1848.

Over the early modern period and beyond, much silver and gold was produced in the Americas (Palma, 2020a). The accidental variability of silver and gold resources was exploited by Palma (2022) to study the real effects of money in early modern Europe. The paper uses the production of precious metals in the Americas as exogenous variation for commodity money across six early modern European countries. Silver and gold in the Americas was mined according to the availability of new technology as well as the discovery of new mines. Importantly, mining intensity was not a function of local conditions in Europe. The study concludes that increases in the availability of money increased real GDP across first-order and second-order receivers, though more so for the former than the latter. The effect persisted for several years, as prices adjusted sluggishly.

Brzezinski et al. (2024) exploit a different source of randomness. Maritime disasters occasionally destroyed ships containing precious metals on the way from the Americas to early modern Spain, affecting the Spanish money stock. These disasters mainly occurred due to ad-



(a) Loss of precious metals

(b) Response of real output

Figure 2: Loss of money due to maritime disasters (panel a) and response of real economy to a money inflow shock equivalent to 1% of money stock (panel b) in the Spanish empire, 1531-1810. ©2024 by the President and Fellows of Harvard College and the Massachusetts Institute of Technology.

verse weather events, such as hurricanes, constituting a repeated natural experiment. Panel (a) of Figure 2 shows the money loss series as a proportion of Spain's existing stock, taking into account the fact that sometimes some of the precious metals could be salvaged (grey diamonds). In the period of 280 years considered in this paper over the 16th-19th century, 33 such disasters occurred. On average, maritime disasters resulted in a 4% contraction in Spain's money stock. Panel (b) shows the response of real output to a decline of money inflow equivalent to 1% of the stock. Real GDP declined for several years after maritime disasters, peaking at a decrease of 1% after one year. Analysis of transmission mechanisms shows that prices responded sluggishly and that the maritime disasters led to a shortage of liquidity, manifesting itself in higher interest rates.

Policy experiments Policymakers experiment in their minds, or their models, all the time. Choosing a policy means deciding between various courses of action whose consequences are evaluated. Sometimes, actual events can be interpreted as if they were such experiments. We can learn from their learning and policy mistakes if we study the past.

Richardson and Troost (2009) is an example. In 1930 the state of Mississippi was divided into two Federal Reserve districts. In other respects the two regions were homogeneous and of little importance to each Reserve Banks in charge of the respective region, so local conditions would not shape their policy stances. The two Reserve Banks differed in their ideology which shaped their policy stance. The Atlanta Fed followed Bagehot's dictum: to accommodate a financial panics, it should act as a lender of last resort and swiftly provide liquidity to afflicted banks. The St. Louis Fed followed a real bills doctrine in which lower economic activity requires less access to credit. Given the stated assumptions that local conditions across the two Fed districts where exogenous to the different policy stances, The distinct actions of the two Feds are akin to one Fed experimenting with two possible courses of action.

At the onset of the Great Depression, the ideological disparities across the two Fed districts within Mississipi led to different monetary policy responses. One part of Mississippi saw an increase in liquidity and emergency loans, while the other saw limited lending and high collateral requirements. The policy differences led to a different trajectories during the financial panic. Figure 3 shows the evolution of banks 'in business' (i.e. not bankrupt but potentially temporarily suspended) and 'in operation' (i.e. not bankrupt and open) across the Atlanta and St. Louis districts. After the onset of the Great Depression marked by the collapse of Caldwell

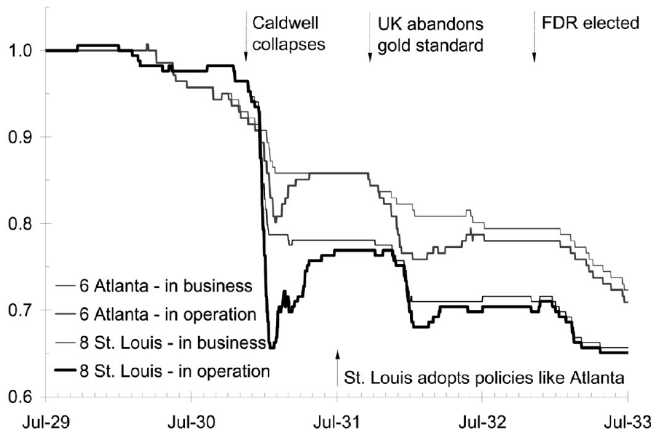


Figure 3: Banking activity after Great Depression onset across Federal Reserve districts ©University of Chicago Press.

(first downward arrow in the figure), the proportion of banks in business fell in both districts; further falls (marked by further downward arrows in the figure) were experienced when the UK abandoned the gold standard and when Roosevelt was elected.[9] The key takeaway from the figure is that, across these episodes, banks in the Atlanta district faced much fewer closures and suspensions than those in the St. Louis district. Against the backdrop of the Atlanta Fed's more interventionist monetary policy, this suggest that monetary intervention mitigated the banking panic. Indeed, once St. Louis adopted Atlanta-like policies in July 1931 (upward arrow in the figure), the difference in bank closures across the two districts became smaller.

A much earlier policy experiment on a macroeconomic is analysed by Velde (2009) for eighteenth century France. Policymakers decreased the nominal value of coins three times by a cumulative 45 percent in 1724, and then increased it by 20 percent in 1726. The changes occurred without prior announcement and overnight, which was possible since at the time the nominal value of coins was decided by decree. This experiment was neither natural nor random: indeed, the policymakers had clear economic goals, to reduce prices back to an earlier level. They also had a clear model, namely instantaneous adjustment of prices and neutrality of money. What makes the episode of interest is the uncanny resemblance to a classic thought experiment in monetary economics: the money balances of all agents are all proportionally altered at the same time. Figure 4 shows the changes in the nominal value of money alongside the price of goods over the course of the policy experiment, where both indexes are normalised to 1 for January 1724. Detailed data on prices exists for this time period as policymakers were keen to track the effects of the policy. In 1724, the nominal value of coins decreased in three steps, indicated by the first three downward arrows in the figure. An increase in the nominal value followed in 1726, indicated by an upward arrow. Policymakers expected that prices would adjust in line with the changes in the nominal value of the coins—they expected money to be neutral. In terms of the figure, under this hypothesis, the price index of goods should move in tandem with the currency index. However, the figure shows that commodity prices departed from the currency index for several years. The paper also documents that wages were slow to adjust, and that a severe industrial contraction ensued. Prices adjusted immediately in one market only, that for foreign exchange. Puzzled contemporaries proposed various explanations for the failure of markets to adjust to the change in nominal money supply, prominently coordination problems

[9]See also Eichengreen (1992) for evidence linking the gold standard to the Great Depression. Countries which abandoned the gold standard earlier recovered faster.

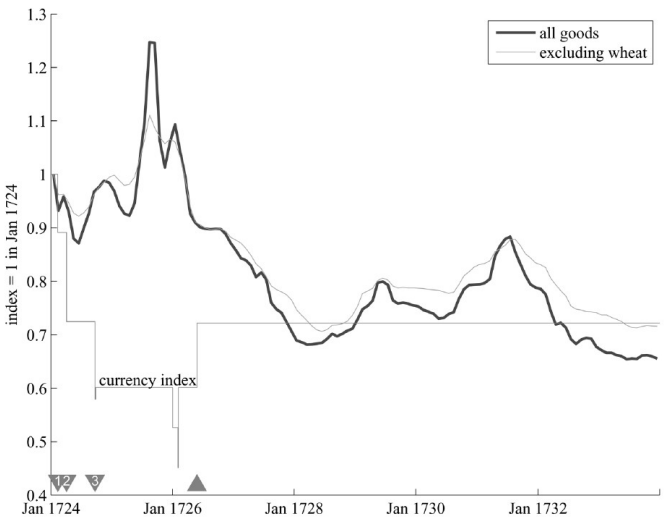


Figure 4: Changes in the currency versus changes in prices ©University of Chicago Press.

and expectations of future policy changes.

Thought experiments and structural methods

Given the scarcity of natural or policy experiments, economists and economic historians have turned to "constructing" their own. Such approaches differ in the extent to which they impose theoretical assumptions. They range from identifying monetary policy shocks from the qualitative historical record, to finding suitable instrumental variables, building counterfactuals from countries not exposed to shocks, and running simulations within structural models.

"Narrative approach" of identifying monetary policy shocks. One way to overcome the endogeneity of money supply to economic activity is to isolate monetary policy changes that did not occur in response to the real economy. This "narrative approach" goes back to at least Friedman and Schwartz (1963) seminal work on US monetary history, later revisited and formalised by Romer and Romer (1989, 2004).[10]

Conceptually, the narrative approach sits between the (quasi-)experiments reviewed above and the other thought experiments reviewed below. While natural and policy experiments are generated by as-if random variation in the weather, institutional settings, and other "accidents", the monetary policy changes considered in the narrative approach did not occur for random reasons: instead, they had very particular goals in mind. Some of these policy changes, however, may be out of line with economic fundamentals — in the judgement of the researchers who review them. It is this arguably relatively strong element of judgement that distinguishes the narrative approach from the policy and natural experiments reviewed above.

Friedman and Schwartz (1963) identify several episodes where monetary policy was in their view strongly out of line with economic fundamentals in the interwar period, finding real effects of such money supply shocks.[11] Romer and Romer (1989) formalise this approach and re-examine the interwar period analysis of Friedman and Schwartz (1963), as well as additional periods in the

[10] See also, for the United Kingdom, Cloyne and Hürtgen (2016).

[11] As discussed in Romer and Romer (1989, p. 125), the authors also find additional episodes before the interwar period, which are less clear-cut monetary policy shocks.

post-war area. To more formally conduct their analysis, they specify their selection criteria for the episodes they analyze: monetary contractions that occur for the explicit reason to reduce inflation, and are not driven by considerations of aggregate output. The authors assert that "there appears to be no plausible channel other than policy through which trend inflation could cause large short-run output swings" (Romer and Romer, 1989, p. 134-135). The authors find, again, strong and persistent effects of money supply shocks on the real economy, both for the inter-war and post-war period.

Instrumental variable approaches and the Trilemma of International Finance. While interest rate movements are in general not random, they sometimes occur due to reasons beyond the control of the monetary authority of a country. This is true in countries that have pegged their exchange rate to a 'base' currency and allow for free capital movement, which must follow the interest rate movements of their base country to keep their exchange rate fixed. Using changes in base interest rate for countries on a pegged exchange rate, Jordà et al. (2020) pursue an instrumental variable approach for a sample of 17 advanced economies over 1870-2006. The results suggest that monetary shocks have real and persistent effects. The validity of their approach crucially depends on the exclusion restriction: conditional on controls, the changes in base interest rates must change outcome variables only by affecting the interest rate of the country under analysis.

Synthetic controls. Monetary policy usually affects a country as a whole, with some remarkable exceptions discussed above. There is therefore no suitable control against which the effect of a policy can be judged. An approach to construct an experiment out of existing data is to create a "synthetic control" or counterfactual, based on a group of countries who were not subject to the event being analyzed. The main assumption is then that the thus constructed 'doppelganger' mimics how the country under study would have behaved if it did not experience the policy shock.

Charotti et al. (2022) exploit a synthetic control method to gauge the long-term effects of increases in money stock in early modern Spain. The Spanish Empire imported vast amounts of silver starting in the middle of the 16th century, in amounts that dwarved existing European money stocks. When compared to a synthetic control consisting of other early modern countries, the authors find that the real effects of this monetary expansion was positive across the first century, but turned negative after 150 years. Similar results are found in Kedrosky and Palma (2024) for the case of Portugal, which saw increased economic activity for the first half a century following increased inflow of gold, but declined activity thereafter.

Structural methods. The approaches discussed so far were mainly empirical in nature—which does not imply that they are model-free. In particular, the exogeneity assumptions necessary for inference presume certain relationships, or lack thereof, between variables. Other approaches, however, work by imposing significantly more structure, i.e. by explicitly specifying a fuller model of the economy. Structural methods are prevalent to studying monetary policy in the post-war period, but examples exist for earlier times. Christiano et al. (2003) construct a dynamic stochastic general equilibrium model of pre-WWII US and fit it to data from the 1920s and 1930s. They re-examine the Friedman and Schwartz (1963) hypothesis that the monetary policy regime significantly contributed to the Great Depression. Their counterfactual analysis confirms the view that a more expansionary monetary policy would have resulted in a smaller output collapse under the Great Depression.

For the early modern period, Palma and Silva (2024) show using a quantitative dynamic

general equilibrium model that American precious metals were the key driver of early modern Euro-Asian trade. A structural model permits unbundling the effects of the simultaneous discovery of precious metals and new trading routes. The authors show that precious metals were at least as important as the new routes for explaining intercontinental trade. Testable predictions of a different sort are derived in a model of early modern Spain by Drelichman (2005). The author builds an open economy model which predicts a Dutch disease effect: discrete regime changes in exchange rates after wealth shocks are realised. The model is useful in this context as it makes it possible to test for Dutch disease effects using only observable price and expenditure data, without needing to data on unobservable wealth. The author finds evidence for discrete jumps in the ratio of prices between tradable and non-tradable goods around big changes in the import of monetary silver, consistent with a Dutch disease. Calibration of the model suggests that the Dutch disease effect significantly contributed to early modern Spain's decline in economic activity.

Structural methods need not take the form of full-blown estimated or calibrated models. Sometimes a simple use of models allows a proper reading of pure time series.

As we said, money has been a regalian right and a potential source of revenue for centuries. Hence the interdependence of monetary and fiscal policy emphasized by Sargent and Wallace (1981) has been at play for a long time. It follows that a proper understanding of the current arrangements is required to interpret long monetary time series, or even short ones. Is money pegged or backed, and if so how? What movements in the government's budget constraint might lead agents to expect a change in such arrangements? Figure 5 (Sargent and Velde, 1995) makes the point. A simple pair of time series (money and prices) tracing the life of the paper money issued in France from 1789 to 1796 requires three theories for three regimes. The first regime (circles on the figure), was one of a fully backed currency. Movements in real monetary balances were associated with little changes in inflation; a model of fully backed and credible money easily makes sense of this observation. What followed was a large fiscal shock that and large increases in real money balances (crosses); the absence of inflation is explained by a "guillotine-backed" regime that forced money holdings. Finally, things unravelled in the third regime (stars), with an increase in inflation as people get rid of money. This is consistent with a classic "Cagan-style" collapse in money demand.Regime changes can create sharp discontinuities in the relations between endogenous variables through expectations (Sargent, 1982). Soon after, across the Channel, a large monetary expansion in the United Kingdom did not lead to high levels of inflation due to the credibility of the Bank of England and the sovereign debt that it held as reserves during the age of the paper pound (Bordo and White, 1991; O'Brien and Palma, 2020, 2023).

4 Past, Present, Future

The previous section presented a range of tools that have been used in empirical work, and highlighted a number of findings. We wish to open up the panorama by returning to the questions raised in the first section, and hopefully provide both a vindication and an invitation. First, what can we learn from history that we wouldn't know otherwise? Second, what remains to be explored?

4.1 This time isn't different

The phrase "this time is different" (Reinhart and Rogoff, 2009) epitomizes the unfortunate inclination to neglect the past when, in fact, any analysis of the present ought to be confronted

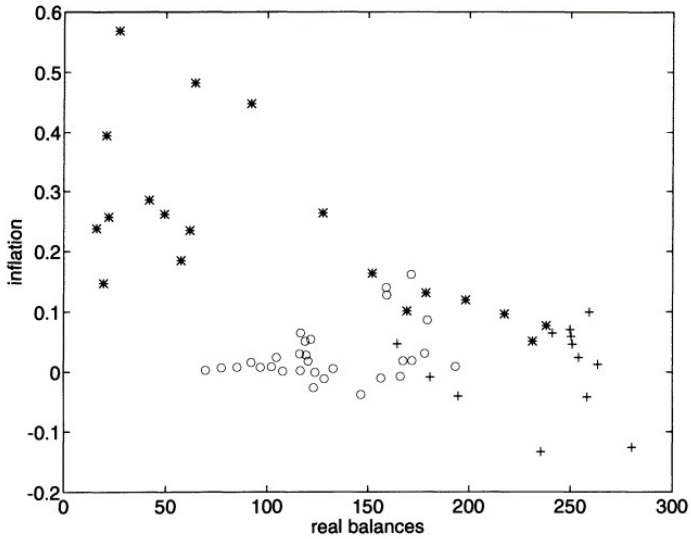


Figure 5: Scatter plot of the logarithm of the inflation rate on the vertical axis, vs. real balances of assignats, on the horizontal axis. Three time periods are distinguished: circles from January 1791 to July 1793, crosses from August 1793 to July 1794, stars from August 1794 to March 1796. Source: Sargent and Velde (1995, 498). ©University of Chicago Press.

with it, if only as a gut-check. Here, we return to the perennial monetary questions raised in our introduction, and discuss how a close reading of history allows us to draw insights we wouldn't have had otherwise.

Price stickiness and its causes. Let us start with the example of price "stickiness," which has been extensively investigated empirically, is embedded in mainstream macroeconomic models, and underlies our understanding of the real effects of money. The work we reviewed corroborates that changes in money supply affect the real economy for several years (Velde, 2009; Palma, 2022; Brzezinski et al., 2024), confirming that price stickiness is not a modern phenomenon. In some cases the effect sizes are remarkably similar to modern estimates. Yet, the historical perspective affords more than just a confirmation of previously known results. It shows that price stickiness is not a modern phenomenon, but deeply ingrained in money markets across different local characteristics. It gives a chance to consider some low-frequency natural and policy experiments, which are rarely, if ever, afforded in modern times. And, it allows to study monetary effects over longer periods of time. Some recent studies suggest that money may have long run consequences, spanning multiple decades and determining the long-run evolution of states (Bonfatti et al., 2020; Chen et al., 2022; Kedrosky and Palma, 2024; Charotti et al., 2022).

The fact that history confirms the presence of price stickiness, however, should not comfort us in our usual assumptions. Determining plausible causes for price stickiness is as elusive a task for historical periods as today; however, some natural experiments form the past offer guidance on what mechanisms cannot explain price stickiness. Indeed, Velde (2009) points out that most mechanisms proposed to account for price stickiness do not apply in his context: neither menu costs nor rational inattention, for example, can explain why prices of most commodities (but not financial prices) did not react fast (especially downwards). The remaining explanations are hence expectations and a coordination problem, e.g. the fact that someone in a production chain

cannot easily change their price individually. Likewise, labor unions or staggered contracts will not explain sticky wages in early modern Europe (Palma, 2022; Brzezinski et al., 2024).

Private versus public money. Another topical example is the proper boundary between public and private. The basic template of economists to handle this question is to look for market failures and remedy them, with due attention paid to incentives. Money, in the broad sense, is still a contested topic, perhaps because it is not so easy to pin down the friction that gives rise to money, and therefore the market failure to remedy. It may also be because due attention needs to be paid to the regulator's incentives, in particular the intertemporal government budget constraint. The Great Financial Crisis and the emergence of digital currencies has brought to the fore the question: Who should provide liquidity and safe assets?

These are age-old questions. Responsibility for providing a medium of exchange and a standard of account always rested with the state as a matter of principle, and it is not hard to read the arguments made historically in terms of, say, coordination externalities. But the State only gradually, and perhaps reluctantly, ventured into providing liquidity and safe assets. Sometimes, because of costs, it was derelict in its duties to provide smaller denominations, and the private sector readily filled the gap left in the denomination structure (Selgin, 2008). The private sector could also organize provision of liquidity in emergency situations (Calomiris and Kahn, 1996). But, importantly, private moneys entered the economy when there was a gap to fill (usually in the span of denominations), and they remained there for as long as the gap was there. Private monies never replaced public monies entirely, and their existence attests the latter's occasional shortcomings more than the former's deep superiority.

Proponents of private digital currencies argue that the gap to be filled is not denominational but conceptual: what is missing is a state-independent and anonymous currency, but the reality of that gap is far from clear. It may well be, but the burden of proof that "this time is different" is on the advocates of private money. As for central bank-issued digital currencies (CBDC), the question may simply be one of technological change. History shows that a variety of technologies have been used over time; which could be used at any time depended in large part on its capacity to counter the threat of counterfeiting, an issue at the core of digital currencies' design. Central banks, or their predecessors, sometimes innovated but more often adopted private sector technologies (the ledger, notes) to meet their mandates. The future of CBDC may well be an example of the latter.

The main functions of money. Of the three traditional functions of money, the unit of account is the least studied. New Keynesian models in their "cashless limit" still retain the unit of account: the central bank's role is only to alter at will the relative price of units of account over time, via the nominal interest rate. One reading of history is that merging the varieties of media of exchange into a stable unit of account has been difficult, but the need for a nuit of account was relentless. But why are units of account so pervasively used, when indexing or pegging to other objects is usually available? This question has been studied theoretically by Doepke and Schneider (2017) but there remains more work to be done. Even nowadays, governments provide indexed bonds but their success is limited and agents seem to prefer nominal debt. This is no doubt related to the role of money as legal tender, the ultimate instrument that will always discharge a nominal debt. Here

legal history also has a role to play. Money is also a legal construct. The law needs specify how to discharge a debt or fulfill a contractual obligation, and which monetary objects can be used for those purposes. The law shapes expectations and, in a game-theoretic setting, defines alternative paths. Monetary theory, however, usually tries to make money emerge out of a purely physical environment without laws, contracts, or courts. Conversely, the nature of money in the law is strangely opaque, taken as a given by lawyers and making its appearance only as incidental to technical problems (Ernst et al., 2016).

Achieving price stability Policy makers in the Middle Ages thought of monetary stability as a natural goal, money was the measure of all things. At the same time altering money has real consequences, some of which a policymaker with more pressing concerns might find attractive. Altering money is also easier in practice than raising taxes, especially for governments with limited enforcement. It is not surprising, then, that the use of money as a fiscal resource is about just as old as money. Price stability was not easy to achieve with multiple metals, denominations, and units, but these problems pale in comparison with the results of fiscal policy interference.

This reading of medieval and early modern history carries over when different institutions, public and central banks, and different media of exchange, without intrinsic value, appear on the scene. The value of these media will depend on the expectations that the commitments to redemption or self-restraint backing them can be fulfilled.

4.2 Call to arms

History portrays money in its many facets, some of which are permanent, some short-lived, and some reoccurring. Money has always been adapted to new circumstances in inventive ways; any hope of understanding how it will evolve into the future can only be founded on an understanding of its past. We hope that our review can serve as call to arms to future economic historians and economists, to reach into the depth of knowledge stored away in archives and waiting to be uncovered. We will not give a list of items to be investigated, as it is difficult to conceive of topics where history does not have a new and interesting insight to offer. In the examples we covered, we showed that history offers unique opportunities to better understand why money has real effects, what policies succeed or fail to stabilise prices, or how monetary policy depends on the state. Much remains to be researched on these topics; other topics of interest were omitted by our review, but are of no lesser interest. The distributional effects of monetary policy, for instance, receive increased interest, and some historical studies show that such effects were pronounced centuries ago.[12] Another avenue for fruitful research is the political economy of money. We need to understand better the trade-offs between fiscal and monetary policy faced by governments under spending pressures: which circumstances lead governments to choose monetary manipulations or inflation over taxation? Monetary history is rich in such case studies.

Beyond enriching empirical analysis, history also informs our models of money. Rational expectations imposes, in Sargent's 2008 phrase, a "communism of beliefs": all agents,

[12] Brzezinski et al. (2024) show that in early modern Spain monetary shocks hit lower-skilled agricultural workers and builders, who were often employed on a temporary basis, more than higher-skilled workers.

including the government, understand the correct model and form correct beliefs about the data-generating mechanism. As we have argued, the history of money looks more like a long process of collective learning about the properties of money under different regimes. The process of learning comes about through an interaction between agents' actions, based on possibly mis-specified models, and learning from the data generated by these actions. It is therefore crucial to understand under what models choices are made: only against these models can their actions be judged as successes or failures, dead-ends or breakthroughs. Learning from policy mistakes from the past is less costly than learning through repeating them in the present.

5 Conclusion

Money has existed for millenia and puzzled policymakers and intellectuals for centuries. Ignoring historical evidence on monetary effects does not only reduce the evidence base available for testing economic models—it also throws out centuries worth of debates and thoughts on the topic. Policymakers of the past may not have had access to most recent advances in structural modeling, but they certainly had economic models in mind when shaping their respective economies with their actions—and they had unique insights into their domain of operation that we lack today. For monetary economists, the unit of observation is of a macroeconomic scale, severely constraining the evidence pool. And monetary shocks of a (quasi-)experimental nature occur at very low frequencies. Monetary economists simply cannot afford to ignore past evidence, nor past debates, when trying to understand why money works in such mysterious ways.

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