The State, the Market and the Euro

Chartalism versus Metallism in the Theory of Money

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1. The two concepts of money: Implications for the analysis of optimal currency areas

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1. INTRODUCTION

Much of the economic analysis and assessment of the comparative advantages and disadvantages of moving to a single currency, euro, area in Europe has been undertaken within the context of the Optimal Currency Area paradigm. This, in its turn, is the spatial/geographic facet of the currently dominating model of the nature and evolution of money. This latter views money as having developed by a process whereby the private sector has sought to minimize the costs of making exchanges in the process of trading. In this chapter I shall argue, first, that there is a second, alternative approach to the story of the evolution and nature of money, which is historically and empirically more compelling. Next, I shall claim that this second approach is far better able to predict and explain the observed relationship between sovereign countries and their associated currencies than is the OCA model.

There has, in fact, been a continuing debate between those who argue that the use of currency was based essentially on the power of the issuing authority (Catalysts)—that is, that currency becomes money primarily because the coins (or monetary instruments more widely) are struck with the insignia of sovereignty, and not so much because they happen to be made of gold, silver and copper (or later of paper)—and those who argue that the value of currency depends primarily, or solely, on the intrinsic value of the backing of that currency (Metalists). A common debate exists between those who argue that money evolved as a private-sector, market-oriented, response to overcome the transactions costs inherent in barter (let us call them Mengerians), and those who again argue that the state has generally played a central role in the evolution and use of money (Catalysts).

There is little doubt that the M team has assembled the more illustrious collection of economists (plus the endorsement of Aristotle and Locke), and has expressed its analysis in more formal and elegant terms, from the earlier economists such as Jevons (1875), and Menger, via Mises (1912/34), Brunner
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The key relationship in the C team model is the duality of the link between political sovereignty and fiscal authority on the one hand and money creation, the mint and the central bank, on the other. A key fact in the proposed euro system is that the link is to be weakened to a degree rarely, if ever, known before. A primary constitutional feature of the European Central Bank (ECB) is to be its absolute independence from government (at any level). Meanwhile, the political and fiscal powers of the various European institutions (Parliament, Commission, and so on) at the matching federal level are far weaker (than has been the case in other previous federal states). That, in itself, raises constitutional and political issues, such as what would happen if the wishes of the community, expressed through its various (democratic) institutions, did not coincide with either the objectives or the operations of the European System of Central Banks (ESCB)?

Within the euro area, the main political and fiscal powers are, instead, to remain at the level of the nation state. Historically the nation states have been able, in extremis (whether in the course of war or other — often self-induced — crisis), to call upon the assistance of the money-creating institutions, whether the mint via the debasement of the currency, a Treasury printing press, or the central bank. Wherever states (as in the USA or Australia), provinces (as in Canada), cantons, lands, and so on, have joined together in a larger federal entity, both the main political, the main fiscal and the monetary powers and competences have similarly emigrated to the federal level. The euro area will not be like that.

In particular the participating nation states will continue to have the main fiscal responsibilities; but in the monetary field their status will have changed to a subsidiary one, in the sense that they can no longer, at a glitch, call upon the monetary authority to create money to finance their domestic national debt. There is to be an unprecedented divorce between the main monetary and fiscal authorities.

The thrust of the C team’s theoretical analysis is that this divorce is all to the good; indeed it is largely the purpose of the exercise. The stance for recent inflation has been placed on political myopia, via the time consistency analysis, and the ability of the political (fiscal) authorities to bend and misuse monetary powers for their own short-term objectives. While there is much truth and realism in this analysis, the C team analysis worry whether the divorce may not have some unforeseen side-effects.

2. ON THE NATURE AND ORIGINS OF MONEY

Many economists and historians have noted the severe transaction costs involved in barter, and also the advantageous characteristics of precious metals...
as a medium of exchange (for example durability, divisibility, portability). Clower (1969) is a good example. This conjunction has led numerous economists to construct models showing how the private sector could evolve towards a monetary economy as a function of a search for cost minimization procedures within a private sector system, within which government does not necessarily enter at all. Kiyotaki and Wright (1989 and 1993) provide the current state-of-the-art examples of such models. Menger's work from the Economic Journal, 1892, is, perhaps, the most quoted early example.

Apart from their lack of historical support (not that any such has usually been considered to be necessary), the main drawback of such models is that they fail to recognize the informational difficulties involved in figuring out what precious metals deserve to be used as money. As I have previously noted (1989, 34),

Precious metals in an unworked state have been used as a means of payment in exchanges only under special circumstances — e.g., in the various gold 'kings' of the Renaissance and Klenzke — and even then the output, immaterial, for example, in a film by Charlie Chaplin, of which the闻名的 and barter system was used, and not necessarily accepted as payment, suggests that payment in unworked precious metals has more in common with barter than with a monetary system.

When the ordinary person goes into a jeweller’s shop, he (or she) has very little chance to judge the fineness, or weight, of a gold or silver object put before him. We usually take on trust the jeweller’s claims about the items involved, supported by the fact that the claim is potentially objectively and independently verifiable, and that the jeweller’s reputation depends on such verifiable claims being upheld.

Nevertheless the cost, and time involved, in such verification is not small. The whole thrust of Aichel’s paper (1979) is that money arises as a result of the existence of a good whose identification costs are low. But the cost of identifying the quality of either unworked or fabricated precious metals for the ordinary person are high. An individual could, of course, go to a money-changer for expert advice, but that would also involve costs. So such costs were probably higher, for example, the cost of identifying the value of items in common daily use, for example salt, corn, nails or even perhaps stools (most people in a rural agricultural community would reckon to be able to assess the value of a cow). Likewise such costs are again greater than the cost of assessing the value of an item which is acceptable by being part of a set of items needed for some intra-societal function (for example religious or wedding). Grierson (1970/1977) is a leading advocate of this latter view (see Appendix A); also see Einzig (1949-1966).

The above argument may appear to be a straw-man, few people argued that precious metals would be used as a medium of exchange currency until the identification problem was largely resolved by the technical innovation of a mint process whereby the identification costs could be drastically reduced by means of stamping a quality guarantee upon a coin (see Appendix B). The argument is that a combination of the intrinsic characteristics of the precious metals, plus the identification cost reduction allowed by minting, enabled the private sector to evolve towards a monetary system.

Again, however, that analysis is historically flawed. Although, once the idea and technical process is discovered, minting would seem to be as capable of being done within the private sector as any other metal-working process, in practice minting has, in the vast majority of cases, been a government, public sector, operation. Amongst the experts on the historical evolution of minting coins are Macdonald (1910), Grierson (1970/1977, 1979) and Craig (1953). These authorities, in turn, refer to texts of other earlier writers. In those cases where the mint has been run by the private sector, the government has in most cases both set the standards of fineness and extracted a rent, or seignorage tax, that collected most of the available profits. This concentration of minting under the government’s system is not accidental. There are two associated reasons why this is so.

First, a mint requires an inventory of precious metals. It will, therefore, act as a magnet for opportunistic theft and violence. It will require protection, and the protector (who wields the force necessary to maintain law and order in the economic system) will therefore be able to extract most of the rent from the system.

Second, the costs of identifying the true value (quality) of the metals included in the minted coin leads to time inconsistency. The mint operator is bound to claim that that quality will be maintained forever, but in practice will always be tempted to deceive the currency in pursuit of a quick and immediately larger return. Olson (1965) has described how the development of a secure, dynamic regime reduces the inconsistency in the value (see also McCleary and Olson, 1956).

Few inventors are made by government bodies (except perhaps within the military field, for example the Manhattan project). This has also been the case in the monetary field. The metallurgical developments and the invention of banknotes in China and the West, came initially from the private sector. But money’s initial role as a means of payment, for example, prices, was recognized and to an extent (probably partly from the case of exchange), and its role in facilitating the fixed habit of government (discussed further later), meant that government made the monetary process, for example the guaranteed through minting of the fineness and at the cost of the weight of the coins, into a pillar of the sovereign state.

There is, as set out by Grierson, a further argument leading to the same conclusion. Society cannot work if violent behaviour is too prevalent. Some people will always be violent. An initial act of violence provides a warning and a possibly endless feud. Feuds destroy society. One early crucial function of
money, wergeld, was to set a tariff whereby the relatives of the initial offender could recompose the damaged party. This practice spread to other interpersonal relationships (bride-price, slaves), in some cases before formal markets and the use of money in trade arose. See also Eadwine 21: 32 and 35 and Deuteronomy 22: 13–19; 28–29. Kleinman (1987b, 251–87) describes such compensations.

I take this as a minimisation assumption that the establishment of law and order involved and requires a governance structure. Others, for example Benson (1990), do not accept that; it is, indeed, a major underlying issue. If law and order, the enforcement of contracts, and the whole infrastructure of settled behaviour that makes markets (and money) work is really independent of the governance structure of our societies, then the M team approach becomes much weaker — the more so, if governments are actually formalised to such necessary infrastructure. But to me, the concept that the existence of law and order is independent of government seems pure (anarchist) wish-fulfilment.

What is remarkable when reading the various histories of mining and currency is the correlation between strong kings (for example Charlemagne and Edward I) and successful currency reforms. Naturally, however, the temptation to debaise the currency increases when (external) pressures threaten the continuing life of a government. Thus Henry VIII's debasement was related to war with France and Scotland at a time when 'The Exchequer's poverty was extreme...' (Craig, 1953, p. 108). For a splendid account of how that process (currency debasement) worked in practice, see Sargent and Smith (1993). Glaser (1989 and forthcoming) emphasizes the value to governments facing military crises of having control over money creation.

Under the C view of money creation, the collapse of strong government would lead to the cessation, or devaluation of the quality, of minting and a reversion towards barter. Under the M view, once the private sector has established a monetary equilibrium, thereby much reducing transaction costs, there is no conceivable mechanism within the model which would lead back to barter. Let us look at history. In Japan, for example, 'rice and fabrics had been commonly used as a medium of exchange after the government ceased the mintage of coins in 928 AD...'. (Seno, 1996). Also, 'by the end of the tenth century, money circulation ceased and the economy regressed back to a barter economy' (Cargill et al., 1997).

In Europe, during Roman times, all coins were minted on the state's account; according to Crawford (1970), the fiscal needs of the state determined the quantity of mint output and coin in circulation. As Redish (1992) notes, however, (1990) has recently simplified this view suggesting that there was no one-to-one correlation between state expenditures and new coinage. If the state acquired bullion at might be coined even in the absence of fiscal need. On the other hand, expenditures could be met by older issues, for example, coins received in taxes.

In any case, when the barbarians submerged Rome, strong government disintegrated. Both governments and mints fragmented into weaker, smaller units. MacDonald (1945) describes the process (see Appendix C) as does Craig (1953), who also notes that amongst the ruling classes operating mints at this time were Lords Spiritual, as well as Temporal. With governments being weaker and less secure, their currencies became of lower quality, more likely to be debased, and less acceptable in commerce (much of the minting that occurred was not to finance trade, but for Danelods and other hoards (military) relationships between power centres). Meanwhile most, but not all, commercial relationships reverted to barter. This decline was halted by Charlemagne and his successor, Louis the Pious.

It is only when a settled and strong government has been established that the authorities can offer both a sufficiently long time horizon and the necessary control to establish a high quality mint. At the same time the creation of money greatly eased and benefited the authorities' fiscal position, as well as much reducing transaction costs for the general public. This may have been so even at the very outset of coinage; as Redish (1992) notes (also see Grierson, 1970/1977).

Numismatists believe that the earliest coins were produced at Lydia (now Western Turkey) in the mid-seventeenth century bc. The coins were made of electrum, a naturally occurring alloy of gold and silver. They had a design on one side and were of uniform weight but had a highly variable proportion of gold. In an influential article Cook (1958) argued that these coins were introduced to pay mercenaries, a thesis modified by Kopy (1964) who suggested that governments wanted coins to pay mercenaries only in order to create a medium for the payment of taxes. Both interpretations stress the role of the government in the introduction of coinage.

The linkages between the creation of currency and taxation are multifaceted, and the subject deserves a major study in its own right. It is largely because of the domination of the M theory's denial of the importance and necessity of such link for the creation of money, that this has not been forthcoming. First, without money, it would be hard to place taxes on anything other than the production, transport and trade of goods, since only goods (or labour time) could be delivered. Once money exists, poll, income and expenditure taxes, as well as taxes on the production of services become easier to levy. When taxes are received in goods or labour, the balance of goods (and labour) obtained will not be that required for public sector expenditure, so money reduces the transaction costs of governments, pari passu with that of the private sector.
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By the same token taxes payable in monetary form raise the demand for base money. Since a government obtains seignorage from money creation, this benefits the fiscal position twice over, not only from the taxes levied but also from the seignorage resulting from the induced monetary demand. This was, as Leimer (1954) notes, one of the major reasons for the introduction of Confederacy currency by the South in the US Civil War.

Secretary Munnings saw the immediate and indispensable benefits from levying taxes payable in government notes. First, taxes created a demand for the paper issued by the government and gave it value. Since all taxpayers needed paper, they were willing to exchange goods for it, and the notes circulated as money. Second, to the extent taxation raises revenue, it reduced the number of new notes that had to be issued. Munnings's numerous public statements during the war show that he clearly realized that increasing a country's stock of money much faster than its real income leads to runaway prices. They also show that he believed that a strong tax program lessens the possibility of inflation. (p. 508)

Indeed, the imposition of taxes, payable only in money (and not in goods or in kind), has been used on numerous occasions in colonial history for the primary purpose of forcing taxpayers out of a (non-monetary) subsistence economy into a cash economy producing goods for sale in the world economy; the receipt of extra fiscal revenues was in some cases just a subsidiary motive, as recorded by writers such as Ake (1981), Rodney (1981), and Anis and Pearce (1976).

There is, indeed, a large literature on the use of taxes, payable in monetary form, as a means of driving peasants into a monetary relationship with a capitalist economy. This is not only to be found in the literature on colonial development, but also in the earlier development of capitalism in Europe, for example Hoppe and Laughton (1994).

Once the close link between money creation and taxation (and of both to the underlying structure and stability of government) is understood, the move from metallic currency to a fiat, paper, currency becomes much more straightforward to understand. Even if one should accept the M theory of the evolution of metallic coins as money, it is problematic to use that same theory in its pure form to explain why agents should suddenly be willing to jump from using paper notes which were ultimately claims on precious metals (that is, precious or public sector banknotes convertible into such precious metals) to paper notes which were backed by no specific assets. Instead, one notes, and are backed by the power of government (for example legal tender laws) and its ability to impose taxes payable (and often only payable) in that fiat currency (as well as legal tender for the discharge of all other payments within the country). Thus the M-form theory has difficulties with explaining the introduction and use of fiat currency. The C-form theory has no such difficulties. The transition was entirely natural. The interesting questions relate, instead, to the factors determining the historical timing of the switch. The growing power of the nation state and the extra seignorage that could be obtained (particularly the need for such in wartime) pushed for an earlier adoption of fiat currency. Historical inertia, credibility effects (since inconsistency problems were always foreseen and legal tender fiat currency invariably had a bad reputation as potentially low quality money), and perhaps at times concerns about counterfeiting, tended to delay the switch.

Let me conclude this section by pointing out that M-form theory finds it difficult to account for the role, or existence, of money within a general equilibrium model. Money in the utility function, or cash-in-advance models, are proposed, without much conviction. This difficulty is not surprising given that such models also abstract from the existence and role of government. While it is, of course, the relationship between taxation and the demand for money that the C-form theory emphasizes, it should also be remembered that it is the maintenance of law and order, the form and enforcement of contracts, and the whole infrastructure of regulation within society, that allow the operation of (organized) (private sector) markets to occur at all.

A disclaimer may, however, also be needed. The purpose of this section was to argue, first, that money frequently played an important role in inter-personal social and governmental roles; before it played a major role as a medium of exchange in market transactions, and second that the relationship of the State, the governing body, to currency in all its forms has almost always been clear and direct. But I do not claim that the private sector cannot, and has not, even been able to develop monetary systems without the involvement of state authorities. Perhaps the most likely early historical example of purely private sector monetary systems is the Aztec coya enemia (Méliès, 1974, 129–30), but more recent examples include the cigarette money of P.O.W. camps, RAF (1945, 189–201), and the use of vehicle currencies in foreign exchange trading (Swedea, 1969, and Hartmann, 1984). Several national currencies have in the course of history become widely accepted internationally, for example the Byzantine hyperpyron or "Bezant", the Francs de Tableau, the Venus Decur, and most recently the printed certificates, US dollar and in some countries the Deutschemark, in some cases against the wishes, and with no involvement, of the issuing government. Indeed, many economic agents voluntarily hold money issued by a state other than their own, for example US dollars almost everywhere, Deutschmarks in East Europe (see Cohen, 1996). Other examples can be added. Moreover, were the state authorities now consciously to choose to abdicate their monetary role, the void would surely be taken up by commercial institutions.
3. THE M-FORM SPATIAL THEORY, OR OPTIMAL CURRENCY AREAS

If the use of money can evolve through a (search) process of cost minimization, without any necessary intervention by a government, then by analogous reasoning the spatial domain for any one money (24) can also evolve from such a similar cost-minimization search process. The Optimal Currency Area analysis has, indeed, followed that approach. It has, broadly, compared the benefit, in terms of transaction cost minimization, of having a single currency over a wider area against the costs in terms of adjustment difficulties (Krugman, 1993).

These costs depend in part on market imperfections whereby there is imperfect flexibility (either spatial, that is, migration, or in (financial) wages) in labour markets. The standard list of factors affecting OCAs then follows, such as size, openness, labour market flexibility, concentration or diversity of production, nature of and specificity of shocks (whether symmetric or asymmetric), and so on.

Note, however, that following M-form theory the functions and role of government do not necessarily, or even usually, enter this list. Under the (pure) OCA theory (Mandell, 1961) there is no reason why currency domains need to be coincident and co-terminous with sovereign states. There is no reason why such a state should not have any number of currencies from zero to n, and an Optimal Currency Area, in turn, should be able, in theory, to incorporate (parts of) any number of separate countries from one to n. There should under the M-form OCA theory be a diversity between currency areas and the boundaries of sovereign states. Most subsequent OCA applied research has, however, simply taken for granted the initial starting coincidence of sovereign governments and currencies, and then applied the standard tenets of OCA theory to the question of monetary union between such countries. But that ignores the 'political economy' factors that made currency areas coincident with countries in the first place, and hence is likely to overlook the crucial political economy factors that will determine the success, or failure, of such unions, including EMU.

Such lack of concern for political economy considerations is not the case with C-form theory. Since under this theory money is indefinitely bound up with the stable existence and fiscal functions of government in any area, the sovereign government of that area is predicted to maintain its single currency within the area's boundaries.

Which theory has the better predictive and explanatory power? Si monumentum requiris, circumspice! In a recent paper, Eichengreen (1996), writes,

Michael Mussa is fond of describing how, each time he walks to the IMF cafeteria, down the corridor where the currency notes of the member states are arrayed, he

Yet the economics profession has taken little notice of this 'robust regularity' in its assessment of monetary theory (national or international), and in its adherence to the M-form theory of private sector evolution. Moreover, it is difficult to see how several large countries, encompassing regions geographically separate, sometimes at very different stages of development, often with regionally concentrated production, could possibly meet the criteria for OCAs, for example USSR before its collapse, Brazil, Australia, Canada, and even USA.

In how many countries do we find multiple currencies? Prospectively there will be, after 1992, one such country, China, where the Special Economic Region of Hong Kong will keep its separate currency (for 50 years). Given the political circumstances of the planned arrangement, this could be described as an exception that proves the rule. In some countries which have suffered hyperinflation, 'dollarization' has occurred, as in Argentina, Peru and - to some extent - Russia, and similarly with respect to the Deutschmark in Yugoslavia (see Petrovic and Vujosevic, 1986, on the Yugoslav hyperinflation of the 1990s). What is remarkable in these cases is how high the inflation tax rate on domestic currencies has to climb before the public switches to an alternative foreign currency - although once such a switch has occurred it does not reverse easily or quickly. And when the public does decide to abandon the inflating domestic paper currency, the alternative, privately chosen, good money can vitally drive out the 'bad' official money (Bernholz, 1989).

There have, however, been a few historical examples where currencies from several states were treated as equally acceptable in all of them. These included the Latin Monetary Union (1865–1914) and the Scandinavian Monetary Union (1873–1914). Cohen (1993) has studied the historical cases of such monetary union, and concludes that the economic factors considered in standard OCA theory have little, or no, explanatory or predictive power: to explain the varied history of the sustainability of such unions, and that political considerations are overriding.

Only in one single respect does the M-form, OCA theory have much statistically significant explanatory power, and that is that tiny states (principalities like Liechtenstein, San Marino, Monaco and Andorra), will generally not have their own currencies, and that there is some (statistical) tendency for larger states to adopt more flexible exchange rates and smaller states to have pegged exchange rates (see, for example, Al-Marzuki and Wallott, 1996). But this is observationally equivalent, in some considerable extent, with the belief that the tiny principalities have very little sovereign voice, and are in several cases effectively vassal subsidiaries of their larger neighbour. Consider, for example...
ments have often used their money creation powers to support and benefit themselves (via seigniorage and the inflation tax), though usually when they are weak and are threatened, especially by war. Clearly access to the inflation tax benefits such governments. Whether it has benefited, or harmed, the public depends on the circumstances, for example the relative value to them of maintaining their existing government. A properly organized system of privately determined money creation could, so it is argued, provide a monetary system with a superior quality. This is the approach taken by economists such as Hayek, many (but not all) monetarists and the Free Banking School. In the absence of any more radical moves in this direction, the separation of the powers of money creation in an independent Central Bank (which under the Maastricht Treaty is required not to take instructions from governments), is (usually) seen as, at least, a step in the right direction by M-form theorists.

More generally there has been an overlap between M-form theorists and those who believe that the intervention of government within the economy is excessive, unnecessary (in most cases) and should be reduced. There is, therefore, an (disguised, but not hidden) agenda of M-form theory in advocating a reduced role for the state in economic affairs. By contrast, C-form theorists tend to believe that government intervention is an inevitable concomitant of the organization and operation of our (political) system. And many worry whether the prospective European Central Bank (ECB) may not suffer from a 'democratic deficit'. But that is a larger issue which we shall not pursue further here.

4. CONCLUSION

OCA theory has little, or no, predictive or explanatory capacity. Unlike C-form theory it is unable to account for the close relationship between sovereignty and currency areas, a relationship that tenaciously persists through the course of the creation, and break-up, of federal states. The empirical weakness of OCA theory, the spatial facet of M-form theory, throws further doubt on the ability and value of the latter to explain the evolution and nature of money as well as C-form theory can. The main advantages of M-form theory appear to be technical, in that it leads itself better to mathematical formalization, and ideological, in that it is based on a process of private sector cost minimization, rather than a messier political economy process. It is, however, a pity to suspect that monetary economies may be driven more by technical and ideological purity than by empirical and predictive capacity.

If, then, the key issue is the (political) relationship between control over money and sovereign power, we need to consider carefully what problems this may portend for the future euro single currency area. In the euro zone the traditional historical links between money creation and sovereignty will be broken.
APPENDIX A. GRIERSON'S VIEWS ON THE SOCIETAL ORIGINS OF MONEY

In his pamphlet on "The Origins of Money" (1975, 1976), Grier son writes (19-21):

In any case, the generalized application of monetary values in commodities could scarcely have come about before the appearance of market economies, and monetary valuations were already in existence in what Sir John Hickey has lucidly clarified 'commercial' and 'commodity' pre-capitalist societies. A theory of economic history, (1969, pp. 2 ff. (of the market)), 53-6 (of origins of money). He has to some extent telescoped the invention of money and the invention of coins, and in my view he exaggerates the 'true' value element in early money. Nor, if any argument that money anticipated the development of the market is correct, is it the case that the standard 'should be something that is regularly traded'. In such societies they provide a scale of evaluating personal injuries in the institution which the Anglo-Saxons termed the wager, and it is in this institution that the origin of money as a standard of value must, I believe, be sought.

The practice of wagering, that of paying a compensation primarily for the killing or wounding of a man but the term by extension covering compensations for injuries to himself or his family and household, is most familiar to us in its Indo-European setting. The general object of these laws was simple, that of the provision of a tariff of compensations which in any circumstances their compilers liked to envisage would provide resort to the blood feud and all the inconvenient social consequences that might flow therefrom. The object of the laws is that of preventing retaliation by force to force, and the principle behind the assessments is less the physical loss or injury suffered, than the need to assuage the anger of the injured party and make his loss in public reputation. It would cost one time four times as much to deprive a Russian of his most valuable sword as to cut off one of his fingers... Karl Menger, in an impressive article on the origins of money published many years ago, argued ingeniously that one would expect monetary standards to be based on the commodities most commonly and easily exchanged in the market, since these would have the maximum salability. The laws codes suggest that while this may be true of money substitutes, it is not true, or at least is not necessarily true, of the commodities used as standards themselves. [NB for detailed references see the original.]

APPENDIX B. LIMITS TO THE ABILITY OF EARLY MINTS TO GUARANTEE THE QUALITY OF COINS

Although the development of mints provided a major advance in identifying and guaranteeing the quality and weight of coins, several problems however remained. Until a process was found to give coins milled edges, coins could be clipped, and thereby lose weight. Also, as McClint (1974, 71), notes, though most of the Middle Ages, many individual coins of the same issue differed substantially in weight and fineness. Indeed, prior to the 13th century, coinage methods hardly permitted less than a 5 to 10 percent variation in weight between individual coins struck from the same mint. Thus, accounting for different coins belonging to the same denomination and issue often varied. Differences in weight and fineness, along with a host of other factors, like varying compositions, quality of minting, clipping, and sweating, continued to produce differences in accounting pieces of money units of the same denomination and issue all the way down to the 15th and 16th centuries.

With coins of varying weight, but of a known, given fineness, transactors would have to make a difficult choice between weighing coins, a time-consuming exercise (or of getting a specialist to assess them), or accepting them as equivalent, without weighting, for example by tale, which carried the risk that some underweight coins would not be subsequently acceptable. See, for example, Sargent and Smith (1977).

Kleinman (1984a) notes that a devalued party, when overcharged, could revoke a deal within a certain time span.

Accumulating the 'right' price of an article was thus supposed to be a matter of, at most, several hours. The only exception was delicate coins, of which it was said that when in one permitted to revoke the deal! In cities, until one can show (the coin) to a moneychanger; and in villages — until the following Sabbath.

To understand we have to remember that the coinage circulating in the Roman world of the first two centuries AD was most heterogeneous.

Moreover, it was sometimes difficult to check whether the fineness of the coin was as stated, without complex, and destructive, metallurgical testing. During the Tokugawa Shogunate in Japan, not only was the fineness of the coins never published (see Ueda, Taguchi and Saito, 1968), but also, in spite of enormous differences in the fineness of the Koban created by a series of recasting, the color of the surface did not deteriorate much and the surface generally shines with a golden color. The Koban of low fineness, namely the Ginshu Koban and the Gembu Koban, do look slightly inferior in the surface color to other types of Koban, but other Kobans mixed in and after the Bunka era show just as beautiful a golden color as the high fineness Keicho and Kyocho Kobans even though their fineness is even more inferior.

This phenomenon is produced by the later process in the minting of the Koban called 'color owing' (color improvement or coloring). This process disguises the silver element on the surface of Koban by heating it after coating the surface with chemical substances. This process seems to be unique to Japan in the history of minting and we have not heard of any similar instances in other countries.