

Mind and Monetary Arrangements: A Method to Assess Monetary Heuristics in Historical Time

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Abstract

In order to theoretically analyze, from the perspective of new monetary economics and social learning, the evolution of monetary arrangements with functional separation of money, this paper develops a method to study this phenomenon in the history of monetary arrangements of the North and Baltic Seas region, from the Hanseatic League onwards. The aim is to do historical economics, analyzing history from the perspective of the economic theorist, while the approach is topic-oriented rather than discipline-oriented, involving economics, history, and cognitive science. The focus will be on the cognitive aspect of money as social institution. This implies multiple methods. The evolution of units of account and media of exchange are adaptive responses by human minds. The focus will be on the heuristics of long-distance traders in the Baltic and North Seas region, expressed in the form of units of account and media of exchange they used and their success in the contemporary trading environments. Lessons for monetary separation with an abstract unit of account compared with one based on a commodity bundle will be developed. This involves the identification of the unit of account in which contracts and calculations were made and what media of exchange were used to make the payments. From a cognitive perspective, the medium of account provides a script that translates the unit of account into a particular worth. When the value of the underlying commodity bundle changes from the original worth, market agents observe a script deviation of that bundle, attributing that to changes in the commodity space, and adjust the bundle accordingly. This method will be developed to be able to study four historical cases: Hanseatic monetary arrangements, seventeenth century banking, the gold standard and the unification of monetary functions and nineteenth century monetary unions, and interwar monetary fragmentation.

Keywords: emergent money, liquidity, monetary arrangements, value of money, social learning, monetary history, North and Baltic Seas region

1. INTRODUCTION

In human societies, people come to a shared understanding what in a society constitutes money and monetary arrangements. As Searle (1999) points out, something is money, because it has been given the normative status of money. Money is, therefore, a social convention, that is a social institution, which evolves through social interaction. Money is a social convention,

which provides social expectations of value (Winter 1994). The expectations of value are defined by some medium of account, which is unified with the medium of exchange in the asset we know as money. New Monetary Economics, however, involves a functional separation of monetary functions, implying that units and media of account are distinct from media of exchange. According to Cesarano (1995), the basic feature of New Monetary Economics is non-tangible means of payment with a separation of the medium of exchange from the unit of account. Using a Mengerian approach to new monetary economics, Cowen and Kroszner (1994) argue that media of account evolved prior to media of exchange and that assets used as media of exchange change over time in an ongoing process.

The idea that money is a social institution rather than a commodity has been observed by Schumpeter (1970), Mises ([1912] 1924), Wicksell ([1906] 1966) and Yeager (2000). In particular, referring to Schumpeter (1970), Yeager views money as a clearing device. Yeager (1989, 2001) considers money as a record-keeping device that facilitates multilateral exchange, referring to Schumpeter's (1917-18) view of money as a receipt vouchers for productive contributions and a claim tickets on goods to be received in exchange.

The clearing device function requires some shared understanding of the value of money, thus bringing in monetary heuristics, the heuristics that emerge among traders in an economy concerning the monetary arrangements, required in exchange. According to Cesarano (1999), the Mengerian selection process for commodities with the highest "salability" was guided by the search for informationally more efficient ways of settling transactions. Yeager (1998) regards the unit of account as vocabulary, grammar, and idioms, while the media of exchange constitute particular documents and speech recordings. As social learning establishes the value of the media of exchange, they become gradually mutually accepted as clearing device (Marmefelt, 2012a). The evolution of units of account and media of exchange are adaptive responses by human minds. Along the lines of Gigerenzer (2008), the science of heuristics

include the adaptive toolbox (heuristics, computational programs), ecological rationality (co-evolution of heuristics and environment), and design (design heuristics and environment to improve decision making).

This paper develops a method how to assess the monetary heuristics of traders in historical time, expressed in the form of units of account and media of exchange they used and their success in their contemporary trading environments. Lessons for monetary separation with an abstract unit of account compared with one based on a commodity bundle will be developed. This involves the identification of the unit of account in which contracts and calculations were made and what media of exchange were used to make the payments. From a cognitive perspective, the learning mechanism involves a script, which links events to subsequent outcomes, in which common knowledge of the script implies that everyone knows the meaning the actions of other agents and how to respond (Schank and Abelson 1977).

The medium of account provides a script that translates the unit of account into a particular worth. A script allow us to infer a sequence of events that cannot be seen, a shared meaning of the order of events, where the script is an underlying intuitive component that matches the computational neural capability with the social inference processing needs (Lieberman 2000). Scripts shape attributions and script-deviations means that information is considered in the view of world knowledge (Hilton and Slugoski 1986; Lipe 1991). The formation and use of a unit of account and associated media of exchange, separated or unified, can be seen as a social script – a shared mental map for a social routine, according to which market agents attribute a specific worth to some abstract symbol or some commodity or set of commodities. When the value of the underlying commodity bundle changes from the original worth, market agents observe a script deviation of that bundle, attributing that to changes in the commodity space, and adjust the bundle accordingly. For a precious metal bundle, the weights are adjusted.

The paper starts with emergent money, liquidity and monetary heuristics, followed by social learning and the value of money, before two historical cases of monetary arrangements in the Baltic and North Seas region are considered, leading to some concluding remarks.

2. EMERGENT MONEY, LIQUIDITY, AND MONETARY HEURISTICS

Money is an emergent order and the monetary regime required in order to keep credit creation consistent with the financing requirements of innovation (Marmefelt, 2012a), while liquidity constitutes a crucial link to the financial system (Marmefelt (2012b)). Money emerges from a process of social interaction among economic agents, and should be seen as a specific monetary arrangement. It is the asset that unifies the monetary functions of medium of account with medium of exchange. Liquidity of enterprises in the real economy is provided through credit creation by the financial system *ex ante* and must be absorbed by innovation desired by consumers *ex post*, so sustainable growth requires that the financial system, through a trial-and-error process, finds the correct liquidity which meets the financing needs of innovation desired by consumers (Marmefelt, 2012b).

Concerning liquidity, Hicks ([1967] 1979) makes a distinction between *fully liquid* money and the latter *more or less liquid* assets. Similarly, Yeager (1968) distinguishes between *the amount of the medium of exchange* and *the total purchasing power of firms and individuals* available from their asset holding and borrowing possibilities. In a credit economy, liquidity is driven by the demands of the real economy. Wicksell ([1906] 1966) argues that credit is a remedy to scarcity of money and in his pure credit system, credit is substituted for gold and the value of money is separated from gold. Similarly, Meulen (1934) argues that credit is necessary in any advanced system of division of labor and legal restrictions cause capital to go only where the demand is extremely keen. Both Wicksell and Meulen have an abstract

medium of account, and credit tokens, in Meulen's ideal system of credit, will be demand-driven to achieve full employment (Marmefelt, 2012a).

In the BFH system that Greenfield and Yeager (1983) propose, a physically defined unit of account - the total market value of definite quantities of specific commodities - is functionally separated from privately issued media of exchange, which are demand-driven, because there is no base money impeding them.¹ The difference from Meulen and Wicksell is that the medium of account is concrete, being based upon a fixed commodity bundle. However, the commodity bundle is nearly comprehensive, including most commodities (Woolsey & Yeager, 1994). Unlike the BFH system, where the unit of account is commodity-based, the units of account in pre-modern Europe were based on social convention and could therefore be adjusted to control liquidity (Marmefelt, 2012b). Consequently, various monetary arrangements emerge because they provide adequate liquidity to the real economy.

In Cesarano's (2008) view, the evolution of monetary arrangements is being shaped by diverse, heterogeneous factors – market forces, technological progress, and dominant paradigms, while Cowen and Kroszner (1994) point out that new media of account and exchange have changed throughout history as technological and institutional constraints have changed. Moore's (1988) endogenous money is an important characteristic of post-Keynesian economics. Credit creation expands money supply endogenously with credit supply emerging from recursive interaction of financial and industrial/household sectors (Setterfield, 2006). Similarly, Yeager (2001) argues that money is an instrument of financial intermediation and the quantity of money changes with the demand for media of exchange in an economy without base money, such as the BFH system.

¹ In the BFH system the government defines a unit of account physically in terms of a commodity bundle, while private fund banks would emerge to issue media of exchange (see Greenfield and Yeager, 1983; Yeager and Greenfield, 1989; Woolsey and Yeager, 1994).

Cesarano (1999) refers to Wicksell's ([1906] 1966) pure credit economy as a main contribution to the understanding of a payment system devoid of currency, while Cesarano (2008) argues that the current expansion of information technology moves actual economies towards a Wicksellian credit economy by making tangible money obsolete. Wicksell ([1906] 1966) argues that credit is a remedy to scarcity of money and explains how bills of exchange increase virtual velocity, before turning to the development of banking with certificates of deposit and banknotes, and the rise of the modern bank when deposit and giro banks started lending out deposits. This implies the evolution of what economic agents understand as money over historical time, reflecting some continually evolving monetary heuristics.

As Greenfield and Yeager (1983) argue, the BFH system's unit of account has its general purchasing power fixed by definition, but Marmefelt (2012a) points out that a unit of account must maintain its value over time, which innovation will change under a physical definition. Steuart (1810) stresses that the money of account, an abstract unit of account, must be a yardstick of unvarying length, while Meulen (1934), who emphasizes worth rather than weight, argues that a precious metal would provide a yardstick made of gutta-percha. Similarly, Schumpeter (1917-18) argues that the value of money is independent of its metal content and from the viewpoint of the ticket theory, that the purchasing power of money cannot be derived from the metal content of money. In addition, Mises ([1912] 1924) points out that the objective exchange value of money, its purchasing power, reflects subjective individual valuations of the commodities that can be bought for the money, while the modern organization of settlements and the institution of credit have liberated trade from the constraints made by the volume and weight of the money material. Monetary heuristics evolve with financial evolution.

According to Cowen and Kroszner (1994), financial evolution starts with media of account, because they give traders a commonly understood “language”, before the greater liquidity of the medium of exchange eventually united the media of account and exchange into a single asset called money, while new media of exchange with superior pecuniary returns evolve as a consequence of progress of information and communication technologies, favoring electronic or book-keeping entry assets. These stages have their own monetary heuristics. Following Gigerenzer (2008), the science of heuristics include the adaptive toolbox, which provides the building blocks for fast and frugal heuristics, fast because it can solve problems in little time and frugal, because it can solve it with little information. He defines fast and frugal heuristics as a strategy, conscious or unconscious, that searches for minimal information and consists of building blocks that exploit evolved capacities and environmental structures, and finds social heuristics to exploit the capacity of humans for social learning and imitation. Consequently, he argues for ecological rationality, which matches mind and environment, giving the success of a heuristic, the result being used to design heuristics and environment to improve decision making.

Concerning monetary heuristics, humans have evolved in economic environments, in which they conduct exchange. In order to do that they develop monetary heuristics, giving some medium of account providing an adequate stability for making calculations in the economic environment and associated media of exchange for conducting the exchange. As exchange constitutes social interaction, a monetary heuristic, which is fast and frugal, is a social convention that emerges through social interaction. Hayek (1979) views competition as a process in which people acquire and communicate knowledge. As Searle (1999) argues, all institutions but language require language or language-like symbolism. Searle’s description of the symbolizing role of language as the foundation of the social universe is quite analogous to the symbolizing role played by money prices in the economic universe, and money prices

communicate contextual and tacit knowledge, which is beyond the capacity of language (Horwitz, 2007). Market prices possess a language-like symbolizing function, but language is required to establish a shared meaning of money, property, exchange, and price, in order to give market prices that function (Marmefelt, 2009).

A commodity bundle, defining the unit of account adjusts over time, thus changing the social script, the shared mental map for the social routine, by which a unit of account is used to evaluate commodities obtainable using the media of exchange associated with that unit of account. Market agents learn socially, through social interaction in the market, where they receive price signals, whether innovation has caused productivity growth of a commodity in the bundle defining the unit of account, thus adjusting the weight of that commodity in order to keep its worth constant (Marmefelt, 2012a). This would be in accordance with the abstract unit of account, advocated by Steuart (1810) and Meulen (1934). Scripting is a mind-enculturation practice, ordering actions according to accepted patterns or rituals, varying across cultures, where mental sharing enables communication to take a novel form in which experiential and attitudinal comments can be exchanged about topics of mutual interests (Bogdan, 2000). Monetary heuristics are formed through such a scripting process, which establishes the script as convention: use a unit of account X to calculate the price of a commodity Y in units of account and then make the exchange, where the buyer pays a specific number of the medium of exchange Z , according to the exchange rate Z/X , in case of monetary separation, or use money M to calculate the price and pay for commodity Y , in case of a unified unit of account and medium of exchange, in the form of money.

Arguing for an evolutionary Hayekian approach to macroeconomics, Koppl and Luther (2012) put forward the idea of evolutionary psychology that our minds are shaped by the environment of evolutionary adaptedness (EEA), the environment of prehistoric hunter-

gatherer bands. Bogdan (2000) argues that there are evolutionary reasons implying specialized and innate skills, making the child socialize and later becoming cultural to pursue her aims. However, Buller (2005) points out that evolution has shaped a brain capable of adapting to its local environment, i.e. a brain having neural plasticity giving it developmental flexibility, rejecting the idea that we are walking fossils of our Pleistocene hunter-gatherer ancestors. Buller's objections to the claims of evolutionary psychology are:

- i. The adaptive problems faced by our Pleistocene ancestors varied widely in character.
- ii. There must be a transgenerationally stable environmental structure, but there is virtually no recurrent environmental structure common to different adaptive problems.
- iii. Information of effective solutions to adaptive problems cannot be derived from experience.

As monetary calculation and monetary exchange were hardly established during the Pleistocene, the human mind was hardly shaped by the EEA when it comes to monetary matters. Even when considering primitive money, neural plasticity is reflected in the great variety of systems. Einzig (1966) finds the study of primitive money to be a study of contrasts and he observes an infinite variety of systems with the aid of which communities at early stages of development tried to solve their monetary problems. Among the primitive monies, he finds both staple goods which communities choose because they handle them daily and understand the meaning of values expressed in them and fictitious monetary units used for measuring value. According to Einzig (1966), mats and to a lesser extent bark cloth played a prominent part in exchange, in Samoa, on the frequency of which the entire economic and

social system was built, while in Yap stone money reflected value based on size, shape, and quality, made of stone shipped from Guam and Pelew, owing its value to scarcity, cost of production, and risk, whereas pig money in the New Hebrides provided a most elaborate and extensive credit system. In addition, he also considers the dual monies of Rossel Island.

Einzig finds the indigenous monetary system of Rossel Island more intricate than any monetary system in modern economies. Rossel Island's two monies are the male money *ndap*, which consists of individual pieces of *Spondylus* shell and represents higher values – the highest treated with religious reverence and only the lower circulating freely, and the female money *nko*, which consists of sets of ten disc shells probably made from giant clam and represents lower values, so all units circulate freely. The parities of the values, he finds very peculiar. Higher values represent lower values plus accumulated interest for a certain period, and there are special uses for each denomination, and it is frequently necessary to borrow a unit by giving a unit of higher value as security. Einzig observes interest and discount operations, but he also questions the monetary status of the two monies, because each unit can only be used for a specific purpose and the units are not freely interchangeable. These examples of primitive money illustrate the importance of the cultural embeddedness of monetary heuristics.

It evolves what Bogdan (2000) calls a metaintentional scheme, involving purposed relatedness, directedness, and target, because a mental condition is intentional when it is purposely related to and directed at another condition as target. This is consistent with Searle (1999), who considers intentionality as subjective states, such as beliefs and desires, intentions and perceptions, loves and hates, and fears and hopes that relate a person to the rest of the world. Applying Bogdan's metaintentional scheme to the case of money, the unit of account and medium of exchange functions are purposely related in a single asset called

money, but it exists also with monetary separation, because a medium of exchange has a price in the unit of account, thus giving purposed relatedness, and these monetary functions are directed to the target of defining the value of commodities in the commodity space.

Schumpeter (1917-18) considers money as tickets that give access to a share of the opportunity space of commodities rather than to a specific commodity and regards the value of money as the purchasing power of the unit of income. However, Mises ([1912] 1924) finds that the sum of available tickets does not correspond very well to the opportunity space of commodities and considers price as the expression in terms of money of the exchange value of each commodity. According to Mises, the value of money, its purchasing power, reflects subjective individual valuations of the commodities that can be bought for the money. Hence, money is directed to the target of valuating commodities that are obtainable through exchange.

Bogdan (2000) also considers a metarepresentational scheme, according to which a mental condition is understood to represent the target, and a generative scheme, where the metathinker recognizes and tracks iterations, extended sequences and multiple embeddings of mental representations. In the case of money, prices represents the valuation of commodities, giving the metarepresentational scheme and changing relative market prices, entry into and exit out of the commodity space, and extension of markets belong to the monetary generative scheme, in which the cultural context of the monetary arrangements matter.

3. SOCIAL LEARNING AND THE VALUE OF MONEY

As opposed to individual learning, social learning means learning from others. Social learning arises from communication and social interaction among animals as well as humans. Imitation is an important form of social learning, sometimes seen as its only form, and it can be based

on mimicry, like birds learn to sing from listening to other birds, or molding, which is guided learning of skills (Moore, 1996). However, through social interaction individuals may also learn from observation and association, a cognitive process, where the individual observes, reflects, and responds according to some mental map, like agents do in markets. Hence, social learning consists of learning from others both by observing them and doing like them, with or without guidance, and by observing them, interpreting their behavior, and taking appropriate action. Social interaction may cause actions to diffuse, but may also cause reactions to actions. In either case, an individual learns from other individuals through recursive processes of social interaction. It is never groups or societies that learn, but individuals living in groups and societies.

The emergence of the social institution of money is essentially a social learning process, where acceptability is established by means of assignment of a Searlean status function (Marmefelt, 2012a). Language and the language-like symbolism of money give humans an image-creating and image-communication faculty (Marmefelt, 2009). Communication is essential to social learning, which is learning through social interaction, while social learning means that humans change their images by communication with other humans through language or money prices, and that the price is a symbol of valuation, while money is its underlying idea, involving image and affection (Marmefelt, 2012a). This invokes the idea of intellectual path dependence.

Yalcintas (2012) uses the intellectual path dependence concept to develop an evolutionary history of economic ideas, in which the symbols constitute the genes of a scholarly community, whose members use these symbols, leading to the truth arising out of interaction rituals. The essential idea is that the viability of the symbols depends on the viability of the ideas expressed in those symbols. The idea is some form of monetary arrangement, such as money, uniting the medium of account function and the medium of exchange function, or

some unit of account under some degree of monetary separation, while price expressed in some form of money, money or some money of account, is the symbol of valuation. The viability of money prices as symbol of valuation depends on the viability of the actual underlying money or monetary arrangement. The monetary arrangements are the genes, or perhaps more appropriately the memes, forming the exchange order, which structures the economy.

The monetary social learning process yields the extrinsic value of money, its value as social institution, as opposed to its intrinsic value, its value as a thing, e.g. a piece of precious metal, and there may be some intergenerational monetary social learning, when new money is redeemable into old money, which suggests some path dependence (Marmefelt, 2012a). From a cognitive perspective, the learning mechanism involves a script, which links events to subsequent outcomes, in which common knowledge of the script implies that everyone knows the meaning the actions of other agents and how to respond (Schank and Abelson, 1977), representing what Hayek (1952) calls a map, which reproduces relations in the physical world, around us. Marmefelt (2009) finds that these reproductions are what Boulding (1978) calls images in the human mind. The medium of account provides a script that translates the unit of account into a particular worth, defining it as a measure of value. Price signals transfer images among entrepreneurs, thus giving rise to social learning (Marmefelt, 2012a). Money is a social convention, which provides social expectations of value (Winter 1994).

A script allows us to infer a sequence of events that cannot be seen, a shared meaning of the order of events (Lieberman 2000). If one uses a particular unit of account to set a price of any commodity, then a specific worth, representing some symbol or some commodity or commodity bundle, is attributed to the priced commodity, which can be paid for using media of exchange according to their price in units of account. Scripts shape attributions and script-

deviations means that information is considered in the view of world knowledge (Hilton and Slugoski 1986; Lipe 1991). If a unit of account and the associated media of exchange become obsolete in a new commodity space, then a commodity bundle is adjusted. The unit of account is a social script, according to which market agents attribute a specific worth. When the value of the underlying commodity bundle changes from the original worth, market agents observe a script deviation of that bundle, attributing that to changes in the commodity space, and adjust the bundle accordingly. This involves what Bogdan (2000) calls social referencing, by which the affective orientation of others are perceived and responded to.

In an exchange situation, it could be that the seller defines the price in a particular unit of account and accept payment in some medium of exchange at a particular price in units of account, and observes the buyer' reaction concerning the choice of unit of account, the medium of exchange, and the price of the latter in the former. When both focus on realizing the exchange, they share attention on alternative units of account, media of exchange, and the relative price of the latter in the former. In the case of money, they share attention on alternative monies and the price of a commodity in various monies. Bogdan (20009 writes that shared attention opens up for communication by shared meaning and language acquisition. In that way, it opens up for communication by means of money prices.

Social learning means that humans change their images by communication with other humans through language or money prices (Marmefelt, 2012a). As Searle (1999) argues, all institutions but language require language or language-like symbolism. Searle's description of the symbolizing role of language as the foundation of the social universe is quite analogous to the symbolizing role played by money prices in the economic universe, and money prices communicate contextual and tacit knowledge, which is beyond the capacity of language (Horwitz, 2007). Market prices possess a language-like symbolizing function, but language is

required to establish a shared meaning of money, property, exchange, and price, in order to give market prices that function (Marmefelt, 2009). Competition as discovery procedure is a process of acquisition and communication of knowledge (Hayek, 1979) and characterizes Hayek's (1976) wealth-creating game of catallaxy, the market order.

According to Boulding (1978), symbols are the messengers of the integrative system, which together with the exchange and threat systems, is a social organizer that shapes the bonding structure, and these symbols allow the transfer of complex images from one mind to another. Boulding (1962) distinguishes between necessity in mechanical systems and chance in biological systems, and considers the growth of money invested to be governed by necessity when invested in a safe bank deposit at a constant rate of interest and by chance when invested in speculative enterprises. Similarly, Davidson (1978, 1982, 1987) argues that the institution of explicit money contracts matters in a nonergodic world, i.e. under uncertainty, which he defines in terms of nonergodic stochastic processes.² Social institutions, such as money and contract, then provide a resolution to uncertainty. Social institutions can themselves be regarded as heuristics that reduce uncertainty, as suggested by Hodgson (1989).

Turning to time and the implication of history, Davidson (1982-83) argues that the economic process is nonergodic, because it moves in historical time, and that economic agents destroy any ergodic stochastic processes when they make crucial decisions. Hence, as the economy evolves, it is subject to chance and thereby nonergodicity. The monetary arrangements are then put under pressure to adapt, ideally in a coeval way. According to Boulding (1978), the evolution of the integrative system, based upon an image of identity using symbols, depends upon the human learning process and the transmission of culture and

² Davidson's distinction between ergodic and non-ergodic stochastic processes correspond to Knight's (1921) distinction between risk, which can be calculated using a probability distribution, and genuine uncertainty, which cannot, because the probability distribution is unknown.

the knowledge structure. Hayek's (1952) map is an apparatus of classification, by which a sequence of individual mental images results from streams of impulses. Hence, monetary heuristics emerge in the mind of economic agents as the stream of price signals expressed in some monetary unit provides a monetary script for a valuation and exchange of commodities, involving social referencing and shared attention.

Financial evolution means that monetary arrangements obtain a higher level of complexity, including more sophisticated monetary heuristics. In societal evolution, there is increasing complexity of the knowledge structure (Boulding, 1978). Following Hicks ([1967] 1979), money is a human institution and the evolution of financial institutions, such as banks, insurance companies, money markets, and stock exchanges, has changed money, while Cowen and Kroszner (1994) point out that multiple media of account prevail in the early and the later stages of financial evolution, in advanced stages due to heterogeneous traders in terms of endowments and desired portfolio position. At various stages during financial evolution, a historically specific monetary heuristic has emerged, based upon some specific social monetary script.

In Menger's (1892a,b) theory of the evolution of money, media of exchange evolve to overcome the inconvenience of barter. However, Cowen and Kroszner (1994) argue that the development of media of account is historically and logically prior to the development of media of exchange and put the Mengerian story, where marketable intermediary commodities to overcome the double coincidence of wants evolve and generally acceptable media of exchange arise as the most salable or liquid of assets through a market process, later in the evolution of monetary arrangements. However, eventually, they argue, the medium of account and medium of exchange functions are united in a single commodity or asset, because the medium of exchange comes to represent a commonly understood value by being more liquid

than the medium of account. Being the most salable or liquid of assets, thus, represents a monetary heuristic when the medium of account and medium of exchange functions were unified in the asset we call money. In long-distance trade when several currencies are used, their relative liquidity, as reflected in their exchange rates, will provide a useful heuristic.

As Galef (1996) argues, the study of social learning in animals concerns both the evolutionary roots of the human mind, i.e. possible links between social learning in animals and humans, on the one hand, and the consequences for the evolutionary fitness of animals that live in groups and therefore learn socially in such a social group, on the other hand, keeping in mind that social learning matters to adaptability. Concerning monetary arrangements in the Baltic and North Seas region, the evolution of units of account and media of exchange are adaptive responses by human minds, in the form of heuristics of traders, where long-distance traders rely upon the liquidity of various currencies, as reflected in the exchange rates.

4. ASSESSING HISTORICAL MONETARY HEURISTICS: TWO EUROPEAN CASES

The evolution of monetary scripts, through a sequence of script deviations can be observed in medieval Japan, where the state did not mint coins. Honda (2007) argues that Chinese coins emerged as media of exchange, because the Japanese state neither minted nor issued coins, replacing commodities, such as silk, linen, and rice. By the late fifteenth century, he finds that high quality coins started being selected, while inferior coins were rejected, eventually leading to a division between “pure coins” used as measure of value and “ordinary coins” used as means of payment, according to the prevailing exchange rates, in the Ōuchi domain. This can be seen as some kind of monetary separation, where a rare coin of high quality

emerged as unit of account, while common coins functioned as media of exchange.

Nevertheless, the origin of the Japanese medium of account was rice. As Einzig (1966) points out, rice was extensively used as unit of account in the seventeenth century and provided meaning to metallic money, and landowners issued rice notes that were freely convertible into rice, a practice that continued even after metallic money had taken over with the expansion of trade. Hence, the original monetary script was to calculate and pay the price of other commodities in rice.

Chinese coins were attributed a high value, as a Chinese commodity, but people learned their effectiveness as a medium of exchange (Honda, 2007). The Japanese monetary script evolved to include these coins as medium of exchange, although rice still functioned as a measure of value. Expansion of trade caused to a shortage of coins, leading to the minting of domestic coins, while Chinese money was debased, causing anti-shroffing edicts to ban inferior coins (Honda, 2007). In this situation, the monetary script evolved to use the scarce high quality Chinese coins as medium of account and inferior domestic and foreign coins as media of exchange, at prevailing exchange rates.

The Japanese case above illustrates the crucial importance of trade. Following Clower (1999), monetary exchange arise from the same forces of self-interest that induce individuals to make markets; some transactors becoming marketors, eventually specializing, but what constitutes money depends on what country we are in, when we are there, and where we are. Hence, rather than looking upon money as a uniform social institution, we may consider it as historically specific social institutions.

For the Baltic and North Seas region, the focus is upon the role of East-West long-distance trade in the region, from the Hanseatic League, an inter-city union of merchants, onwards. Fink (2011), studying the Novgorod *kontore* of the Hanseatic League, argues that

the Hanseatic League originally was an association of merchants and later of cities, while the *kontore* was a genuine social contract between Hanseatic merchants operating there, which gradually turned into an association of merchants, as the Novgorod *kontore* lost its independence to the cities of the Hanseatic League. Pöder (2010) studies Tallin as trading establishment for Hanseatic trade with Novgorod and stresses the great axis Novgorod-Tallin-Lübeck-Hamburg-Bruges-London, focusing on the Tallin merchant guild, which had been set up to facilitate honest trade, but later became rent-seeking.

In pre-industrial Europe, in addition to a southern trading zone in the Mediterranean, a northern trading zone emerged from the Low Countries to the Baltic, where the Hanseatic League played an important role, and down the Bay of Biscay to the Iberian Peninsula, in which trade within the zone transformed the technology of production (Kohn 2001a,b). As previously argued, trade requires appropriate monetary arrangements, some unit of account and some medium or media of exchange. Baltic exports were in the early modern period paid by bullion (Attman, 1983), but later colonial commodities replaced bullion (Johansen 1983; Rönnbäck 2010). However, we need to start with the original monetary scripts, and their monetary heuristics, in the region.

Einzig (1966) reports that cattle was frequently used as medium of exchange in medieval Germany, and Charlemagne in dealing with the Saxons defined the value of his *solidus* as the value of a one-year-old ox, while medieval Iceland operated first under a cattle standard, cattle supposedly being a prehistoric Scandinavian currency, followed by a cloth, and later a fish standard. He also argues that cattle must have served as a currency in early times in Russia, as the oldest name for money is *skot*, meaning both cattle and treasure, a term he believes to have been imported by Viking traders, but the Russians used fur money in international trade, and furs and skins remained in monetary use long after the adoption of metallic money. Hence, they played the same role as standard of value as rice had in Japan.

For medieval Sweden, Einzig finds that cattle and cloth were most widely used as currency until coined money appeared, while Baltic countries under Swedish control used skins and furs as currency, and precious metals in the form gold and silver rings were used as currency in Sweden, like in Denmark.

Now, consider what would happen if, in the Middle Ages, Germans, Swedes, and Danes settled in Reval (medieval Tallinn) to trade with Novgorod, as Pöder (2010) does, focusing on the local merchant guild. How would we be able to assess the evolution of the monetary script? Following the line of monetary thought of Schumpeter, Mises, and Wicksell, money is attributed value according its perceived purchasing power. We can, therefore, imagine that long-distance merchants thought in terms of the money price of their own domestic currency for a commodity to be sold or bought and the equivalents in other currencies. Exchange rates between currencies were established according to relative perceived purchasing power, some kind of classifier system. Hayek's (1952) map is an apparatus for classification, by which a sequence of individual mental images result from streams of impulses. The monetary heuristics establishes the value of various monies by means of some reference commodity, be it an ox or a piece of fur, which may differ among agents. This establishes exchange rates among accepted media of exchange depending on their relative money price for various traded commodities. We may, thus, use exchange rates to assess monetary heuristics, because they leave footprints, the exchange rates.

For the Middle Ages, Spufford (1986) compiles exchange rates that we may use, although scarce for Northern and Eastern Europe. The monies of Lübeck and the Wendish Monetary Union, at the Baltic Sea, and Flanders, at the North Sea will be compared with some references to those of Riga. For the Low Countries, Spufford (1986) finds the monies of account to be very complex, as reflected in Bruges, where currencies from many countries were used as media of exchange, since foreign merchants came there, and the monies of

account of the Low Countries were developed on the basis of the many adopted coinages. For Flanders, he mentions monies of account based on the deniers of Flanders, Flemish sterlings, Flemish versions of the gros tournois and later the Flemish groten, the French gold royale or masse d'or, and the rheingulden, many of which became tied to the Flemish groot.

Table 1 Observations of the Lübeck gulden in Lübeck schillinge and pfennige by year/period

Less than 10 s.	Less than 15 s.	Less than 20 s.	Less than 30 s.	More than 30 s.
1343-47	1355-71	1402	1418	1449
1347-52	1368-74	1411-15	1422-23	1456
1354	1374	1411	1424	1457-58
1355-71	1375-82	1415	1432-39	1468-72
	1375	1418	1441	1472
	1375			1476
	1391			1482-83

Note: More than one observation for a particular year or period sometimes exists.

Source: Spufford (1986)

Table 1 presents observations by year or period of the Lübeck gulden in Lübeck schillinge and pfennige and shows what seems to be a gradual depreciation of the schillinge and pfennige towards gulden. Gold was excluded from the Wendish Monetary Union and Lübeck minted its own gold coin between 1340 and 1801 (Spufford, 1986). Arguably, the gulden represented a particular worth to Lübeck merchants, while the schillinge and pfennige that were common to the Wendish Monetary Union decreased in relative value from 1340s to the 1480s. This represents bimetallism, where gold and silver coins were legal tender in a common unit of account, which, Redish (2000) points out, started tied to a particular coin that over time might no longer be minted, thus becoming an abstract unit.

The money of account was not imaginary, according to Roover (1948), but based upon either a real coin, such as the groot in Flanders, or a coin that had ceased to circulate but still represented a weight in gold or silver, such as the denier parisis in Flanders. In Lübeck and the Wendish monetary union, the Lübeck mark of 16 schillinge was used, while common coinage consisted of pfennige and from 1432 also schillinge, according to Spufford (1986), so the mark was a money of account for silver coins used as real money.

For Lübeck, we observe, thus, that the gulden appreciated gradually to the mark.

Following Redish (2000), gold tended to be undervalued, so the mint equivalent ³of gold relative to silver was lower than the relative price of gold to silver, thus causing a gradual adjustment upward. What about the valuations of other currencies in the Hanseatic League?

Consider the money of Flanders, thus going westward to Bruges. Let us consider the Flemish pond groot in mark, schillinge, and pfennige in Lübeck, thus staying within the monetary scripts and heuristics of Lübeck merchants. Table 2 shows that in the minds of Lübeck merchants, the Flemish pond groot depreciated from the 1340s to the 1390s, but started appreciating again from the late 1390s to the 1470s. In fact, Spufford reports the lowest value of the Flemish pond groot in 1394, 3 mk., 14 s., 7 d.

Table 2 Average exchange rate of Flemish pond groot in Lübeck mark, schillinge and pfennige

Period	Mark (mk.)	Schillinge (s.)	Pfennige (d.)
1341-1353	8	7	2
1356-1371	6	3	11
1373-1394	4	13	4
1398-1418	5	15	4
1418-1437	7	2	11
1445-1474	8	1	6

Note: For 1418, two observations give a turning point in the Lübeck gulden exchange rate.
Source: Spufford (1986)

Hence, when the gulden appreciated continually, the Flemish groot first depreciated until the mid 1390s and then appreciated. This reflects an assessment of Lübeck merchants about the relative liquidity of Flemish money. According to Roover (1948), Flanders was on a silver standard in the fourteenth and fifteenth centuries, so if silver content was the monetary heuristic this reflects changes in the purchasing power of silver in Flanders. Roover mentions the sharp increases in the price level in the fourteenth century, leading to monetary ordinance of 1389-1390, involving a new groot, thus suggesting a rapidly declining purchasing power

³ Redish defines mint equivalent as the legal tender value of coins, in units of account, for a given weight of the precious metal, as opposed to the mint price, which was posted for a given weight and fineness of that metal.

being gradually restored. Looking at some descriptive statistics may be helpful to assess the monetary heuristics.

Table 3 Descriptive statistics of the exchange rate of the Flemish pond in Lübeck mark, schillinge and pfennige

	1341-1394 N=35			1398-1474 N=32		
	Mark	Schillinge	Pfennige	Mark	Schillinge	Pfennige
Minimum	3	14	7	4	10	0
Median	6	0	0	6	13	7
Maximum	9	1	0	9	0	0
Standard deviation	1	10	1	1	1	8

Table 3 shows that the median was 6 mk. in the 1341-1394 period and slightly higher, 6 mk., 13 s., 7 d., in the 1398-1474 period. At the same time the standard deviation, which measures volatility, decreased from 1 mk. 10 s. 1 d. to 1 mk. 1 s. 8 s., suggesting a somewhat more reliable monetary heuristic in the latter period. Nevertheless, the range was from 4 mk., 10s. to 9 mk. This is line with the price history of Flanders. In the eastward direction, however, the monetary heuristic seems to have been more reliable, according to the limited data Spufford provides. Table 4 shows that the Lübeck mark was translated into the mark, schillinge, and pfennige of Riga at fairly stable rates, in both Reval and Riga, so that 100 Lübeck schillinge fluctuated within the range of 256.25 and 281.25. However, this relative stability reflects Lübeck's central position in the Hanseatic League and the Hanseatic control over exchange in the Baltic.

Table 4 The exchange rate of the Riga schillinge to 100 Lübeck schillinge in Riga and Reval

	Riga 1319	Riga 1406	Riga 1432-33	Riga 1457	Riga 1461	Reval 1456	Reval 1457
281.25	X		X				X
276.56		X					
262.50				X		X	
256.25					X		

Source: Spufford (1986)

Turning to the seventeenth and eighteenth centuries, it is interesting to study the monies of account of the Hanseatic city Hamburg. According to McCusker (1978), Hamburg had two monies of account that both had to be understood for commercial reasons, one shared with Lübeck (lubs), the reichsthaler, which was equal to three marks and the other owing its origin to Antwerp, the Flemish (vls) pound, pfund-vlamische, where one pfund-vls was equal to seven and a half marks-lubs.⁴ This monetary script gives monetary heuristics based upon the purchasing power of observed for each currency in their respective markets. According to Wicksell ([1906] 1966), credit instruments, such as bills of exchange increased virtual velocity, thus being a remedy to scarcity of money, a process that continued with the development of banking, involving certificates of deposit and banknotes, and later with the rise of the modern bank when deposit and giro banks started lending out deposits.

In the seventeenth century, the Baltic and North Seas region saw the establishment of pure deposit banks, such as Amsterdamsche Wisselbank (Bank of Amsterdam), founded in 1609, and combined deposit and credit banks, such as Stockholms Banco, the Bank of Palmstruch, founded in 1656, a precursor of Sveriges Riksbank and the first European bank to issue banknotes. Huerta de Soto, J. (2006) views the Amsterdamsche Wisselbank as a 100 percent deposit bank, which nevertheless started violating its legal principles in the 1780s, while he argues that Stockholms Banco, which had one department for safe-keeping of deposits on a 100 percent ratio basis, and one devoted to loans, violated the 100 percent reserves criterion by issuing banknotes beyond actual deposits received in cash. Hence, fractional reserve banking with credit expansion, creating money, was gradually established. This extended the meaning of money to be perceived and agreed upon by traders.

⁴ The relationships were 1 pfund-vls = 20 schillinge-vls = 240 grote-vls and 1 mark-lubs = 16 schillinge-lubs = 192 pfennige-lubs (see McCusker, 1978).

According to Denzel (2010), the bill of exchange was a cashless means of payment of European merchants between the Middle Ages and the twentieth century, but in Northwestern Europe and the Baltic Sea region, merchants relied on the bill obligatory, a payment promise,⁵ but from the late sixteenth century the former gradually replaced the latter. He provides an example involving a good credit, where the seller in city A receives money in the currency of city A by selling the bill to a merchant banker in city A, who send the bill to a merchant banker in city B, who in turn presents it to the purchaser in city B, who responds by accepting and paying the money in the currency of city B, as well as a case of money transfer with a single merchant banker in cities A and B. In the former, some commodity is valued in two different currencies, in terms of their purchasing power to that commodity, while the latter is based upon the exchange rate thus established.

Furthermore, Denzel describes endorsement, established at the Antwerp stock exchange in the sixteenth century and spreading to Northwestern Europe, which improved the transferability of bills of exchange, thus making it a negotiable paper among merchants, a practice that was perfected by the establishment of the *Amsterdamsche Wisselbank*, an exchange bank. A merchant banker in city A (drawer) gives the bill to another merchant banker in city A (remitter), who sells the bill to a merchant banker in city B (payee), who credits the remitter's account and presents the bill to the merchant banker in city B (the drawee), to whom the drawer draws the bill, and the drawee charges the account of the drawer. He argues that a Northwestern European dominated cashless payment system with Amsterdam as financial center characterized the seventeenth and eighteenth centuries and Dutch commercial interests integrated the Baltic Sea region and Archangel to the Dutch

⁵ The bill of exchange transaction involves three or four persons: the issuer, the drawer, receives money by selling the bill to the remitter, who in turn sends it to the beneficiary, the payee, who then presents it to the drawee, who accepts and pays the beneficiary for the bill, thus concluding the exchange transaction between the drawer and drawee, the beneficiary and remitter sometimes being the same person, while the bill obligatory, as a payment promise, involved only two or possibly three persons: the merchant who borrowed money to be paid back at the next fair, the lending merchant, and possibly a representative of the lender (see Denzel, 2010).

cashless payment system, London gradually taking over the position of Amsterdam during the eighteenth century and becoming the most important exchange market in Northwestern Europe after 1815.

For the purpose of this paper, Denzel presents exchange rates that refer to bills of exchange, converted into decimal price quotations. These exchange rates represent the purchasing power of the currencies at issue. As the cashless payments system had Amsterdam as focal point, until London took over after 1815, we study the exchange rates of the currencies of Hamburg, mark banco, and Saint Petersburg, the silver rouble during the 1710-85 and 1839-70 periods, and the Russian paper money, banco rouble, which was used from 1786 to 1839, to the currency of Amsterdam, the guilder Flemish banco, as of 1816 the Dutch guilder, for the 1710-1870 period, i.e. up to the gold standard. In addition, the exchange rates of two other Baltic Sea area cities, Danzig and Riga, are considered in the guilder Flemish banco/Dutch guilder, the guilder (zlot) Polish current, also named guilder Danzig current, after Danzig lost its territorial connection to Poland in 1772, and the Albertthaler of the Spanish Netherlands, a silver trade coin used as unit of account in Riga, respectively. The latter two are given only for a fraction of the period considered, but may still shed some light on the Russian rouble. Monetary heuristics are assessed by considering the stability of the median exchange rate together with the range and standard deviation, setting the exchange rate of 1780 to one hundred, for some periods of varying length due to institutional change of Russian money.

Table 5 shows that the exchange rate of the currency of the Hanseatic city Hamburg to that of Amsterdam was much more stable than the exchange rate of the Saint Petersburg, especially during the era of the banco rouble, the Russian paper money, the mark banco appreciating slightly over time, while the Russian silver rouble depreciated, but the Russian silver rouble was, nevertheless, more stable than the Polish/Danzig guilder current during the

1710-85 period, while the Albertthaler used in Riga was more stable in the late eighteenth century, early nineteenth century than the Polish/Danzig guilder. The small appreciation of the Hamburg mark banco may simply reflect the declining importance of Amsterdam, thus suggesting a viable monetary heuristic in Hamburg, while the depreciation of the silver rouble suggests a less viable monetary heuristic, based on silver weight, while for the banco rouble the monetary heuristic was very unreliable.

Table 5 Descriptive statistics of Hamburg, Saint Petersburg, Danzig, and Riga exchange rates on Amsterdam, 1710-1870 (1780=100)

	Minimum	Median	Maximum	Standard deviation	N
Hamburg ¹ 1710-1785	95.8	101.0	108.5	2.11	76
Hamburg 1786-1839	83.9	95.2	100.5	3.29	54
Hamburg 1840-1870	92.9	94.1	95.2	0.66	31
Saint Petersburg ² 1710-1785	56.4	83.2	104.0	11.63	75
Saint Petersburg 1786-1839	101.3	357.4	464.7	124.32	54
Saint Petersburg 1839-1870	100.9	108.0	135.1	9.97	32
Danzig ³ 1710-85	61.7	68.8	101.9	14.32	76
Danzig 1787-1810	83.0	89.7	97.2	4.06	24
Riga ⁴ 1757-1809	88.8	97.6	100.2	2.50	27

Notes:

1. Mark banco per 100 guilders Flemish banco, per 100 Dutch guilders as of 1816.
2. Silver roubles per 100 guilders Flemish banco/Dutch guilders (as of 1816) in 1710-85 and 1839-70; banco roubles per 100 guilders Flemish banco/Dutch guilders (as of 1816) in 1786-1839.
3. Guilders Polish/Danzig current per 100 guilders Flemish banco/Dutch guilders (as of 1816).
4. Albertthaler per 100 guilders Flemish banco/Dutch guilders (as of 1816).

Source: Denzel (2010)

As Fantacci (2005) argues, intrinsic value matters in long-distance trade, as opposed to local trade, where extrinsic value matters. Monetary heuristics, to evaluate the relative purchasing power of two currencies, seem to have been based on weight rather than tale, by the intrinsic value of a precious metal rather than extrinsic value based upon the institutional context. Arguably, the proximity between Hamburg and Amsterdam meant more exchange and social learning among traders, while the Albertthaler had its origin in the Netherlands, but

still the monetary heuristics seem to have been based on weight. The mark banco was a never-minted money of account of the Hamburger banco (the Hamburger Wechsel-Bank) established in 1619, but it was based on the speciethaler of 1566, a silver coin (Denzel, 2010). This abstract unit of account was then based on some previous coin, again suggesting monetary heuristics relying on the weight of precious metal, representing a particular purchasing power. The Polish/Danzig guilder was a silver coin of declining weight of pure silver to 1766, from 1766 to 1786 it was fixed to the Konventionskurant at the value of 4:1 and during the Prussian occupation 1793-1814 four guilders Danzig current was equal to one thaler Prussian current (Denzel, 2010), again suggesting a monetary heuristic based on silver weight. Nevertheless, this is not necessarily metalism, as the existence of the agio illustrates.

McCusker (1978) points out that the transactions of the Amsterdamsche Wisselbank were entered into its books, using bank money, while everyday business used current money, the difference being called agio, the percentage premium on bank money for current money, the former being of greater value, the same being the case for Hamburg. According to McCusker, most foreign exchange transactions were negotiated in bank money, but there were exceptions, such as those with Denmark and Sweden. However, the merchant bankers of Amsterdam and Hamburg were clearing-houses for mutual payments between England and Sweden in a system of multilateral trade (Heckscher, 1950), so calculation in Amsterdam or Hamburg bank money was possible. Dutch merchants were also active in establishing a grain trade link between Atlantic France and Poland in the seventeenth century (Collins, 1984). Falling transportation costs and the development of the bourse markets had made trade even more focused on the Low countries as the center of the northern trading zone with Amsterdam merchants coordinating grain trade, keeping the price in Amsterdam relatively stable (Kohn, 2009, referring to Unger, 1983). Therefore, Amsterdam bank money had a central position.

The agio can be seen as information about the value of the bank money in terms of current money with a specific metal content. In this way, the bank money can be considered as an abstract unit of account, being derived from a sequential process, ultimately to the original commodity value, along the lines of Kitson (1895), or Meulen's (1934) banknote pound as invariable unit of value, which was to be created by substituting banknotes for gold coins and then letting the price of gold in banknote pounds fluctuate according to market conditions for gold. Some original purchasing power gives the value of the bank money, while the current money varies according to market conditions. The agio is then a measure of market conditions for precious metal, which is used to produce current money, and thereby subject to social learning among traders. There was some original silver weight defining the value of money, as purchasing power, in that historical context.

The Hanseatic League and the Amsterdamsche Wisselbank are two historical cases, where monetary heuristics of long-distance traders may be assessed by looking on the stability of exchange rates, which reflect the relative purchasing power of two currencies, used in long-distance trade. Monies of account were linked to real monies, coins in precious metal, which had a certain purchasing power of commodities traded. The monies of account represented some specific purchasing power in a specific historical context used as framework of reference.

5. CONCLUSIONS

Developing methods to assess the monetary heuristics of traders in historical time, involves the form of units of account and media of exchange they used and their success in their contemporary trading environments. The medium of account provides a script that translates the unit of account into a particular worth, as market agents attribute a specific worth to some abstract symbol or some commodity or set of commodities. It is a social script whenever it is

a shared mental map for the social routine of attributing that specific worth. Money emerges from a process of social interaction among economic agents as a specific monetary arrangement, the asset that unifies the monetary functions of medium of account with medium of exchange. However, various monetary arrangements emerge because they provide adequate liquidity to the real economy. As a commodity bundle, defining the unit of account, adjusts over time, the social script changes. When the value of the underlying commodity bundle changes from the original worth, market agents observe a script deviation of that bundle, attributing that to changes in the commodity space, and adjust the bundle accordingly.

In the case of money, traders share attention on alternative monies and the price of a commodity in various monies. Monetary heuristics emerge in the mind of economic agents, when a stream of price signals, expressed in some monetary unit, provides a monetary script for a valuation and exchange of commodities. The script emerges as a mental map of the routine of attributing worth to a unit of account, leading to some heuristic device facilitating that routine. At various stages during financial evolution, a historically specific monetary heuristic has emerged, based upon some previously established monetary script. Being the most salable or liquid of assets, thus, represents a monetary heuristic when the medium of account and medium of exchange functions were unified in the asset we call money. In long-distance trade, the relative liquidity of currencies reflected in their exchange rate provides a heuristic.

The evolution of units of account and media of exchange are adaptive responses by human minds, giving heuristics of long-distance traders in the Baltic and North Seas region. Looking on original monetary scripts, various commodities were used as primitive money and the value of coins were defined in terms of these commodities to facilitate long-distance trade. Long-distance merchants thought in terms of the money price of their own domestic currency for a commodity and the equivalents in other currencies. Exchange rates between currencies

were established according to relative perceived purchasing power, some kind of classifier system. Exchange rates can be seen as the footprint of these monetary heuristics, or classifier systems. Since intrinsic value mattered in long-distance trade, the precious metal content is a likely monetary heuristic.

However, a comparison between the monies of Lübeck and the Wendish Monetary Union, at the Baltic Sea, and Flanders, at the North Sea with some references to those of Riga suggests changing purchasing power of silver in Flanders, to which Lübeck merchants reacted, which means that the unit of account was abstract, referring to some original purchasing power of Flemish currency. Comparing for the 1710-1870 period, the exchange rate of the bank money currency of the Hanseatic city Hamburg, Saint Petersburg, involving both silver and paper monies, Riga, and Danzig, to that of Amsterdam, also in bank money, suggests that the monetary heuristic in Hamburg was viable and more reliable than that of Saint Petersburg, using Russian silver money, while Russian paper money meant a very unreliable monetary heuristic, having no intrinsic value in silver. There was some original silver weight defining the value of money, as purchasing power, in that historical context. The Hamburg bank money was an abstract unit of account based on some previous coin, thus suggesting monetary heuristics relying on the weight of precious metal, representing a particular historical purchasing power.

REFERENCES

- Attman, A. (1983). *Dutch Enterprise in the World Bullion Trade 1550-1800*.
Göteborg(Gothenburg): Kungl. Vetenskaps- och Vitterhetssamhället.
- Bogdan, R. J. (2000). *Minding Minds: Evolving a Reflexive Mind of Interpreting Others*.
Cambridge, MA and London: The MIT Press.
- Boulding, K. E. (1962). "The Relations of Economic, Political and Social Systems." *Social and Economic Studies*, 11: 351-362.
- Boulding, K. E. (1978). *Ecodynamics: A New Theory of Societal Evolution*. Beverly Hills,
CA: Sage.
- Buller, D. J. (2005). *Adapting Minds: Evolutionary Psychology and the Persistent Quest for Human Nature*. Cambridge, MA and London: The MIT Press.
- Cesarano, F. (1995). "The New Monetary Economics and the Theory of Money." *Journal of Economic Behavior & Organization*, 26, 445-455. Reprinted in Cesarano (2008).
- Cesarano, F. (1999). "Monetary Systems and Monetary Theory." *Kredit und Kapital, Heft 2/1999*, 192-208. Reprinted in Cesarano (2008).
- Cesarano, F. (2008). *Money and Monetary Systems: Selected Essays of Filippo Cesarano*.
Cheltenham & Northampton, MA: Edward Elgar.
- Clower, R. (1999). "From Markets to Money." *Ekonomia*, 3:1-13.
- Collins, J. B. (1984). "The Role of Atlantic France in the Baltic Trade: Dutch Traders and Polish Grain at Nantes, 1625-1675." *Journal of European Economic History*, 13: 239-289.
- Cowen, T. & Kroszner, R. (1994). *Explorations in the New Monetary Economics*. Oxford and Cambridge, MA: Basil Blackwell.

- Davidson, P. (1978). *Money and the Real World*. Second Edition. London: Macmillan.
- Davidson, P. (1982). *International Money and the Real World*. London: Macmillan.
- Davidson, P. (1982-83). "Rational Expectations: A Fallacious Foundation for Studying Crucial Decision-Making Processes." *Journal of Post Keynesian Economics*, 5: 182-198.
- Davidson, P. (1987). "Sensible Expectations and the Long-Run Non-Neutrality of Money." *Journal of Post Keynesian Economics*, 10: 146-153.
- Denzel, M. A. (2010). *Handbook of World Exchange Rates, 1590-1914*. Farnham and Burlington, VT: Ashgate.
- Einzig, P. (1966). *Primitive Money: In its Ethnological, Historical, and Economic Aspects*, Second Edition. Oxford: Pergamon Press.
- Fantacci, L. (2005). "Complementary Currencies: A Prospect on Money from a Retrospect on Premodern Practices." *Financial History Review*, 12: 53-61.
- Fink, A. (2011). "Under What Conditions May Social Contracts Arise?" *Constitutional Political Economy*, 22: 173-190.
- Galef, B. G. Jr. (1996). "Introduction." In: C. M. Heyes and B. G. Galef Jr. (Eds.), *Social Learning in Animals: The Roots of Culture*, San Diego, CA: Academic Press, 3-15.
- Gigerenzer, G. (2008). *Rationality for Mortals: How People Cope with Uncertainty*. Oxford and New York: Oxford University Press.
- Greenfield, R. L., & Yeager, L. B. (1983). A Laissez-Faire Approach to Monetary Stability. *Journal of Money, Credit, and Banking*, 15, 302-315. Reprinted in Yeager, L. B. (1997), *The Fluttering Veil: Essays in Monetary Disequilibrium*, G. Selgin (Ed.), Indianapolis, IN: Liberty Fund.

- Hayek, F.A. von (1952). *The Sensory Order: An Inquiry into the Foundations of Theoretical Psychology*. Chicago: University of Chicago Press.
- Hayek, F.A. von (1976 [1982]). *Law, Legislation, and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy* (Vol. 2: The Mirage of Social Justice). London: Routledge & Kegan Paul.
- Hayek, F. A. (1979 [1982]). *Law, Legislation, and Liberty: A New Statement of the Liberal Principles of Justice and Political Economy* (Vol. 3: The Political Order of a Free People). London: Routledge & Kegan Paul.
- Heckscher, E. F. (1950). "Multilateralism, Baltic Trade, and the Mercantilists." *Economic History Review*, New Series, 3: 219-228.
- Hicks, J. R., ([1967] 1979). *Critical Essays in Monetary Theory*, Oxford: Clarendon Press.
- Hilton, D., & Slugoski, B. (1986). "Knowledge-based Causal Attribution: The Abnormal Conditions Focus Model." *Psychological Review*, 93: 75-88.
- Hodgson, G. M. (1989). "Post-Keynesianism and Institutionalism: The Missing Link." In J. Pheby (Ed.), *New Directions in Post-Keynesian Economics*, Aldershot: Edward Elgar.
- Honda, H. (2007). "Copper Coinage, Ruling Power, and Local Society in Medieval Japan." *International Journal of Asian Studies*, 4: 225-240.
- Horwitz, S. (2007). Learning, Monetary Exchange, and the Structure of the Economic Universe: An Austrian-Searlean Synthesis. In M. White, & B. Montero (Eds.), *Economics and the Mind*. London and New York: Routledge, 75-88.
- Huerta de Soto, J. (2006). *Money, Bank Credit, and Economic Cycles*. Auburn, AL: Ludwig von Mises Institute.

- Johansen, H. C. (1983). *Shipping and Trade between the Baltic Area and Western Europe 1784-1795*. Odense: Odense University Press.
- Kitson, A. (1895). *A Scientific Solution of the Money Question*. Boston: Arena.
- Knight, F. (1921). *Risk, Uncertainty, and Profit*. Boston: Houghton Mifflin.
- Kohn, M. (2001a). "Trading Costs and the Pattern of Trade in Pre-Industrial Europe." Draft chapter of *The Origins of Western Economic Success: Commerce, Finance, and Government in Pre-Industrial Europe*. Dartmouth College, Department of Economics, Working paper 00-06, <http://www.dartmouth.edu/~kohn/00-06.pdf>
- Kohn, M. (2001b). "The Expansion of Trade and the Development of European Industry to 1600." Draft chapter of *The Origins of Western Economic Success: Commerce, Finance, and Government in Pre-Industrial Europe*. Dartmouth College, Department of Economics, Working paper 00-20, <http://www.dartmouth.edu/~kohn/00-20.pdf>
- Kohn, M. (2009). "The Development of Commerce." In: *How and Why Economies Develop and Grow: Lessons from Preindustrial Europe and China* (Chapter 7). Dartmouth College, Department of Economics, <http://www.dartmouth.edu/~mkohn/Papers/lessons7.pdf>
- Koppl, R. & Luther, W. J. (2012). "Hayek, Keynes, and Modern Macroeconomics." *Review of Austrian Economics*, 25: 223-241.
- Lieberman, M. D. (2000). "Intuition: A Social Cognitive Neuroscience Approach." *Psychological Bulletin*, 126: 109-137.
- Lipe, M. G. (1991), "Counterfactual Reasoning as a Framework for Attribution Theories." *Psychological Bulletin*, 109: 456-471.

- Marmefelt, T. (2009). "Human Knowledge, Rules, and the Spontaneous Evolution of Society in the Social Thought of Darwin, Hayek, and Boulding." *Journal of Economic Behavior & Organization*, 71: 62–74.
- Marmefelt, T. (2012a). "Emergent Money and Economic Cycles: A Social Learning Perspective." In: A.Tavidze (Ed.), *Progress in Economics Research. Volume 26*, New York: Nova Science Publishers, 31-57.
- Marmefelt, T. (2012b). "Media of Exchange and Liquid Assets of Political and Market Enterprises: A New Monetary Perspective on Medieval French Monetary Mutations." In: A. López-Varela (Ed.), *Theoretical and Methodological Approaches to Social Sciences and Knowledge Management*, Rijeka: InTech, 375-392, Available from: <http://www.intechopen.com/books/theoretical-and-methodological-approaches-to-social-sciences-and-knowledge-management/media-of-exchange-and-liquid-assets-of-political-and-market-enterprises-a-new-monetary-perspective-o>.
- McCusker, J. J. (1978). *Money and Exchange in Europe and America, 1600-1775: A Handbook*. London: Macmillan.
- Meulen, H. (1934). *Free Banking: An Outline of a Policy of Individualism*. London: Macmillan.
- Mises, L. von ([1912] 1924). *Theorie des Geldes und der Umlaufsmittel*. Second Revised Edition, Munich and Leipzig: Duncker & Humblot.
- Moore, B. (1988). *Horizontalists and Verticalists: The Macroeconomics of Credit Money*. Cambridge: Cambridge University Press.
- Moore, B. R. (1996). "The Evolution of Imitative Learning." In: C. M. Heyes and B. G. Galef Jr. (Eds.), *Social Learning in Animals: The Roots of Culture*, San Diego, CA: Academic Press, 245-265.

- Pöder, K (2010). “Credible Commitment and Cartel: The Case of the Hansa Merchant in the Guild of Late Medieval Tallinn.” *Baltic Journal of Economics*, 10: 43-60.
- Redish, A. (2000). *Bimetallism: An Economic and Historical Analysis*, Cambridge University Press.
- Roover, R. de (1948). *Money, Banking, and Credit in Medieval Bruges: Italian Merchant-Bankers, Lombards, and Money-Changers: A Study in the Origin of Banking*. Canbridge, MA: The Medieval Academy of America.
- Rönnbäck, K. (2010). “Balancing the Baltic Trade: Colonial Commodities in the Trade on the Baltic, 1773–1856.” *Scandinavian Economic History Review*, 58: 188-202
- Schank, R. C., & Abelson, R. P. (1977), *Scripts, Plans, Goals, and Understanding*, Hillsdale, NJ: Lawrence Erlbaum.
- Schumpeter, J. A. (1917–18). “Das Sozialprodukt und die Rechenpfennige. Glossen und Beiträge zur Geldtheorie von heute. *Archiv für Sozialwissenschaft und Sozialpolitik*, 44, 627-715. Reprinted in Schumpeter, J. A., *Aufsätze zur ökonomischen Theorie*, Tübingen, 1952.
- Schumpeter, J. A. (1970). *Das Wesen des Geldes*. Edited by F. K. Mann. Göttingen: Vandenhoeck & Ruprecht.
- Searle, J. (1999). *Mind, Language, and Society: Philosophy in the Real World*. London: Weidenfeld & Nicholson.
- Setterfield, M. (2006). “Effective Demand and Endogenous Money: Towards a ‘Moorian’ Credit Supply Curve – and a Reconciliation between Horizontalists and Structuralists?” In M. Setterfield (Ed.), *Complexity, Endogenous Money, and Macroeconomic Theory: Essays in Honour of Basil J. Moore*, Cheltenham & Northampton, MA: Edward Elgar, 119-138.

- Spufford, P. (1986). *Handbook of Medieval Exchange*. London: Offices of the Royal Historical Society.
- Steuart, J. (1810). *Principles of Banks and Banking of Money*. London: Davis.
- Unger, R. W. (1983). "Integration of the Baltic and Low Countries Grain Markets, 1400-1800." In J. M. van Winter (ed.), *The Interactions of Amsterdam and Antwerp with the Baltic Region, 1400-1800*. Leiden: M.Nijhoff, 1-10.
- Wicksell, K. ([1906] 1966). *Föreläsningar i nationalekonomi, Häfte II: Om penningar och kredit*. Fifth Edition. Lund: Gleerups.
- Winter, S. (1994). "Förväntningar och kognitionsforskning." Lund University Cognitive Studies LUCS 33.
- Woolsey, W. W., & Yeager, L. B. (1994), "Is There a Paradox of Indirect Convertibility?" *Southern Economic Journal*, 61: 85-95.
- Yalcintas, A. (2012). "A Notion Evolving: From 'Institutional Path Dependence' to 'Intellectual Path dependence'." *Economics Bulletin*, 32: 1091-1098.
- Yeager, L. B. (1968). "Essential Properties of the Medium of Exchange." *Kyklos*, 21: 45-69, Reprinted in Yeager, L. B. (1997), *The Fluttering Veil: Essays in Monetary Disequilibrium*. G. Selgin (Ed.). Indianapolis, IN: Liberty Fund.
- Yeager, L. B. (1998). "Are Markets Like Language?" *Quarterly Journal of Austrian Economics*, 1: 15-27.
- Yeager, L. B. (2000). "Against Mistaken Moralizing." *Quarterly Journal of Austrian Economics*, 3: 49-54.
- Yeager, L. B. (2001). "The Perils of Base Money." *Review of Austrian Economics*, 14: 251-266.

Yeager, L. B., & Greenfield, R. L. (1989). Can Monetary Disequilibrium Be Eliminated? *Cato Journal*, 9, 405-419. Reprinted in Yeager, L. B. (1997), *The Fluttering Veil: Essays in Monetary Disequilibrium*. G. Selgin (Ed.). Indianapolis, IN: Liberty Fund.