# The Future of Money



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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

## ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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# Foreword

Looking to the next few decades, technological advances combined with fairly dramatic economic and social changes could create conditions for the emergence of new, virtual forms of money and credit. On the positive side these digital forms of money could help to create more efficient and more global economies and societies. On the negative side tomorrow's new forms of money could make it easier to engage in anti-competitive behaviour; exacerbate exclusion and inequality; foster economic volatility; facilitate criminal activity; and even undermine the effectiveness of macroeconomic policy.

To examine these issues and advance the dialogue among high-ranking government officials, business leaders and academics, an OECD Forum for the Future conference was held in Luxembourg on 11-13 July 2001. The conference had two primary aims: first, to explore the interrelationship between new forms of money and technological, economic and social change; and second, to consider the implications for leadership in the public and private sectors.

The conference was organised around three sessions. The first set the stage by looking back to historic developments, and forward to the technologies that could influence future forms of money. The second examined how interactions over the next few decades between new forms of money and economic and social changes could give rise to a wide range of new opportunities and risks. Finally, the third considered the ways in which public and private sector decision makers might encourage synergy between new forms of money and technological, economic and social dynamism.

The conference was opened on 11th July in the "Hémicycle européen" of the Kirchberg Conference Centre by Ms Lydie Polfer, Vice Prime Minister and Minister of Foreign Affairs and External Trade of Luxembourg; introductions to the theme of the conference were given by Mr Donald J. Johnston, Secretary-General of the OECD, and by Mr Luc Frieden, Luxembourg's Minister of Treasury and Budget. All three speeches delivered on this occasion are reprinted in this volume.

The opening event was attended by several hundred people from various professional walks of life – government officials, bankers, other financial experts,



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economists, consultants, researchers, university teachers, entrepreneurs, journalists, and many more – from all over the world.

The conference benefited from special sponsorship by the Luxembourg Government, the Luxembourg Bankers' Association (ABBL) and the Luxembourg Federation of the Professionals of the Financial Sector (PROFIL). Additional financial support was provided by numerous Asian, European and North American partners of the OECD Forum for the Future.

This publication brings together the papers presented at the meeting. It also includes an introduction prepared by the Secretariat. As with all previous Forum for the Future publications, this introduction not only endeavours to provide an overview of the main issues at stake and to reflect the richness of the very lively debate that took place; it also attempts to further advance the thinking on the subject in hand, inspired by the fruitful discussions at the meeting. The book is published on the responsibility of the Secretary-General of the OECD.



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# Executive Summary

To put it in succinct and current terms, money's destiny is to become digital. This general conclusion emerges from an examination of money's long historical record and its likely relationship to future socioeconomic changes. Historically, money has been on the path towards greater abstraction, or pure symbolic representation disassociated from a precise physical materialisation, for millennia. Less evident, when looking to the future, is the question of the rate at which the last vestiges of physical money will disappear and, in the minds of some, if it is really destined to vanish. Views also differ regarding the economic and social importance of traversing this "last mile" and what it would take to achieve it. At one end of the spectrum, Singapore's Board of Commissioners of Currency is moving forward with a comprehensive effort that is meant to replace, by 2008, the physical money it issues with a functionally equivalent and much more efficient digital system. At the other end of the spectrum, many central banks and governments have taken predominantly conservative stances, which accounts in part for the very limited success of recent efforts to diffuse digital money more widely.

A case can be made for reconsidering both the significance, in economic and social terms, of much fuller digitisation of money, and how to make it happen. On the economic front it can be argued that there are high costs, public and private, because of the slow pace at which new payment systems, capable of generalising digital money throughout the economy, are being introduced. These costs are not only the familiar direct ones caused by the large expenses involved in handling, clearing and policing physical cash, but also the less obvious losses associated with the difficulties of making the transition towards a "new economy of intangibles". From this "opportunity cost" vantage point, instantaneous digital payment systems that extend throughout the economy are seen as a crucial and still underdeveloped part of the infrastructure necessary for the flourishing of tomorrow's global knowledge-intensive economy where electronic commerce, in all its forms, is likely to be one of the key determinants of overall economic performance.

In social terms there is concern regarding the ways in which payment system costs are distributed and how accessibility issues will be addressed. Today the costs of cash (and near-cash instruments like cheques and credit cards) are largely hidden from consumers. For instance, there is little discussion of the equity



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dimension of the cross-subsidy, imposed when credit card companies prohibit merchants from offering discounts for cash payment, between people who pay cash (particularly the "unbanked" without other options) and those who pay with credit cards. Similarly, many clearing and settlement systems give rise to expensive service charges and lucrative floats that have serious social consequences in areas such as remittances by foreign workers, providing financial services to the excluded, or encouraging the start-up of micro-enterprises. Equally serious is the possibility that a major social fault line could develop in the future when access to digital money becomes the principal way to benefit from lower transaction costs and burgeoning cyber markets.

Adding these social concerns to the economic ones makes a strong case for proactive policies that aim to accelerate the diffusion of digital money to the point where it would marginalise physical cash. This conclusion has not emerged from most other recent discussions of the future of money because, for the most part, the focus has understandably been on the new and exciting technologies that might replace the physical with the digital and concerns about the implications of these technologies for central banks. Those discussions have provided reassuring conclusions regarding the implications of new technologies for the effective pursuit of macroeconomic policy. However, such a technology-centric approach tends to obscure both key forces likely to influence the future of money, and important policy issues and tools. Indeed, as became apparent at this conference, policy makers have good reasons not only to increase the pace at which tomorrow's digital money diffuses throughout the economy, but also to shift the policy focus away from monetary technology (physical) towards monetary agreements and standards (virtual) that underpin clearing and settlement systems that could be used by all participants in money-based transactions.

Two precedents offer important insights into why it makes sense to redirect policy efforts towards the virtual side of money. First, the Internet, as a network of networks, shows how uniform standards (TCP/IP and HTML, both originally sourced from the public sector) can be neutral with respect to the particular technologies (physical and digital) that use the system. This is crucial because it creates a wide-open market on the connection side where competition, technical advances and a very wide diversity of uses can flourish. Second, the national interbank clearing systems and international currency markets provide some examples of how, in the past, policy makers have helped to introduce the rules, as well as nurture the institutions, that run complex settlement systems with relatively high degrees of confidence and efficiency. Taking these kinds of policy initiatives could go a long way towards transforming technological potential into practical and efficient economic reality.

Finally, the terrorist events of September 11th, 2001 give additional salience and urgency to the accelerated introduction of much more widespread clearing



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and settlement systems based on broadly agreed rules for ensuring transparency of financial transactions. Establishing Internet-type open standards for ubiquitous payment systems, with internationally agreed principles for respecting privacy and the responsibilities of citizenship embedded in the basic software code, offers a major opportunity to marginalise illegal transactions of all kinds. First it would significantly reduce the place of cash, and second, it would bring all economic agents onto a level playing field when it comes to the transparency of their financial activities. Many pieces of such systems are either in place or being developed. Now, with global interdependence so clear to everyone, there is an opportunity to add a sense of urgency to setting an ambitious and innovative policy agenda for the future of money.



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*Chapter 1*

# The Future of Money

*by*

*Riel Miller, Wolfgang Michalski and Barrie Stevens*
OECD Secretariat, Advisory Unit to the Secretary-General

## Introduction

Over the past few years the future of money has received considerable attention. Many important questions have been posed and many answers provided. The findings presented in this chapter build on previous efforts to clarify a number of crucial issues and add a dimension that has been largely ignored up to now – to what extent might major advances in economic and social conditions, two to three decades from now, depend on as well as give rise to the use of digital money in most (if not all) market transactions? Consideration of this latter question follows directly from the mission and preceding conferences of the OECD International Futures Programme, in particular the findings of the recent 21st Century Transitions conference series on the prospect that there may be technological, economic, social and governance changes on a par with the radical transformations that characterised the transition from agricultural to industrial society. This introductory chapter offers a four point overview of the main findings.

## 1. Defining the issues

Fairly often, discussions of the future of money get sidetracked by confusion over the definition of money – its many functions, various forms, and the multitude of mechanisms for effecting transactions. Without offering a systematic review of the numerous strands of thought and differences in vocabulary, it is worth covering three basic points that together provide a solid analytical foundation for approaching the subject. First, for most economists, money serves three classic functions – as unit of account, means of payment, and store of value. In the future there is little prospect of change in these basic attributes. Second, there are a



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range of forms of money, not all of which must serve all three of money's primary functions. In the future there is a good chance that current forms of money will be joined by new ones, although it is difficult to ascertain the likelihood of widespread acceptance. And third, there will doubtless be a proliferation of monetary media or transaction methods, both physical and digital, over the next few decades.

These points of departure are helpful for clarifying the issues at stake in the discussion. However, two additional concepts make it much easier to assess the many possible trajectories that monetary forms and means of payment might take over the coming decades. One is the idea of a "monetary space" which refers to a domain, understood both in the physical sense of a particular territory and in the virtual sense of a specific market, within which a particular money serves one, two or all three functions. For instance, the territory of Japan defines a territorial monetary space that uses yen, while oil markets define a virtual monetary space that uses American dollars. The second useful concept is that of a "monetary hierarchy" that exists within a monetary space. This notion helps to distinguish different forms of money and the relationships that exist among them.

Dominating the hierarchy is the form of money that inspires the greatest confidence and can perform fully all of money's primary functions. Here it is worth recalling that money is a form of credit, with state debt in the form of issued currency usually having the highest degree of credibility in terms of the expectation of future redeemability. Legitimate and stable political authority has two strong advantages when it comes to ensuring that its money constitutes the common denominator of the monetary hierarchy. First, the state can specify that the payment of tax liabilities must be in a specific currency. Second, in so far as a government maintains its fiscal balances within acceptable limits, respects the prevailing rules of political legitimacy and seems well positioned to maintain its territorial sovereignty, there is usually widespread confidence that the currency will be a generally accepted unit of account and means of payment in the future (often this acceptance is a legal requirement within a territorial monetary space).

Other forms of money occupy a less dominant or less central position in the hierarchy, either because of less credibility or due to an inability to perform one or two of money's general functions. For the most part, the position of a particular form of money in the monetary hierarchy is determined by two attributes: its liquidity, which means the ease with which it is redeemable into the dominant currency, and its effectiveness in performing money's different functions. To take one example, the tokens stored on the smart cards used by some phone companies do not function at all as a generalised unit of account (no prices are posted in these units) and are limited as both a store of value



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(to the extent that they expire) and even as means of payment (no one else accepts them). Furthermore, these tokens are not at all liquid in that there is no redeemability back into the original currency. Frequent flyer miles and loyalty "dollars" are another example of a form of money with relatively narrow functionality. However, despite such limitations, these private tokens are a genuine form of money, while a credit card or other transaction mechanism, like a debit card, simply facilitates exchange using, in most cases, the dominant form of money.

Looked at in terms of monetary spaces and hierarchies it becomes clear that most current discussions of "electronic money" are not about new forms of money at all but rather about new ways of executing transactions with existing forms. Genuinely new forms of money emerge when a person or institution offers to create a token which has no prior record and which they promise to redeem at a particular value in the future. In most circumstances this new token starts at a very weak position in the monetary hierarchy. By way of contrast, new tools or technological means for engaging and recording transactions often try to overcome the steep hurdles to widespread acceptance by using the most familiar and dominant form of money. So when credit cards were introduced there was no effort to compound the problems of gaining users' confidence by attempting to introduce a new form of private money at the same time. Credit cards simply offer an easier way to use the currency that dominates the monetary hierarchy.

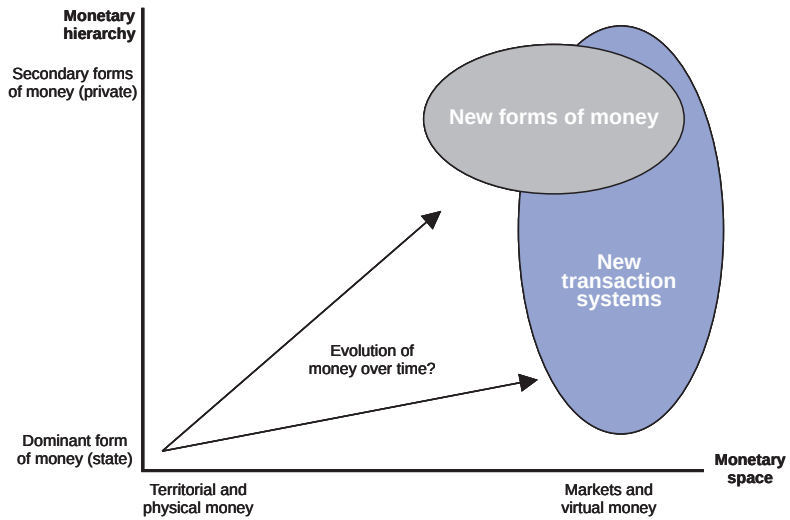
Figure 1 below uses these concepts to provide a graphical context for mapping possible directions for the future of money. The bottom left quadrant of the figure applies to situations where most transactions use the dominant currency of the monetary hierarchy, occur within a particular territory and are conducted using a physical medium. Historically, most societies have operated in this quadrant and even today this is the sphere of the majority of transactions involving individuals, retail merchants and small businesses. However, over time the weight of transactions measured in terms of value has moved more towards the bottom right quadrant. In specific markets such as oil, foreign currency and financial markets more generally, transactions have become less territorially circumscribed and more virtual, although for the most part the strongest currencies of the monetary hierarchy have continued to dominate.

For the future, as Figure 1 makes clear, the question is to what extent transactions will shift towards other quadrants – particularly the upper right, where conditions contrast the most with those that pertain today. Two distinct and mutually reinforcing answers are dealt with in turn in the following sections: one based on the long-run trends of monetary development, and the other rooted in an assessment of the implications for money of future economic and social changes.



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Figure 1. **Possible paths for the future of money**




*Source:* Riel Miller.

## 2. Implications of long-run historical trends

The likely path money might take in the future can be partly assessed by looking at three non-linear but nevertheless persistent trends, considered in detail by Michel Aglietta in Chapter 2, that have marked money's long history. First is the gradual dematerialisation or abstraction of money from a tangible object to an almost entirely intangible sign or digital record. Initial steps along this path can be found in some of the earliest written records. For instance, Plutarch describes how monetary reform in the 6th century BC, aimed at easing the debt load of poor peasants to their landlords, involved reducing the weight of the drachma by 30%. Another prominent step along this same path came with the Italian Renaissance and the introduction of bills of exchange that dematerialised money into entries in the accounts of creditors and debtors. Over time money has steadily moved towards the lower right quadrant of Figure 1, gradually becoming less material and increasingly digital.

The second long-run historical trend relates to the efficiency with which the relationships between creditors and debtors are managed, particularly within the financial sector which plays a pivotal role in sustaining confidence in a specific monetary hierarchy and space. The key development here has been the steady



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improvement in the agreements and standards that ensure mutually acceptable and routine resolution of daily interbank obligations. This trend displays two dimensions, one towards greater centralisation of the management of system-wide clearing, and the other a growing capacity to support complex, decentralised forms of money and payment mechanisms. The first is most clearly seen in today's networked national payment systems, where central banks and a specialised public regulator are usually the backstop and supervisor. The second dimension, made possible by the high integrity of the core financial sector's payment systems, is manifested in many OECD countries by the proliferation of new financial instruments (like mortgage bonds and hedge funds) and payment technologies (like smart cards and the new person-to-person Internet-based payment intermediaries – *e.g.* Paypal).

From the perspective of Figure 1, this twofold movement of centralisation and decentralisation does not suggest a particular trajectory for money. However, there can be little doubt that steady improvements in the capacity to ensure the integrity of a diversified and continuously evolving financial sector is a crucial enabler of movement from one quadrant to another. The successful introduction of both new forms of money and new means of payment depends, in large part, on the ease with which an issuer or medium can become part of a credible and efficient financial system. Without such a base, or when the system is regulated in ways that make it difficult for new entrants and innovation, there is little scope for movement in the possibility space described by Figure 1. This is why, as discussed in the concluding policy section, payment system rules and standards (including how they are governed) are likely to play such a crucial role in determining the pace and extent of the movement towards the upper right quadrant of the figure.

The third trend that marks money's historical record also points towards the importance of regulatory conditions. Here the story is one of the enhancements made to governance capacity, not only in the relatively narrow field of interbank clearing and the integrity of the financial sector, but broadly in terms of how money and the financial sector interact with the rest of the economy and society. Today's monetary spaces and hierarchies rest on governance systems that have the capacity to handle challenges combining broad economic and monetary dimensions such as controlling inflation, dealing with bank failures, and resolving the conflicts of interest that divide different constituencies (*e.g.* importers vs. exporters, debtors vs. creditors). For instance, in most OECD countries, the credibility of the rules and institutions that underpin a specific monetary space and hierarchy is realised through the regular publication of dependable economic statistics (*e.g.* the consumer price index), the establishment of clear lines of accountability and transparency (*e.g.* in state budgets, stock markets and central banks), and open processes for resolving disputes among competing interests



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(*e.g.* legislative debate and judicial remedies). In this system the state is the lender of last resort, legal enforcer of the national currency as means of payment, supervisor of the integrity of the financial sector and guardian of macroeconomic stability. Based on its legitimate political authority the state can make decisions that have a major impact on who are the winners and losers in society, including choices in the monetary sphere that at times favour creditors over debtors, bank shareholders over taxpayers, exporters over importers, and even owners over creators of intellectual property (by, for instance, failing to introduce a level playing field for micro-payments).

For the future, however, governance capacities may need to be significantly enhanced. The biggest challenges seem likely to arise from the need to negotiate new rules and reform or launch institutions capable of setting the standards and supervising the operation of a universally accessible digital currency. Many issues will need to be resolved, from the best method for establishing universal systems for verifying people's identities and providing effortless access to a digital money account, to ensuring high levels of interoperability on both the software and hardware sides of the monetary network. These challenges will require concerted efforts on the part of public authorities. At the national (or in the European case, regional) level, most of the governance capacities in terms of rule-setting, institution building and dispute resolution are in place, even if the experience of the existing system is largely confined to dealing with the issues that arise in the lower left quadrant of Figure 1, the sphere of territorially defined monetary spaces with state-dominated monetary hierarchies. At the global level few of the requisite decision making and implementation mechanisms are in place. The extent to which this could pose a problem will depend, as discussed in the next sections, on the nature of the changes and public policy goals likely to prevail.

## 3. The imperatives of economic and social change

If money's long-run trends signal that major shifts in monetary spaces and hierarchies are possible, it is the strong connection to socioeconomic change that offers a way of assessing the probability and desirability of such movement over the next few decades. There is a clear interdependency between specific socioeconomic conditions and the success of specific forms of money as well as payment mechanisms. For instance, intercity trading during the Italian Renaissance helped to both inspire and diffuse the use of bills of exchange. Taking more current examples, there is a mutually reinforcing relationship between credit cards as a payment mechanism and the conspicuous consumption patterns characteristic of certain social groups. Meanwhile the use of American dollars in parts of the world where the state lacks sufficient fiscal credibility (Argentina) or the "legal" economy is weak (Russia) also demonstrates that there is a close connection between specific socioeconomic and monetary systems.



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In the future, three sets of potential developments seem likely to exhibit a strong interdependency with the emergence of new payment systems and, perhaps, forms of money: *a*) technological advances that open up new possibilities for payment and settlement mechanisms; *b*) the transition to a global knowledge-intensive economy; and *c*) the demands for equitable access in more diversified societies.

### *a) Technological possibilities*

Recent interest in new forms of money has arisen rather naturally from the explosion of economic activity that is closely associated, at least in popular accounts, with advances in information technology and the Internet. Looked at from a purely technological point of view there is much to be excited about, both in terms of new supply-side innovations capable of delivering most if not all of money's primary functions and – maybe more importantly – on the demand side, where the full use of technology's potential will likely require the introduction of new payment systems. Without losing sight of the fact that technological advances are highly contingent on significant economic, social and governance changes, it is helpful to consider what the new tools and techniques might be.

Looking at the supply side, it is worth keeping in mind, for the sake of clarity, that there is nothing new about the dematerialisation of money. Nor is the shift into electronic form much of an innovation. Interbank settlement systems started along the road to a completely dematerialised electronic form of money with the introduction of the telegraph. Indeed, the monetary hierarchy of today is already dominated by electronic money.[1] For central and commercial banks, most transactions are electronic. For the many companies and individuals now connected directly to banks through the Internet, the lion's share of transaction value is in digital form, although in many cases this low-cost simplicity has not penetrated to back-office accounting and clearing procedures. Where innovations based on digital technologies can be expected to gain almost entirely new ground is at the consumer or individual level, where cash, cheques and credit cards remain predominant as means of payment. Competition at this level is fierce and the judgement of consumers, somewhat hesitant to change and very sensitive to gains or losses in convenience and security, have gone strongly against new payment systems.

Two categories of product can be distinguished. The first only involves changes in the transmission mechanism – the medium or method for conveying information. The second category of products concerns the issuing of new tokens that are not existing government-issued legal tender, or privately issued certificates of deposit, or any one of the many forms of money that are already in circulation. The innovations in the first category are due to advances in technology that can handle information much more efficiently. In the second category there is no pretension of



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innovation at a conceptual level: private and local community tokens serving as money have been around a long time. The new products in this category are simply those of new issuers trying to gain acceptance for their private token in the overall hierarchy of money. Perhaps what sows the seeds of confusion is that it is often the same companies trying to introduce the new media and the new tokens.

Considering the first category of new media, future prospects look relatively bright. Even though acceptance has been slow, there is good reason to expect that the long-run trend towards dematerialisation will continue. As Zachary Tumin notes in Chapter 3, electronic purses, which are simply digital memory that can be located in a plastic card with an embedded memory chip, a home computer or any computer connected to the Internet, are highly convenient ways of recording credit and debit transactions. However, for the time being the efficiency of this approach to storing information about money, regardless of the specific issuer or denomination, largely fails to outweigh problems with trust, network economies of scale (lack of a critical mass of participants), privacy and anonymity. Despite these growing pains, and without going into excessive detail about specific technologies – biometrics, intelligent agents and the like – there can be little doubt that full-fledged digital payment systems for consumers will be technically feasible.

What might these new systems look like? In the second decade of this century it is plausible that in many parts of the world the physical computer will have faded into the background of basements, broom closets and industrial warehouses. Users may only deal with video, audio and touch screen interfaces that are either scattered everywhere, like today's light switches and electrical outlets, or integrated into their clothing or watch. Using biometric identification systems that verify voice, face and fingerprint patterns during the course of perfectly normal discussions, the buyers and sellers will be able to confidently instruct their intelligent agent to assess all of the variables that enter into a monetary transaction, such as creditworthiness, consumer satisfaction levels, recent prices, alternative suppliers, current demand conditions and preferred forms of payment. Based on preferences expressed over a long period of time the intelligent agents can use individualised profiles to signal personal expectations regarding the conditions for a deal. Finally, upon approval and verification of identity, the funds transfer directly from the buyer's account (in a bank or some other verifiable, trusted source of funds) to the sellers, clearing and settling instantly.

There are many obstacles to realising this type of peer-to-peer digital money that is nework based, transparent, easy to use and highly secure. The difficulty most often raised when considering this trajectory is the contention that network transactions will never be able to acquire the virtues of anonymity, accessibility and security that characterise hard cash. Other developments, explored more fully in the following subsections on economic and social change, point to the solutions that might emerge as laws, institutions, cultural attitudes and technical fixes bring



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digital money onto a level playing field with cash. One potential for narrowing differences is in the area of traceability. Gradually the same degree of difficulty that now accompanies the recording of serial numbers of hard cash as a way of tracing each transaction will arrive in the digital world, as cryptography, legal safeguards and protocols for erasing identity become widespread and efficient.[2] Similar convergence can be expected in other problem areas like methods for tracking crime where cash is already a boon for black market activities. Eventually, with almost all of the current disadvantages of digital money out of the way, the vast share of consumer means of payment could tip over into the digital realm.

Turning to the second category of new money products, prospects seem less clear-cut. Although there is a good chance that certain sources for issuing private money, such as Microsoft or even Bill Gates, will remain richer and more stable than many sovereign issuers, there is little reason to expect that "Softs" or "Bills" will offer much competitive advantage when compared to the dollar, euro or yen. That is, of course, unless central bank money is abolished. Only in this case, as is convincingly argued by Geoffrey Ingham in Chapter 5, without central bank money there can be little expectation of either monetary stability or political legitimacy for the choices made in managing the monetary system. This does not mean that new technologies will not contribute to making it easier to issue private tokens (or for that matter, a new electronic form of legal tender). It simply means that the private or community-based monies will be tightly connected to the overall hierarchy of money and that the key to viability and diffusion will remain the soundness of the relationship to the primary unit of account that is issued (or, at a minimum, backed) by the central bank.

Digital money will only match the attributes of physical cash if there are major advances in the ease, cost and certainty with which digital transactions are handled. In particular there will need to be considerable progress in the following areas: verification, confidentiality, ease of use, interoperability and reliability – throughout the entire transaction chain. Many of these advances will require improvements in regulatory frameworks and related instruments. For instance, privacy laws can play a major role in ensuring that the required confidentiality levels for different types of transactions are met. The implementation of mandatory cryptographic, insurance, supervisory and other "safety standards" like those applied to so many other products, such as cars and food, could go a long way towards creating the necessary confidence in digital money. There is also a more scientific dimension, where technical progress in fields ranging from biometrics and ubiquitous computing to network protocols and intuitive interfaces can be expected to spur the invention of new payment systems and forms of money, as well as improving the chances that such innovations will be successful in gaining acceptance. In the end, however, the prospects for the diffusion of these technologies will depend on a profound set of economic, social and regulatory changes.



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### *b) Transition to a global knowledge-intensive economy*

Assessments of the possible paths for 21st Century Transitions almost all emphasise the extent to which the economy is likely to be dominated by the value of ideas and other intangibles. Three distinct aspects of this transformation seem poised to both demand and help create the conditions for the introduction of new transaction systems that make digital money as accessible and easy to use as cash, as well as a broader range of private forms of money. First is the transformation of the output and input attributes of all kinds of markets, including entertainment, utilities, transportation and even physical consumer goods. Second is the rethinking of the organisation, methods and even purpose of the firm. And third is the change that could occur at the level of macroeconomic and global relationships as planet-wide integration continues. Perhaps the most direct way to show the connections between these economic transformations and the future of money is to provide a number of examples of how things might function by the second or third decades of this century.

*Markets*

One of the markets where the need for new means of payment and the space for a wider range of private forms of money is already apparent is music. The capacity to create and distribute music using digital technologies has wreaked havoc with the way this market was once organised. Right now if producers want to sell their music they have a real problem in setting a price and in getting payment. What is sorely missing are the mechanisms that recognise private property, provide information for consumers, negotiate prices (for rights, subscriptions, leases, etc.), pay royalties (dependably and automatically), and do all of this on a global basis. Solving these problems will require a wide range of initiatives. But clearly one helpful breakthrough would be the introduction of methods for consumers to pay royalties directly over the network. This type of peer-to-peer system for making payments that are sent automatically whenever someone plays a song could go a long way towards creating the decentralised revenue streams that are obviously desired by many music creators but could also make new internet (dotcom) business models more viable.

The already apparent problems in the music market, which is just the most prominently hit of the various entertainment markets, provide a clear example of how advances in means and forms of payment could play an important part in helping establish viable business models in the future. But entertainment is not the only market where economic and monetary changes need to go hand in hand. For instance, the purchase of electricity and water could be moved to a continuous pricing model where consumers direct their home manager (a computerised intelligent agent) to buy (and sell in the case of locally generated power) when the



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price is lowest (or highest for cogeneration) and matches their demand patterns. Linking the energy market to a consumer-level clearing and settlement system that enabled "peer-to-peer" payments – even in very small fractions and in a form of money that could be negotiated, including for instance credits or debits to a loyalty scheme – could make a decisive contribution to making these innovations happen. Another strong spur to innovation could be to link payment systems to smart highways communicating with smart vehicles; co-ordination with GPS monitoring of traffic could allow the vehicle manager (another intelligent agent) to choose routes according to specified cost and time preferences using direct network micro-payments in agreed forms of money.

Another innovation with potentially profound economic implications that will also require a leap in the reach and performance of digital money networks is the solid-object-printer which "prints" sophisticated three-dimensional objects based on instructions from a computer. Commercial versions of such machines already exist, if only at the Model-T level of sophistication, where a physical object is built up by spraying layer upon layer of carbon composite in a technique that recalls the method a dot-matrix printer uses to lay down two-dimensional letters by putting dots along a horizontal line. With advances in materials science, computing and design, there is a possibility that objects now produced in large manufacturing operations could be decentralised to home or corner "copy shop" solid object printers. But if this type of distributed manufacturing is to flourish, there needs to be a safe and efficient way for making automatic, rapid and transparent micropayments for the designs (and the small custom modifications that are traded across the net) that people download for local printing. The ramifications of this kind of change are immense (for transport of traded goods, for the manufacturing sector, etc.), but what is important from the perspective of money is that today's relatively narrow problem of paying for entertainment in digital form could develop into a fundamental obstacle to the functioning of many parts of the market economy. The introduction of consumer-level, peer-to-peer clearing and settlement systems is important because it corresponds more fully to the needs of tomorrow's markets.

*Firms*

A second area where the economic transformations that are part of 21st Century Transitions may call for new payment systems and forms of money concerns the future functioning of the business enterprise. Here the potential for changes to the way today's typical company operates are not confined to outsourcing (make-or-buy) or disintermediation (cutting out the middleman). What is at stake is a fundamental change in the logic that comes from the non-exclusivity and almost costless reproducibility of the intangibles that may dominate the economy of the future. The much wider reach of digital transaction systems and forms of money



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could open up considerable scope for firms to experiment with new ways of setting prices, collaborating with suppliers, defining markets, improving efficiency, and generating revenue from intangibles.

Under conditions of abundance rather than scarcity, firms must reconsider both the organisation of production and the business model used to set prices in ways that make a profit. Already the bursting of the dotcom bubble and the paths taken by a wide range of Internet-based enterprises show the difficulties of adapting to the new environment. As detailed by Charles Goldfinger in Chapter 4, intangible inputs, outputs and assets follow different rules when it comes to depreciation, capacity utilisation, risk calculations, searching for economies of scale and setting prices. New means of payment and forms of money, by facilitating greater diversity of pricing and transaction models – particularly for intellectual property and intangibles – could offer important ways for firms to manage the ambiguity, volatility and decentralised diversity of tomorrow's economy.

Although at the moment there are more examples of firms that have failed to make this transition, the signs of ferment remain strong. In the business literature, on stock markets, at conferences and in the public media much searching is going on to find ways for firms to manage knowledge. However, if past transitions are a guide, the techniques, organisational structures, incentive systems and behavioural patterns will likely emerge from outside the existing frameworks and institutions. As the composition of the economy shifts, the new methods adopted spontaneously by those outside the existing systems begin to gain more weight overall. Gradually through ascendance and diffusion this periphery becomes the core. Early signs of the transition can be found in the new career expectations of young people, changing investment patterns like the huge boom in start-ups, and the unsettling cultural breaks that arise when notions of status differ markedly across generations and occupations. Getting beyond yesterday's "company culture" is a question not only of waiting for the old to renew from within and the new to take a larger part of the action, but also of introducing the tools that facilitate the transition. Digital money systems that correspond more closely to the unbundling of the functions once united so efficiently within the firm are clearly one of the important developments for facilitating the emergence of tomorrow's enterprises.

### *Global integration*

The global dimensions of 21st Century Transitions may have equally important implications for money as the changes, discussed above, in the nature and organisation of economic activity. Two sets of developments stand out: it seems natural to expect, first, that the changes in the functioning of markets and firms will be projected to the global level, and second, that the process of global integration will alter the economic, social and political underpinnings of money in ways that



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are likely to call for considerable innovation. Overall, a more integrated world will need appropriate means of payment and forms of money. But progress has been very slow, in large part because it entails major changes to the global financial infrastructure.

Turning first to improving the functioning of global markets, the current situation is that consumers as well as most small and medium-size enterprises still conduct transactions using expensive and cumbersome wire transfers, postal cheques and credit cards. On top of the delays and uncertainties of these systems must be added the costs and risks of foreign exchange conversion. Certainly there are powerful clearing and settlement systems that are entirely digital operating at a global level, but they make no pretence of extending beyond the narrow interbank monetary space. However, making good on the promise of global electronic commerce, not to mention the more ambitious transformations of markets and firms discussed previously, clearly requires the development of a much more extensive planet-wide network of sophisticated transaction systems. Only, as is apparent, over the short to medium term the ambitions of both the private and public sectors – with only a few exceptions like Singapore – remain very modest.

Nor, looking at the second set of developments, is much progress being made in improving the alignment between the global monetary space and the first tentative steps towards the creation of planetary public markets aimed at internalising key externalities of the global commons. In fact, strictly speaking, there is no global monetary space. The global monetary system is a collection of exclusively national (or quasi-national/regional) monetary spaces. Without a shared unit of account and its political underpinnings, it is exceedingly difficult to introduce the kinds of transparency needed for functional markets in, for instance, pollution permits or fishing rights. Here, steps towards the creation of a global monetary space could help with the introduction of markets aimed at coping with global warming by trading carbon emission rights or preserving bio-diversity by recognising and paying for the intellectual property rights associated with the genetic assets in different parts of the world. Getting such markets up and running begs the question of which monetary space will apply.

Indeed it is not surprising that global integration, in terms of both private and public markets, poses a challenge to monetary systems. Once again, as the euro clearly shows, economic and political changes both require and depend on advances in the scope and functioning of monetary space. Despite the discomfort of some, the ever increasing flows of goods, ideas and people across the arbitrary boundaries that make up the world's political units are calling into question the meaning and effectiveness of 19th and 20th century concepts and tools of national sovereignty. In addition, the planet as a whole, in terms of its atmosphere, oceans, temperature and biodiversity, is increasingly focusing attention on global "property" that by definition encroaches on the national sphere. Money's important



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social and political dimensions also point towards the eventual introduction of universal and global clearing and settlement systems.

### *c)* E*quitable access in a more diversified society*

Tomorrow's global knowledge economy and society is likely to be characterised by a much more highly differentiated, continuously evolving social tapestry where the introduction of new means of payment and forms of money could play a central role in either overcoming or exacerbating inequality and conflict. On the positive side, as already discussed, rules that ensure easier access and wider distribution of tomorrow's sophisticated range of digital payment systems could help integrate many groups into both the knowledge and the global economies. On the negative side, monetary rules that privilege entrenched interests and narrow access to new means of payment and forms of money could reinforce inequality and exacerbate the risk that social diversity will provoke conflict rather than creativity.

Looking at the positive contribution first, the introduction of a universally accessible, consumer-level peer-to-peer digital payment system could help not only to extend the market in ways that improve the viability of new business models as noted above, but to do so in ways that include groups that have either been marginal or entirely excluded in the past. Easier access via the network to trusted units of account and means of payment could improve market access for both holders of low per-unit value intellectual property rights and producers and consumers in developing countries. At the level of businesses, introduction of the appropriate regulatory frameworks and institutional choices could significantly improve the chances of new entrants competing with the dominant players in the financial sector, particularly if the rules help them to gain the widespread public confidence that is a precondition for success in the financial sector. At the level of consumers, the introduction of legal tender in digital form could help to ensure that fewer people run the risk of being permanently excluded from the new virtual markets because access to Internet transactions pass exclusively through private intermediaries like credit card companies.

A profusion of new payment methods and issuers of money could also have a perverse impact on social dynamism by further fragmenting and ghettoising certain communities and regions. More sophisticated and differentiated monies might be used to discriminate and reinforce the existing correlation between hierarchies of creditworthiness and social status. Under these circumstances there is the risk that the political legitimacy and ultimately the viability of the monetary space are called into question. Without careful attention to the governance of new transaction systems there is an increased danger, already heightened by the social dislocation of a transition period, of a political backlash against changes which are seen as undermining cherished symbols, like the national currency, without suffi-



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ciently opening up new horizons. Alternatively, network money could be specified and implemented in ways that make it both less expensive to use than physical cash and a means of achieving greater social inclusion. Granting all people the right to a verifiable Internet identity and a basic money account, in the context of a much more universally accessible network, would put in place a strongly inclusive foundation for a monetary space that uses predominantly digital money. The pursuit of this more accessible path illustrates not only the close connection between changes in the socioeconomic and monetary spheres but also the determinant role of public and private innovation in setting the direction and pace of change.

* * * *

Overall, putting the analysis of money's long-term tendencies together with an assessment of the possible direction of future technological and socioeconomic changes points towards a future more likely to be in the upper right than bottom left of Figure 1. How far, at what pace, and with what kind of complications will depend largely on the vigour and effectiveness of the public policies that are fundamental for shaping monetary systems.

## 4. Time for policy breakthroughs?

The answer to this question depends in part on expectations regarding what might be accomplished by accelerating the transition to more fully digital monetary systems, and in part on the plausibility that new policy approaches are both available and likely to be effective. Regarding what might be accomplished, the results of this conference suggest that there would probably be a fairly high payoff from a more rapid transition, particularly in terms of encouraging the emergence of an Internet-enabled global knowledge-intensive economy. Moving fairly quickly to introduce the appropriate policies can be justified on both short- and long-run grounds. Looking to the shorter term, policies for accelerating the diffusion of digital money have taken on added urgency for three reasons. First, actions to re-establish confidence and encourage investment are now more important in light of the present global economic slowdown and the "new economy" backlash in particular. A second and equally important current reason for an activist stance is that governments need to find ways to support the creation of worldwide markets in ways that facilitate inclusion and participation. And third, the events of September 11th, 2001 have drawn attention to the importance of introducing more effective control over monetary transactions. Looking to the longer run, by pushing for policy breakthroughs in this domain, governments can make a major and timely contribution to bringing the monetary system into closer alignment with changing socioeconomic conditions. In doing so there is a good chance of both reducing the costs and expanding the benefits of the fundamental economic and social transformations under way.



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Another crucial force likely to drive the diffusion of digital money over the long run is the pursuit of the general public interest in lower transaction costs, less crime, and easier collection of taxes. The introduction of monetary systems where digital money predominates could achieve these goals. The most evident link between lower transaction costs and digital money arises from the potential to eliminate the significant costs associated with printing, handling and back-office accounting of physical cash and cash-like cheques. Further considerable savings might be possible if the clearing and settlement systems could be improved to reduce the costs of delay, intermediation and enforcement. There is also a clear connection between the "underground economy" in all its forms and physical cash. The marginalisation of physical cash, perhaps even to the point where it is no longer used for everyday transactions, could serve to make many types of illegal financial activities (including the financing of terrorism) much more difficult. Tax collection and verification methods that hinder criminal activity could also be automated in a variety of ways if the vast majority of monetary exchanges take place digitally through interoperable, secure and authenticated network-based clearing and settlement systems. Finally, given the appropriate standards and regulations, the shift to the predominant use of digital money could both facilitate the entry of new competitors into the financial sector and encourage the emergence of new revenue models for many intangibles, including intellectual property.

Turning to the issue of the plausiblility that government policies could effectively accelerate the diffusion of clearing and settlment systems, two avenues seem fruitful: first, making rapid extension of the use of electronic money throughout the economy a clear policy goal; second, as the primary method for implementing this goal, working closely with the private sector to introduce the necessary rules and institutions; and third, accelerating the development and diffusion of economy-wide instantaneous clearing and settlement methods, similar to the ones that have been taking over in the sphere of interbank transactions. Government efforts in this direction will need to use technology-neutral approaches that rigorously maintain interoperability (like that of the Internet, where one standard for communication – TCP/IP – allows for a vast range of connections and uses); meet key social criteria with respect to privacy and universal access (judicial protection for individuals, mandatory technical safeguards); and fulfil basic economic criteria regarding transparency and trust (monitoring of monetary aggregates, tax collection, illegal activity, authentication). This means that there will be a crucial role for the processes and institutions that develop and approve standards within and across monetary spaces.

At least two major concerns have been voiced about the risks of rapid movement towards more fully digital monetary systems. One relates to the potential undermining of both macroeconomic goals and tools, and the other to the magni-



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tude of the governance challenge (how to make and implement the necessary decisions), particularly at the global level.

Considering macroeconomic policy first, an initial analytical distinction needs to be made between monetary spaces that are isolated and those that are permeable. In the case of a relatively autonomous monetary space that has a stable, state-dominated monetary hierarchy, there seems little reason to worry. Even if physical currency becomes marginal or disappears altogether, most experts agree that a state-supported central bank would be able to control short-term interest rates by buying and selling financial obligations, at a loss if necessary. With respect to the implications of a predominantly digital monetary system for assessing monetary aggregates and the velocity with which money circulates in the economy, there is a case to be made that the clearing and settlement systems that underpin a virtual monetary space could offer authorities greater transparency. Current efforts at data collection encounter substantial problems because physical cash remains very costly to trace and is still in use for a very large number of day-to-day transactions. Shifting to much more sophisticated digital money systems that depend on universal accessibility to network clearing and settlement opens up the opportunity for real-time verification of almost all transactions by volume and kind, without necessarily abandoning confidentiality. Contrary to some expectations, digital money could appreciably facilitate the tracking of monetary aggregates and thereby improve the effectiveness of policy adjustments aimed at meeting macroeconomic objectives.

In the case of a much less isolated monetary space there seems, at least in theory, to be a more serious threat to the effectiveness of certain macroeconomic management tools. Experience with the interpenetration of monetary spaces shows how the use of "outside money" can threaten to displace the local currency. This in turn can lead to situations where the effectiveness of the central bank's tools for controlling monetary policy are weakened. Recent examples where an outside currency, in this case the American dollar, has been disruptive can be seen in Russia, and even more so in Argentina with the adoption of a currency board. Projected to a global level, the introduction of universally accessible and accepted networked money could increase the risk that strong outside currencies would replace weaker local currencies. Pushed to its logical conclusion, this path might create a single worldwide monetary space and hierarchy. Without pronouncing on the desirability or not of this outcome, an issue long debated by advocates and opponents of a "gold standard", it is clear that many formidable obstacles stand in the way. Two are worth highlighting here. First, the creation of a fully open global transaction system that is entirely agnostic regarding the particular currency being used runs counter to strong perceptions of national or regional interest. Second, the strength of the dominant money within a monetary space rests on the extent to which people have confidence that the policies of the issuer will serve



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the general interest in a politically legitimate way. Despite the views of some that the American dollar, in more or less competition with other currencies like the euro and the yen, could serve as a global digital money, the institutional foundations for a global monetary space and hierarchy remain a long way off. The first monetary hierarchies did not spring to life simply because money is more efficient than barter; nor will the global digital currency suddenly appear. Creation of a global monetary space and hierarchy, like national ones before, would require a legitimate and credible authority.

Governance is the second challenge to policies aimed at accelerating the diffusion of digital money. Here again the problems posed at the national level look to be more manageable than those at the global level. In a national monetary space, many of the necessary institutional, legal and regulatory starting points are already in place. For example, Singapore's bold moves to introduce digital money that is universally accessible, clears in real-time, and allows for peer-to-peer transactions among all economic agents – described by Low Siang Kok in Chapter 6 – offer a useful set of guidelines for bringing together the key constituencies and setting out technical goals for accessibility, interoperability, etc. Authorities in larger, more heterogeneous jurisdictions may encounter a few more hurdles. Initial resistance can be expected from banks and other intermediaries that generate significant revenues from the delays and service charges that are associated with physical cash and near-cash instruments, usually in the context of rather antiquated clearing and settlement systems. Digital systems can drastically reduce many of these transaction costs, including the time it takes for cheques to clear, the service charges added to foreign exchange activities, and the expenses incurred trying to stop criminals from both stealing and using cash. Faced with the advantages of digital money there is a good chance that the champions of change will at least get the ball rolling.

The more stubborn obstacles may arise further down the road, with the efforts to actually introduce the rules and standards that make economy-wide and universally accessible digital monetary systems workable. Serious conflicts are likely to emerge because these parameters determine the competitive conditions that apply both at the basic level, at which institutions have the right to issue digital currency, and at the operational level, at which companies will supply the technology (hardware, operating systems, etc.). Resolving conflicts in this arena, in ways that sustain confidence in the monetary space and hierarchy, poses the most significant challenge to policy makers. Part of the problem stems from the paradoxical situation of central banks. On the one hand, these are the institutions with the credibility and knowledge to champion change in the monetary sphere. On the other hand, actions that might destabilise the monetary system or undermine confidence in the central bank risk undermining the bank's central functions. This means that policy leadership will likely fall to the legislative and executive



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branches of government which are, in any case, better suited to the challenges of overcoming entrenched interests, opening up new fields for competition, and representing the broader societal interest in socioeconomic transformation. Indeed, recalling money's second and third long-run trends, namely the development of regulatory infrastructures, it is to be expected that supervising the integrity and functioning of the clearing and settlement system is a job for central banks and/or oversight institutions. The challenge of setting out the goals and rules that link the monetary system to society as a whole falls naturally to less specialised parts of government. In short, the governance capacities at the national – or in the European case, regional – level are probably both appropriate to and capable of introducing universal digital money.

Looking to the global level, the challenge is severely compounded by the limited decision making and implementation capacities of today's international political institutions and processes. This global governance deficiency is manifested across a broad range of international issues, from the supervision of competition and the redesign of the financial architecture to environmental protection and social equity. Indeed, it is this inadequate governance capacity that leads to fears that the rapid introduction of digital money without the requisite codes and standards will simply serve to facilitate illegal activities like tax evasion, money laundering and violations of privacy rights. One approach that might overcome some of these fears and governance inadequacies involves the development of a common global framework for the introduction of national digital money networks. Building on this shared foundation in national monetary spaces might make it easier to knit together a global network that dispenses with the kind of central authority that has so far been a prerequisite for an efficient and durable monetary space and hierarchy. In this case the global clearing system would operate in ways that are similar to other networks, from social to digital, that use common protocols to create the transparency and understanding that are essential for communication and exchange.

Confidence in such a global network might be sustained, in part, by spreading risk over an immense number and diversity of transactions and participants. However, setting the rules and supervising decentralised global networks, particularly with the degree of certainty and transparency required for sustaining trust in a monetary system, will also call for policies that go beyond national interests. Current circumstances are already spurring innovative efforts of this kind, such as the International Corporation for Assigned Names and Numbers (ICANN), the organisation charged with supervising key aspects of the Internet's technical infrastructure. Although this experiment is encountering great difficulty in finding ways to legitimately articulate a global view, the imperatives pushing this kind of institutional evolution seem unlikely to diminish. In the interim, while global governance capacities mature, the challenge for national policy makers is to accelerate the



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introduction of universally trusted and accessible peer-to-peer, instant clearing systems for all transactions throughout the entire economy. Information technology makes this goal feasible, but in the end only the appropriate rules and institutions can make it practical locally and globally.

## Notes

1. Electronic money has today become digital money, just as the telegraph or telephone's electronic transmission of information has given way to computer code made up of zeros and ones.
2. Traces of virtual transactions are at least equally difficult to reconstitute, requiring the same kind of human testimony as physical transactions, once the records are definitively destroyed. Eventually digital money might be viewed as more anonymous than physical cash that needs to be laundered, literally, in order to erase telltale signs like DNA or radioactivity that can be used to trace material objects.



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*Chapter* 2

# Whence and Whither Money?

*by*

*Michel Aglietta*
Université de Paris X – Mini Forum and CEPII
France

## Introduction

Money goes back a dizzyingly long way in Indo-European civilisation. Well before the invention of minted coins in the Lydian cities of the Aegean in the 7th century BCE, writings from the Sumerian civilisation at Ur in the 3rd millennium BCE refer to documents mentioning silver struck with the head of Ishtar. The mother-goddess and symbol of fertility, Ishtar was also the goddess of death. So from the very outset, money's ambivalence reflects the ambiguity of its social function: an instrument of cohesion and pacification in the community, it is also at the centre of power struggles and a source of violence.

Money towers over the market economy as we know it from so high and so far that its shadow throws suspicion on the prevailing economic wisdom, which incidentally also creates unease within the profession itself. After all, did not Hahn assert that the perplexing difficulty of the theory of value lay in the inability to account for the universality and durability of money?

Economists cannot therefore regard the history of money as a sort of "natural" history which should immediately make sense. The OECD conference invites us to view money as a force driving economic and social change. This position is incompatible with the neutrality of money, which is the theoretical cladding for its supposed unimportance in co-ordinating economic actions.

Necessarily, therefore, the first part of this chapter takes an alternative theoretical approach to the prevailing view of the paradox of money in economics. According to this alternative view, money is the primary standard of exchange, the fundamental institution of the market economy. By setting out the analytical implications of this theoretical foundation, we can postulate the processes whereby viewing money in terms of the path it has taken through history makes sense. These processes are abstraction, centralisation and control.



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The second part analyses the advance of abstraction, arguing that money's most fundamental dimension is as a unit of measurement of value. This gives money an irreducible fiduciary aspect. Money's first path through history therefore involves the development of forms of trust.

The third part considers centralisation in payment technology. In this light, trade relations appear as networks of networks. The process is constantly renewed, since innovative forms of payment have to pass the test of general acceptability. The fragmentation of means of payment that derive from a single unit of account is overcome by centralised organisations, which are transformed by the appearance of new forms of payment.

The fourth part considers the advance of control, anchored in payment systems themselves and designed to maintain trust. Control unfolds over time. Here, money is intimately linked to credit, and trust is expressed in belief in a store of value. Control is therefore exercised upon finance, and through finance upon the economy as a whole.

The idea that the economy is controlled by money exacerbates to the highest degree the opposition between the institutional approach and the assertion that money is neutral. Assuming this opposition, the conclusion outlines a few ideas about the opportunities and risks of the new forms of money that are beginning to emerge.

## 1. The paradox of money in economics

In a recent article, Goodhart commented that the argument between the two concepts of money goes back to the origins of modern economic thought, in the controversy between Bodin and Malestroict in the 16th century. The realist theory, or metallist in its earlier formulations, asserts that money gets its value from its guarantee, which may be the intrinsic value of the metal or the value of saleable output as a whole. This current of thought cares nought for history, preferring to tell a tale in the form of a fable: in the beginning was barter; money came about on the initiative of the private sector in order to surmount the transaction costs of barter. The institutionalist theory, or cartalist in its earlier formulations, asserts that the guarantee is that of a collective authority, which may be a group of private agents but tends to become the state. By this way of thinking, value is not intrinsic but results from the organisation of commodity exchange by money.

Among economists, the realist theory predominates. From Locke to Jevons to Patinkin via the Austrians Menger and Von Mises, it continues into the more recent approaches to monetary theory taken by Ostroy and Starr, Kiyotaki and Wright. The institutionalist view, popularised by Knapp and above all Keynes, is now defended by most neo-Keynesians. More importantly, though, as noted by



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Mélitz and shown by Aglietta *et al.*, it has won the approval of a large majority of historians and anthropologists with an interest in the origins and history of money.

Some commentators have tried to straddle both positions, with varying degrees of success. Samuelson, for example, sought to support his reconciliation of opposites by dissociating quality and quantity, arguing that money is qualitatively essential. But the quantitative theory is true: changes in the stock of money affect nothing but the general level of nominal prices. The dissociation is between two temporalities which do not interact. The first is historical, the emergence from barter of a space filled by money. The second is logical, the operation of market economies once money has been created. In this time dimension, money is purely instrumental. It has no lasting effect on economic behaviour.

Such efforts at eclecticism are highly illustrative of economic liberalism's obsession with exorcising the power of money in order to smooth the way for a pure economy of contracts between individuals. But it is unsatisfactory from the standpoint of both history and economic behaviour. In the first case, Samuelson would like to have us believe that the history of money stops as soon as the first money payment replaces barter. By this view, the development of forms of payment is unimportant. In the second case, private behaviour would have no effect on monetary innovation if agents everywhere always behaved as though money were unimportant. This position makes it impossible to understand the effect of the great wave of inflation in the 1970s on the liberalisation of the financial sector and on subsequent changes in the principle of monetary authority, in the form of central bank independence.

Fortunately a synthetic approach exists, that of Simmel, which provides much more fertile ground for the issues that concern us here. Although Simmel must certainly be counted an institutionalist, he represents money as a fundamental norm, an abstract expression of the community, which is not a creature of the state. Simmel takes trade as his starting point, following the line taken by the Austrian school and used in current forward-looking monetary models. However, he rejects both the utilitarian approach and the *ad hoc* hypothesis of transaction costs. Fundamentally, Simmel regards trade as a social link. Instead of considering trade as an interdependence between economic subjects with prior preference structures which are therefore exogenous to trade, he defines trade as an abstract form which conditions the mental structures of individuals by mediating their actions. It is the direct opposite of Samuelson's approach. Money expresses social interdependence, unknown to individuals, because it is pure quantity. Money is therefore consubstantial with trade. It is because money's quality is expressed in a homogeneous quantity that the subjects of the market economy can become rational. It follows that the development of the market economy and the growing abstraction of monetary forms increasingly detached from their symbolic media describe the same historical framework.



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This powerful theory, defining money as the objectivised form of trade stripped of any idiosyncratic element, posits it as the formal operator of economic value. The implications are vast. Since money is itself the expression of the value of economic objects, there can be no substantial value to guarantee it. The subjective attitude with regard to this social abstraction is trust, meaning the supposition that money will always be accepted in trade by third parties unknown to the other two. But because money is pure quantity, far from being unimportant as Samuelson claims, it is the source of the desire for riches. That is where money's ambivalence lies. On the one hand, collective trust in the power of money holds out the promise of harmonious trade; on the other, the power of money triggers crises which are causes of disorder in the economy as a whole. The two terms of this contradiction become increasingly acute with the global spread of capitalism. That is why trust cannot dispense with regulation, or regulation with public authority.

Supporters of the realist approach to money cannot talk meaningfully about trust even though the word is constantly on their lips. What does trust matter if money is neutral? More profoundly, the present-day realist approach is based on a theory of the market economy which sees it as a coherent set of incentive contracts between private agents. But trust is not a contract. It is not a relationship between individuals but a relationship between each private agent and the community as a whole. This relationship makes sense in the institutionalist approach because according to that view money represents the community of economic agents, which is a community of payments. Trust is expressed in the unconditional acceptability of money. As this acceptability has no "natural" guarantee, it may be shaken or even destroyed in monetary crises. Maintaining trust must be regarded as a regulatory problem of the utmost importance. The problem can be formulated only by identifying the forms of trust and how they relate to each other.

The first form of trust is methodical. Founded on routine or tradition, it derives from the repetition of actions which bring trades to a successful conclusion and ensure final settlement of private debts. This type of trust expresses a security dimension through common adherence to the objectivised rule. A framework of references and roles within which private agents mould themselves, it is the result of regularity. The only form of trust recognised by Hayek and his disciples when they describe their "organic" society, it becomes incorporated into market practice through the repetition of business relationships. Its manifestations in this context include keeping one's word in financial dealings, the existence of a club mentality that creates mutual assurance, the acceptance of prudential standards in organised markets.

However, methodical trust pales into insignificance before the furious rivalries unleashed by the power of money. Regularity is left reeling by financial



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innovation, prudence counts for little against the lure of profit. Moreover, private trade does not constitute the entire economy: far from it. Money also expresses the economic operations of the state, which have their roots in a quite different rationale, that of sovereignty, the legitimate power to transfer, tax and spend in the name of the tutelary protection exercised by government over the members of society. A hierarchical trust exists, therefore, which the political authority imparts to money. The attributes of this trust depend, of course, on the legitimacy (religious or democratic) of that authority. The history of money is therefore also interwoven with that of the process, lasting many centuries, which brought democratic nations into being. In all cases, however, hierarchical trust is sustained by symbols of belonging which, as the seal of sovereignty, are inscribed on fiduciary money.

Hierarchical trust is superior to methodical trust because the political entity with authority over money has the power to change the rules. But this power is not arbitrary, since each nation's sovereignty is limited by that of its fellow nations whereas private exchanges transcend national borders. Thus, the regulation of money changes according to historical ebbs and flows in the internationalisation of trade. But more fundamentally, and a point on which Simmel lays particular emphasis, the growing abstraction of money engenders abstraction of the individual. The rational human being, free of any social relationship other than voluntary trade, becomes a universal value. Human welfare is a duty internalised within individual reason. It is therefore an ethical attitude. It follows that ethical trust limits the exercise of political authority over money. It is at this higher level of legitimacy, and only there, that Frankel can raise the question of the conflict of trust and authority. In order to be legitimate from an ethical standpoint, policies relating to money ought to be consistent with a monetary order. This order is supposed to subordinate the state's control of money to the primacy of maintaining the value of private contracts over time. However, Frankel wrongly contrasts Simmel with Keynes because his conception of the monetary order is ossified by nostalgia for the gold standard and by identification of the human being with the bourgeoisie of the *Belle Époque*. But the 20th century was the period in which salaried employment became the norm and social rights expanded, becoming an integral part of human welfare. Assuming the social debt is a political responsibility which affects the regulation of contemporary money, which in turn is subject to a highly contradictory play of forces. These forces will make the early 21st century fertile terrain for energetic monetary innovation.

However that may be, we now have a set of hypotheses with which we can venture into the history of money without fear of getting irredeemably lost. Our aim is to understand that the story of money has been a tale of innovation from the outset and that, while there may be much sound and fury, it nevertheless also signifies something.



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## 2. Money and unit of account: the advance of abstraction

According to the theory advanced above, money has its essence in number, the realm of quantity. For very lengthy periods, societies were able to trade without generally accepted means of payment. But it is inconceivable that an economy spanning a large number of traders and tradable objects can exist without a generally accepted unit of account.

All the anthropological and historical evidence contradicts the argument put forward by supporters of the realist theory, according to which the use of money as a measurement of value results naturally from its use as a means of exchange. On the contrary, understanding the phenomenon of money involves admitting the opposite proposition, namely that money is created by the institution of a standard of values, which results from an act of sovereignty by the community. Egypt under the Pharaohs, a highly evolved barter economy, had a money of account called the *shat*, though it is uncertain whether it was an ideal unit or a standard defined by a gold ring of a given weight. Whatever the answer, property and goods exchanged by barter were valued in *shats*.

It is trade over time that gives a unit of account its fiduciary quality, because the fact of drawing up a contract presupposes a reference value, sufficiently stable and known to all those involved, so that each party gives and receives what was agreed at the outset. As long as the unit of account remains ideal, stability for private agents is the effect of the apparent movement of prices whose centre is the unit of account, in the same way that the earth is the fixed centre of the Ptolemaic system. The same no longer applies, however, when minted money circulates as a means of payment. In order for the monetary symbol to become generally acceptable, it must be certified by the sovereign authority. In this case, though, the sovereign authority can manipulate the sign by way of monetary reforms in order to transfer value between social groups or use monetary abstraction – *i.e.*, separation of the sign (the monetary unit) from the thing signified (the weight and grade of the minted metal) – for its own benefit.

### *The hyperbole of monetary abstraction*

In the early 6th century BCE, the Athenian ruler Solon carried out the first known monetary reform, described by Plutarch. Reducing the value by weight of the drachma by 30%, the reform was intended to relieve the debts owed by poor peasants to landowners so as to make it more difficult for them be taken into bondage for debt. The reform was the first stage in a process of monetary abstraction that would last for many centuries. The path it follows is that of the irreversible and general devaluation of units of account in terms of the weight of minted mental, culminating in the 20th century in the complete separation of unit of



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account and metal. The unit of account defines itself. Exclusively fiduciary, it is the unit of the issuing institution's liabilities.

We shall begin by trying to discover whether this path obeys a quantitative law. Then we shall consider the principal qualitative stages in monetary abstraction. They show that the social invention of money stems first and foremost from the sovereign authority. They also underline that in the process, phases of rapid change alternate with phases of stability. The fineness and weight in gold and silver of coins can be measured precisely. From this information, it is possible to calculate the weight of pure gold whose price is equivalent to the unit of account in which the coins are denominated, taking into consideration the relationship between gold and silver when the unit of account is defined in silver. In the case of legal tender, it is assumed by convention that the metal content of the unit of account is the reciprocal of the price of pure gold on the free market. Cailleux has collated this information, which is presented in summary and simplified form in Table 1.

Table 1. **From Antiquity to Charlemagne and from Charlemagne to the franc**

| Era | Unit of account[1] | Pure gold content in milligrammes | Franc equivalent price of a kilo of pure gold[2] |
|---|---|---|---|
| Cresus (–560) | Pound weight | 450 000 | 0.022 |
| Sylla (–87) | 20 As libral | 218 800 | 0.046 |
| Caesar (–45) | 20 Aureus | 162 700 | 0.061 |
| Augustus (0) | 20 Aureus | 156 000 | 0.064 |
| Nero (52) | 20 Aureus | 145 000 | 0.069 |
| Diocletian (295) | 20 Aureus | 109 000 | 0.092 |
| Constantine (312) | 20 Solidus | 90 000 | 0.111 |
| Salic law (620) | 20 Solidus | 76 000 | 0.132 |
| Charlemagne (805) | Livre | 24 000 | 0.42 |
| Louis IX (1266) | Livre tournois | 8 270 | 1.20 |
| Philippe le Bel (1311) | Livre tournois | 4 200 | 2.38 |
| Louis XI (1480) | Livre tournois | 2 040 | 4.90 |
| Henri IV (1600) | Livre tournois | 1 080 | 9.26 |
| Louis XIII (1640) | Livre tournois | 621 | 16.1 |
| Louis XIV (1700) | Livre tournois | 400 | 25.0 |
| Louis XVI (1789) | Livre tournois | 300 | 33.3 |
| Bonaparte (1803) | Franc | 290 | 34.2 |
| Poincaré (1928) | Franc | 58.9 | 170 |
| Daladier (1938) | Franc | 24.75 | 404 |
| Pinay (1958) | Franc | 1.88 | 5 320 |
| Giscard (1972) | Centime | 1.08 | 9 290 |
| Barre (1979) | Centime | 0.23 | 43 000 |

1. The nominal correspondence between units of account is:
   20 Aureus ~ 20 Solidus ~ 1 livre.
   1 livre tournois ~ 1 franc = 100 centimes.
2. The nominal continuity of the franc was broken in 1960 by creation of the new franc:
   100 old francs became one new franc in 1963.

*Source*: Cailleux, *Revue de Synthèse*, No. 99-100, July-December 1980, p. 253.



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Table 1 suggests that over the last 2 500 years, units of account have depreciated at a more than exponential rate. The depreciation rate increases over time. Cailleux shows that it is possible to adjust an exponential-hyperbolic distribution to these data, of the type: $p = \frac{a}{b - e^{\alpha t}}$ where p is the price of gold and t is time.

This distribution is intriguing because the price of gold and the rate of increase in the price of gold tend towards infinity in a finite time. As it is not a steady process, however, it is not possible to calculate the future date when the price of gold reaches infinity from the parameters of the function estimated on past data series. It would mean that units of account have no longer an expression in gold, however indirect this expression may be. Periods of accelerated depreciation are, though, interrupted by periods of stability which stop the process from running away with itself, completely cutting the unit of account from any equivalence to gold. However, this is not always the case. The way in which monetary crisis can degenerate into hyperinflation proves that currencies can be destroyed locally, and hence that monetary sovereignty is not immortal.

One particularly noteworthy period of stability is the one that followed Caesar's reform creating the Aureus based on a gold standard. It lasted for more than two centuries, since under Nero the Aureus had depreciated by only 10%, and in 215, under Caracalla, by only 20%. But the economic crisis of the 3rd century triggered rapid change: the monetary economy in the provinces receded and trade contracted throughout the entire Roman world. The reforms of Diocletian and Constantine sought to re-establish the Empire's monetary unity, which was beginning to crumble. But stability was short-lived. A dearth of precious metal and the disintegration of the western Empire led to the break-up of territorial units in western Europe during the High Middle Ages. The apparent stability of the Solidus is that of a unit of account which no longer circulates, the symbol of a distant sovereignty which fades with time.

The monetary anarchy of the High Middle Ages put an end to the monetary system of Antiquity. In that system, the monetary instrument had become increasingly detached from the measure of weight, but the unit of account remained attached to the metals. That is why, when coins in circulation depreciate, the political authority seeks to create coins which, invested with the prestige of sovereignty, are intended to be inalterable. These prestige coins are the indispensable monetary references for determining the economic value of traded goods.

Charlemagne started a process which ended with Louis IX four centuries later. It was a radical innovation in the history of human civilisation, because it would pave the way for bank money. It was the invention of a purely abstract money of account – the livre tournois in France, the pound sterling in England – in relation to which species in circulation were defined. The outcome was the dualist monetary system which would last in France from the 13th century until the Revolution.



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In order to impose the royal money and reduce seigniorial money to loose change, Louis IX minted the gold écu and silver gros in 1266. More importantly, however, in a sovereign act he set the value of the coins in terms of an abstract unit of account, no number of which was inscribed on the coins. He thus left his successors with the option of altering the money by decree without having to change the weights and fineness of the coins in circulation. For five centuries, monetary alterations would be the instrument of royal policies which involved devaluing or revaluing the unit of account according to the interests of the state as public debtor or fiscal creditor. The system allowed for much more rapid devaluations than in Antiquity.

The same rationale applied in Britain. Table 2 shows the depreciation of the currency over a millennium. But stabilisation in Britain, due in no small measure to the creation of the Bank of England in 1694, arrived much sooner and lasted much longer.

Table 2. **Depreciation of the pound sterling**

| Era | Pure gold content in milligrammes | Price of a kilo of pure gold in pounds |
|---|---|---|
| William I (1066) | 24 000 | 42 |
| Edward I (1278) | 20 500 | 48 |
| Edward III (1350) | 17 400 | 58 |
| Henry VII (1489) | 15 470 | 64 |
| Henry VIII (1535) | 9 200 | 108 |
| Elizabeth I (1560) | 7 750 | 128 |
| George III (1793) | 7 320 | 136 |
| George V (1926) | 7 320 | 136 |
| George V (1931) | 4 400 | 228 |
| George VI (1949) | 2 488 | 402 |
| Elizabeth II (1976) | 450 | 2 220 |

*Source*: de Foville and Cailleux (*op. cit.*, p. 254).

It is important to underline the difference between the paths followed by the currencies of France and England. It shows the interaction of the multiple processes which inform the development of money. Decisions about the unit of account taken by the monetary authority may encourage or discourage private monetary initiatives to create new means of payment. In order to understand it, we must analyse the contradictions of the dualist system.

### *The rise and fall of the dualist system*

Thomas (1977) has conducted a detailed analysis of the dualist system on which it is possible to rely. Nominal alterations of the unit of account strengthened coins in circulation as the unit of account weakened. When the monarch decided



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to raise the value of the gold écu by 20%, all the other coins fell into line with the new definition of the money of account according to their relative value. But of course the relative value of the coins raised the problem of bad money driving out good because of the distortion between the stated value of the coins and the commercial price of the metals. This "law" had already been stated by Oresme in the 14th century, two centuries before Gresham, to whom it is attributed. However, the fact that the unit of account was an abstract quantity meant that the broad problem of suiting the money supply to the needs of the realm could be dissociated from that of the structure of means of payment.

The needs of the royal finances certainly played a key part in successive alterations to the livre tournois, but it would be wrong to leave it at that. In the first section, money was defined as the fundamental principle of trade, the social medium which steers the economy as a whole and which the state cannot manipulate arbitrarily. However, historians note that a change in the way these alterations are perceived takes place towards the end of the 15th century. Previously, they had been defined in relation to the money of account, represented as the centre of the monetary system. Afterwards, they were defined in relation to metal money and hence identified as devaluations of the unit of account. At the same time, mistrust of the livre tournois appeared during periods of great instability. Attempts were made to substitute alternative references when drawing up contracts. Private units of account were used despite the royal ban. What was the reason for this major switch from trust into mistrust of the livre tournois?

It is probably to be found in the long-term cycles of European history after 1000. Lengthy periods of economic prosperity, rising prices and plentiful money were followed by periods of penury, falling prices and scarce money. After the ultimate failure of the Crusades, the 14th and 15th centuries were periods of devastating deflation, aggravated by profound and lasting social ills such as climate cooling, the demographic catastrophe caused by the Black Death in 1348-49, and the Hundred Years' War. Devaluing the money of account was the only way to fight deflation, and the occasional attempts of some monarchs to revalue met with resistance from guilds and the populace at large. In contrast, when precious metals flowed into Europe from America in the 16th century, the depreciation of the money of account amplified the inflationary effects of abundant money, so that Bodin and Malestroict were both right. The devaluation of the livre tournois thus sparked off acute social conflict.

In order to gain a better understanding, let us contrast the dualist system and the contemporary system of fiduciary money in which the money of account and the means of payment are the same. In the current system, if the unit of account depreciates, creditors in nominal terms and those who hold liquid assets both lose out. In the dualist system, creditors and hoarders were on opposite sides. The purchasing power of debt decreased in terms of metal equivalent, while the



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purchasing power of cash increased until the rise in prices caught up with the depreciation rate. With the growth of private credit, in which the rise of capitalism had its origins, mistrust of the money of account hindered the productive utilisation of savings. That is why monarchs carried out occasional revaluations in order to raise the value of the livre tournois. They were attempts to restore confidence in the unit of account. But these sporadic efforts were merely expedients. In order to flourish, private business needed lasting stability, a transformation of the monetary system. The fact that this transformation took place much earlier in England than in France is a contributory factor to that country's dominance of the 17th and 18th century world.

### *From the dualist system to convertibility*

As Thomas points out, if capital is to be tied up over a long period, the long-term benefit of hoarding must be replaced by the long-term security of invested savings. This step towards a higher abstraction was achieved by the monetary revolution of the 16th and 17th centuries, though not in France. The monetary revolution preceded the industrial revolution by a good half-century. The former created the economic and social structures within which the latter was able to take place. It was not a functional cause but a structural precondition.

In capitalism, money is created endogenously as a counterpart to private debt. Purely private acknowledgments of debt must be able to circulate like currency. The following section on payment technology considers how this system is organised. But the power of private credit also has knock-on effects on the monetary system. It took four centuries, from Charlemagne to Louis IX, for society to integrate the rationale of separation which culminated in the mental representation of an abstract money of account. In England, it took one century, the 17th, to integrate the rationale of equivalence which culminated in the system of convertibility.

During the 17th century, goldsmiths had got into the habit of taking specie deposits from merchants in return for receipts which then circulated as means of payment. But from repeated observation of ebbs and flows, which advances in the study of probability had made it possible to formalise as concepts, they became aware of the law of large numbers. They issued certificates, which became acknowledgments of debt, over and above their reserves of metal. In the dualist system, the goldsmiths speculated on monetary alterations and on the relative value of coins. They exported or imported the best coins according to whether disparities between official values and metal prices were increasing or decreasing, putting poorer quality coins back into circulation. This attracted a hostility which was to crystallise after the political revolution of 1688, since the goldsmiths were very close to the Stuarts, their debtors. The new government, of a liberal cast, was



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hostile to them. It was feared that the new government would not acknowledge its predecessors' debts, casting doubt on the goldsmiths' solvency. The situation was compounded by the war of the Spanish succession, which had begun in 1689 and considerably increased the Crown's financial needs. The merchants needed a guarantee, which the goldsmiths could not provide, if they were to lend to the Crown. The situation created the conditions for a stabilisation which was to go much further, since it actually engendered a new monetary system.

The merchants created the Bank of England in 1694 and lent its entire subscribed capital of £1 200 000 to the king. The Bank could discount commercial bills and grant advances to individuals. It could issue notes up to the amount of its capital which, though not legal tender, served as means of payment. The most vital institution of the forthcoming capitalist era had come into being. All that remained was to introduce the convertibility of notes so as to give it the sheet anchor of trust. Such was the unintentional consequence of Locke's proposal to put an end to monetary disorder.

Since Elizabeth I's accession to the throne in 1561, England had stopped making alterations to the pound sterling. The disorders of the 17th century had their origins in the goldsmiths' exploitation of disparities between different types of coin. As a consequence, these disorders undermined trust in the circulation of notes. Deteriorating trust was exacerbated by the explosion of inflation in 1694-95, which augured ill for acceptance of notes issued by the Bank of England. Lowndes, the Secretary to the Treasury, reacted in the old manner, proposing a devaluation of the pound sterling. Locke, however, suggested cleaning out the entire metal-based system by withdrawing all bad coins and re-minting only high-quality coins corresponding to the statutory definition. The solution of deflating through monetary reform was widely imitated, first in England after the Napoleonic wars, then in other countries in the 20th century. Exchanging coins caused a loss of £2 600 000 to the state, but the chosen gold-silver ratio (15.9 compared with 15 in continental Europe) attracted an influx of gold into England, which became a *de facto* gold-standard country. However, the most important factor was the institution of a system in which a (private) bank issued a currency, trust in which was maintained by convertibility into a high-quality metal currency constituting a monetary base which was itself linked to the unit of account via a ratio decreed by the sovereign. As will be shown, this system paved the way for the spread of bank money and its organisation into hierarchical banking systems under the aegis of central banks. But it was not the end of the story.

### *The advent of the self-referential unit of account*

Each of the monetary systems identified above has its own rules and political constraints in order to preserve the unit of account. The unit of account is linked to



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the minting of metal in the system of Antiquity, separated by alterations in the dualist system, regulated by convertibility in the gold-standard system. Because money is the abstract form of exchange, the most general of social links, it absorbs the movement of societies with all their tensions. These tensions are themselves fuelled by the contradictory powers (for example between creditors and hoarders under the dualist system) which stem from possession of money. History teaches us that when societies change, pressures build up which become incompatible with the rules contained within a given unit of account system. Crises may therefore arise within a system, such as the temporary suspension of convertibility in a standard-based system. There are also periods of recurrent crisis, or abrupt transformation, which result in a change of system. As we have seen, these changes take place along a path leading towards greater abstraction which seems to be characterised by increasingly rapid deterioration of the unit of account in periods of recurring crisis. The open question, to which history does not provide an answer, is whether the periods in which the unit of account is defined in a system inspiring trust get shorter and shorter.

However that may be, the convertibility system, which ultimately converged on the gold standard, did not withstand the turbulence of the 20th century, a century of concentrated, mass forces of both destruction and progress. These forces profoundly modified social structures, including those of claims and debts, and the monetary system is responsible for enforcing the contractual obligations arising out of them in order to maintain trust in the unit of account. One form of conflict lies in the dissimilarity of obligations for which money is the vehicle: on the one hand, transfers resulting from political rights (deriving from war debts) or social rights (deriving from social debt), and on the other the collection of credits generated by capitalist projects. With the rise of wage-earning societies after the First World War and their generalisation after the Second World War in the most developed capitalist countries, a distributive economy based on social rights became entwined with a liberal capitalist economy based on private property. From this mixed economy emerged an economic policy in which the state controlled the level of overall output and how it was shared. The trend, irresistible after the great depression of the 1930s, resulted in the nationalisation of money. All links with gold were severed, in domestic payments before the Second World War, and in international payments in 1971.

The monetary system therefore consisted of national currencies: units of account defined in terms of the liabilities of issuing central banks. By detaching themselves completely from gold and silver, societies cast off all the symbolic lines that could still anchor trust in belief in a universal guarantor outside the monetary system. Money continued down its path towards a representation consistent with its essence: a social operator objectivised in number. The system which makes it work is an institutional construct, with an institution to define and



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measure, by convention, changes in the unit of account's purchasing power over time, an institution to frame and implement strategies to control the economy through money, and institutions of public opinion and democratic authority to legitimise these strategies.

Present-day monetary systems, unlike those of the past, have an almost permanent capacity for transformation in interaction with society. Control takes precedence over the sovereign act of defining the currency. Released from the requirement of convertibility, private monetary instruments outdistance the fiduciary currency of the central institution on all sides. Beliefs in symbols of sovereignty have yielded to conventional definitions of the units of account. Trust has shifted from a quasi-religious belief toward the critical acceptance of the institutional capacity of controlling the flows of money. In order to understand how this control is possible and what threatens it, we must consider the private aspect of monetary innovation.

### 3. Money and payment technology: the advance of centralisation

Very little is known about how means of payment were used in the Babylonian era, then in the outskirts of the Persian empire, in the Phoenician cities, though they seem to have been weighed ingots or fractions of ingots. The invention of minted coins in the cities of Lydia in the late 7th or early 6th century BCE was a radical departure. It is closely linked to the institution of the monetary system, described in the preceding section, which enables the unit of money to be detached from the unit of weight through collective acceptance of the nominal value guaranteed by the sovereign and certified by the hallmark punched on the reverse of the coins.

Specie, in which soldiers were paid their wages, paved the way for the spread of payments by money for goods. Indisputably, the link between cause and effect is the opposite of the one postulated by the realist theory. Specie did not originate in a spontaneous extension of trade. It stemmed from the sovereign mark which caused money to be accepted as a social abstraction. Gold or silver became a means of payment by the sign impressed on it. It gave goods the status of merchandise by the trade that its common acceptance generated. Trade determined economic value.

Throughout Antiquity, as we have seen, abstraction went no further than the sovereign mark impressed on the metal. Without a purely ideal unit of account there was no possibility of credit money, hence no banks or transfer by signature. Payment technology went hand in hand with the technology of metal extraction, metallurgy and the working of precious metals. Use was made of electrum, an alloy of gold and silver that is easy to work. Be that as it may, the development of means of payment in Antiquity and the High Middle Ages is a matter for numisma-



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tists. In this study, guided by an institutionalist view of money, the emphasis lies on the relations between changes in the monetary system and the invention of forms of payment. By this yardstick, the 13th century has no equal. With the bill of exchange, capitalism was invented.

### *The monetary inventions of the* Middle Ages*: bills of exchange and debt certificates*

The bill of exchange was a private monetary invention brought into circulation by 13th century Italian merchant-bankers who were in trade with Islamic merchants among whom the bill of exchange was already in use. Because of the Crusades, monarchs and popes needed to transfer what for the time were very considerable means of payment from one end of Europe to the other. The efforts made by kings to establish their supremacy over national territories had dislocated the feudal system, causing the great monasteries to go into terminal decline and significantly weakening papal authority. Merchant cities, many of which had gained political independence from feudal overlords, thrived as trade links with the Near East were re-established.

All that is true. But in purely monetary terms, autonomous private currencies, as opposed to mere private debt, are possible only if they can be expressed in abstract units of account. As we have seen, these abstract units of account were created by the introduction of the dualist system. At the same time as the unit of account broke away from the sovereign monetary mark, making it possible for trading communities to create abstract units of account, the bill of exchange acquired autonomy with regard to specie.

The bill of exchange took two centuries to become a codified, uniform international means of payment throughout Europe. It called for four agents: the drawer, the original creditor, the payer to whom the letter was presented for payment, and the beneficiary of the payment, who was not necessarily the bearer. An obligation of the issuer in the form of a payment order, it could be used to settle trade debts or to lend money. As an instrument for transferring debt, it generated a private monetary dynamic that was at the origin of capitalism because, now that private agents were free to transfer debt between each other, it was possible to sell against future payment, to buy without being able to pay immediately. The private relationship between claim and debt could become the vector for capital to circulate without being directly dependent on a monetary authority, which could therefore no longer dominate all monetary functions. It had never been possible for this relationship to develop in Antiquity. In Roman law, debts were personal. They could not be assimilated to monetary instruments enabling others to release themselves from their commitments.

So the bill of exchange was a forerunner of bank money which would develop in the 17th century. As a payment order, the bill of exchange was addressed



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directly to the person responsible for making the payment. It was not in principle a transferable credit instrument, though it would become one by circulating in the international merchant community. When the bill of exchange became accepted as proof of a prior obligation, first in practice, then in law, it was itself a financial instrument. This legal status was not acquired until the end of the 15th century.

As the payment stipulated in the bill of exchange was to be made somewhere outside the drawer's own monetary zone, it acted as an instrument of exchange between bankers. Use of the bill of exchange was therefore linked to long-distance trade, which it helped to foster. When trade is sufficiently extensive and diversified, trading companies have available funds in some places and payments to make in others. This lies at the origin of banks having correspondent banks elsewhere. When the resulting interdependence becomes multilateral, problems of clearing bills of exchange arise. Organising a clearing system was the way in which merchant bankers freed themselves as far as possible from the need for payment in specie and the arbitrary nature of official alterations ordered by monarchs. In order to carry out these clearing operations, guilds of merchant bankers invented private units of account to evaluate bills of exchange accepted for clearing and to calculate net positions. Clearing remained periodic until relations between correspondents became sufficiently numerous and stable from one place to another. Clearing was carried out in the network of towns and cities which held fairs. It was the first organised international money market in which bills of exchange of different quality were evaluated and the conversion between them denominated in different units of account, in which arbitraging was practised, and in which net balances were carried over (to the next fair) or paid in specie.

The advent of the bill of exchange thus created the first form of centralised payment. It also entailed two types of exchange rate, side by side: rates for specie and rates for currencies. The differences could be very considerable, because rates for coins minted by different monarchs depended on alterations of official units of account, manipulations of the quality of the coins, and restrictions on minting and circulating them. Rates for currencies depended on the implicit incorporation of interest over variable periods and the estimation of risks borne by merchants with differing reputations.

Thanks to centralised clearing and private international monies of account, transfers from one account to another meant that the currency exchange market could be organised so as to reduce its dependence on official monies. However, it was not entirely free of them. Currency rates quoted at fairs set future exchange rates, since a bill of exchange issued in the creditor's currency was paid at a later date in the debtor's currency. The exchange rate was defined as follows:

| Future exchange rate = Official parity ± Implicit interest rate ± Exchange rate risk |
|---|



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Hedging exchange rate risk became common practice among international merchants who maintained large-value reciprocal flows. Merchants forward-sold claims which represented the counterpart of their exports and bankers forward-sold the bills of exchange they bought, generating strictly financial relations that were at the heart of the foreign exchange markets. The tension between these currency markets and official monetary alterations were at the source of the problems of international monetary control that we shall consider in the last section of this study.

### *Bank money, the law of reflux and multilateral clearing systems*

As we have seen, all the techniques of international finance were invented between the 13th and 16th centuries. But, as Braudel has so often emphasised, the most basic economic relationships, the exchanges of everyday life, hardly changed at all. Capitalism was born in Europe, then spread worldwide in the 16th century, long before its roots penetrated into and extended throughout domestic economic activity. As Marx pointed out, primitive accumulation predated the industrial revolution by several centuries.

As we saw in the previous section, the industrial revolution in England was preceded, by more than half a century, by a monetary revolution which ushered in the phase of convertibility. However, the monetary revolution itself resulted from the rise of a national, manufacturing-based capitalism in the 17th century. After the final financial collapse of the Habsburgs in 1632 and the end of their attempt to gain imperial sway over Europe, the emergence of rival capitalist nations became the dominant force in the economy. However, the formation of a unified trading area which was its foundation could not accommodate the extreme monetary instability that arose in the dualist system in the late 16th and early 17th century. State-driven manufacturing-based capitalism needed regular supplies of raw materials and a concentration of financial resources invested over the long term. The security of these investments and the needs of the public treasury combined to urge for the reduction of the enormous guarantees taken by creditors because of monetary uncertainty.

The Netherlands was the first country to explore the idea of banking, with the creation of the Bank of Amsterdam in the 17th century. But the full efficacy of the match between the banking principle of spreading risk and the principle of monetary convertibility did not become apparent until the 18th century in England. This match is expressed in the law of reflux. Banks issue notes or create deposits against their assets over and above their reserves of specie. Banknotes circulate as means of payment. Notes and deposits are convertible on demand in the metal coin which is the base currency. If the banking rationale is allowed free rein, as in the free banking theory, the monetary authority does not control the quantity of



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base currency. The government merely defines the unit of account by setting an official price for a weight of metal chosen as the medium for specie. Convertibility is the rule that validates bank money. The law of reflux is the process whereby convertibility limits the issuance of competing bank monies. It economises specie and verifies the quality of notes at one and the same time.

The theoretical difficulty lies not in the formulation of the law of reflux but in understanding the specific characteristics of the banking principle in finance. These characteristics mean that the law of reflux is fulfilled in the centralisation of relationships between interbank correspondents within multilateral clearing systems.

One erroneous interpretation of the law of reflux is the real bills doctrine. This argues that in order for means of payment to be acceptable, banks should issue them only against commercial bills whose status as safe collateral can be easily verified. If that is the case, the money does indeed return to the issuer for destruction. But it also means that the loans have been made on the basis of public information and that they can equally well take the form of tradable securities. Thus, at most the real bills doctrine explains the existence of securities financial intermediaries issuing acknowledgments of debt whose value depends on that of the assets held by the intermediaries. It does not in any way explain the banks' historical role in the development of capitalism.

Banks are institutions which offer non-transferable claims combined with the provision of payment services. They invest in specific information, whose quality depositors are not able to assess. This asymmetric information structure, coupled with the network effects in the system of payments, implies, as being the most efficient relationship, that deposits are valued at par in units of account and are hence convertible at par into the base currency. This relationship came into its own in the second half of the 19th century when deposits became transferable by means of cheques. Cheque payments transfer deposits from one bank to another and create interbank positions. The law of reflux is the process whereby these positions are netted out and settled between banks.

If the daily bilateral balance between two banks resulting from the balance of the value of the cheques they collect had to be settled in cash, the law of reflux would be highly restrictive. The need for liquid reserves to meet the requirement would hamper the expansion of bank credit. That is why banks found it to their advantage to enter into co-operative arrangements to economise specie. These arrangements spurred an advance in payment technology by leading to the organisation of clearing houses. Multilateral clearing of interbank positions on the clearing house's books with settlement of net balances is the seed from which the centralisation of payments grew. It highlights the ambivalence of money, because it is a collective structure whose cohesiveness derives from co-operation between competitors. Although it is to the advantage of all, this co-operation is not self-evident. If a single



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bank fails, the co-liability of banks subject to the law of reflux can topple them all into bankruptcy. That is the systemic risk associated with centralised payments. The contradiction was resolved by creating a hierarchical structure with the central bank as its keystone, acting as the bankers' bank.

### *The advent of central banks and the security-oriented regulation of payment systems*

A clearing house is a centralised organisation which introduces collective rationality into payment systems. Clearing houses appeared in the leading business centres of the United States in the mid-19th century, at a time when there was no central bank. But clearing houses were not content merely to economise specie and reduce the cost of cheque collection. They issued settlement certificates on behalf of their members, who deposited reserves with them. At times of crisis, especially when convertibility was suspended, the clearing houses acted as central banks, as Goodfriend points out (1988). Transferring certificates was equivalent to settlement among their members. This higher status of settlement money gave the clearing houses hierarchical authority over their members: they were truncated central banks. The responsibility for preserving the integrity of payments among the clubs of retail banks of which they were the centre led the clearing houses to guarantee the irrevocability of payments in return for the banks' compliance with restrictive obligations.

Irrevocability guarantees that a collected cheque constitutes final payment for its beneficiary, even if the account on which it has been drawn has insufficient funds or if the payer's bank does not have sufficient means of settlement. Irrevocability means that the beneficiary's account is credited immediately. Payment is guaranteed against default on the part of the payer's bank. In order for this guarantee to be operative, all the members of a clearing and settlement system must collectively agree to cover the liquidity risk when one of them is unable to settle its net position with the clearing house at the end of the day. The clearing houses therefore assumed stringent regulatory powers in matters such as conditions of access to banking activity, capital adequacy requirements, reserve ratios, loss sharing agreements, monitoring of members' financial situations by committees of experts, and penalties for non-compliance which could go as far as exclusion.

Irrevocability is therefore the principle on the basis of which a payment system can be conceived as an interdependent network. Because of irrevocability, payments mediated by banks superseded earlier forms. A hundred years during which banks became the key players in monetary economies led to the development of national payment systems and ended the fragmentation of means of payment. But in order for this point to be reached in the 20th century, the limits of private co-operation had to be overcome by establishing the primacy of central



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banks. Whatever their origins and legal status, central banks imposed themselves as the bankers' bank in the payment system.

Curtailed collective rationality is ineffective where the public good is concerned, as was amply demonstrated in the United States in the second half of the 19th century. At the same period, the Bank of England was asserting its position at the pinnacle of the banking hierarchy. The system of convertibility was strengthened as a result, because liquidity crises could be overcome without the need to suspend convertibility. In contrast, in times of crisis private clearing houses preserved only their members' internal payments. Excluding the other banks, they aggravated the crisis for peripheral banks whose debit positions had to be settled in specie. Thus, the American payment system became increasingly vulnerable with the use of bank money until the acute disorder of payments in 1907. Even though regional clearing houses circulated their certificates, withdrawals by depositors demanding conversion into gold spread throughout the entire country.

It is possible from the example of the United States to understand the essential innovation which gave the principle of irrevocability the necessary scope to unify a national payment system, namely a central bank capable of providing an elastic supply of a single, unanimously accepted means of payment and of assuming the responsibility of lender of last resort.

The collapse of convertibility and the establishment of national systems of fiduciary money between the two world wars consolidated the primacy of central banks in two-tier banking systems. Central banks took up a position at the centre of payment systems to guarantee settlement, prevent systemic default, control the expansion of means of payment, set prudential rules and ensure compliance with them.

### *The present-day hierarchy of payment systems*

National payment systems are interlocking networks of networks with the central bank as their fulcrum, because its liabilities are the ultimate means for settling interbank balances. This superior liquidity of central bank money is consistent with the definition of the unit of account in fiduciary money systems. The unit of account is the unit of measurement of the liabilities that the central bank causes to be accepted as money. Contrary to the arguments of proponents of the "legal restrictions" theory, this system results from an extension of the banking rationale and not the imposition of a rule by the state. The monopoly on issuing banknotes conferred on the central bank is indeed a legal restriction. But directly holding money issued by the central bank in the form of notes is not a logical necessity of the hierarchy of monetary instruments in fiduciary systems.

The characteristics of the wide variety of retail payment instruments are summarised in Table 3. It can be seen that scriptural and electronic means of payment



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Table 3. **Retail payment instruments**

| Monetary features | Fiduciary money | Scriptural money | Electronic money |
|---|---|---|---|
| Logic of CIRCULATION and medium for PAYMENT | Decentralised, mechanical and anonymous (physical transfer) | Centralised, arithmetical and personalised (transfer of book entries) | Centralised by interconnection, electronic and personalised |
| | Perpetual for coins and notes (except for wear and tear)<br>Sovereign mark<br>Counting | Ephemeral (cheque)<br>Acceptance by signature | Ephemeral (electrical impulse)<br>Electronic card or purse guaranteed by the issuer |
| INFORMATION associated with PAYMENT | Memory dispersed and extinguished with the transaction | A cheque is a voucher. Memory stored in movements between accounts | A card is a certified voucher: signature by PIN code |
| | Circulation of notes is equivalent to payment | Irrevocability means that payments can be guaranteed, but the payer's solvency is not monitored in real time | With smart cards, the payer's solvency can be monitored in real time |
| LIQUIDITY<br>and | The means of payment itself is liquid | Dissociated from the means of payment (cheques ≠ accounts) | Account identification from the card |
| SECURITY | Low level of security (susceptible to theft) | Protected (except signature theft)<br>Collective security against bank insolvency (lender of last resort) | Protected by code<br>Collective security (lender of last resort) |

have similar characteristics – centralisation of payments and personalisation of means of payment – which imply a structure that has fixed costs and increasing returns. Electronic money can dominate scriptural money because it is more efficient, having earlier value dates; because it can convey more information; and because it enables users to be identified with greater security. It may therefore be supposed that electronic means of payment could entirely replace cheques in the future. Coins and notes, in contrast, have the opposite characteristics to means of payment backed by organised networks: decentralisation versus centralisation, anonymity versus identification, liquidity in circulation versus liquidity on deposit, sovereign mark versus private signature. Of course, the electronic purse has some of the features of fiduciary money. Between two recharges it transports liquidity, since payments made with an electronic purse are not individually linked to a bank account. These payments are therefore decentralised to a certain



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extent. But an electronic purse is not anonymous, and the memory of payments is not erased at each transaction. It is linked to a bank account which is debited at each recharge. It must therefore be guaranteed by the issuing bank. Thus, it is not the medium of absolute liquidity, but depends on the security provided by the hierarchically organised payment system, which depends on the central bank.

Electronic fund transfers have revolutionised large-value payments in the last thirty years. The interlinking of computers, the extraordinary increase in their capacity to store and process data, and developments in remote transmission techniques have enormously increased the payment flows generated by financial transactions. More generally, large-value payment systems may be divided into three categories: interbank fund transfer systems, settlement systems for transactions in financial instruments and derivatives, and multi-currency payment systems. These high-value payment systems are in contrast with the low-value, retail payment systems considered in Table 3. It is within these high-value payment systems that systemic risk is located, since the errors of judgement and the hazards which affect all economic exchanges are concentrated in their flows. More specifically, high-value payments concentrate risks with a strong likelihood of becoming systemic. In contrast, high-value payment systems are liquid if they can transport large amounts quickly (value-time) and safely (guaranteed final settlement). This liquidity in the broad sense is threatened by the combination of several types of risk.

Credit risk arises when payment orders are used to make other payments before they have been settled. They are aggravated by time pressures. In particular, the risks arising from interbank positions during a day may be incurred on very large debts. Liquidity risk in a narrow sense arises when the payment branch and delivery branch for an economic or financial commodity are not the same. When delivery has been made to the counterparty but the payment has not yet been made, there is a pure liquidity risk. In the interconnection of payments, there are two forms of liquidity risk induced by dissociation: time to settlement and desynchronisation of settlement (or Herstatt risk in multi-currency payments).

Secure payment depends on the organisation which assumes these risks in order to guarantee final settlement. As already mentioned, this presupposes that payment orders are irrevocable for the beneficiaries. Subsequent settlement by the central agent must also be unconditional. In payment systems where the central agent is a private institution, this unconditionality cannot be guaranteed, since the agent cannot create, out of nothing and in potentially unlimited amounts, the ultimate means of payment which is unconditionally accepted. That is why there has to be a hierarchy of payment systems, with net balances from private systems feeding into the higher system (or systems) that settle accounts on the books of central banks.



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Rising levels of risk led European monetary authorities to develop at least one high-value interbank payment system in each country, which is not only capable of processing multi-currency transactions but also both irrevocable and unconditional, in order to contain systemic risk. These more secure systems, which handle central bank operations designed to implement monetary policy, were interconnected within the TARGET system when monetary union took effect. In order to increase security still further, these exclusive systems were equipped with the most advanced information technology, enabling them to switch from end-of-day net settlement to continuous gross settlement.

Since the first days of interbank clearing, each bank's net balances on the clearing house's books were calculated and settled at the end of the day. Central banks assumed the liquidity risk on settlement. So as not to incur the inherent credit risk, they drew up strict regulations, including loss sharing agreements between members with solidly established legal validity, provision of collateral to the central bank to secure its lines of credit, and limits on daily overdrafts.

In guaranteed gross settlement procedures, interbank payments are presented on a continuous basis and accepted after a check has been made to ensure that the payer can raise the necessary liquidity. For the central agent, the credit risk can disappear entirely. But when payments are rejected because of insufficient immediate liquidity, a payment freeze can spread by contamination. In order to forestall such an eventuality, banks have to have large amounts of liquidity at their disposal. The central bank can provide these, by means of clever computer programmes that optimise the order of payments in a queue instead of rejecting them, and advances against very high quality paper provided as collateral.

The point to be borne in mind from this movement along a path towards the centralisation of payments is the dilemma between effective execution of payments and the stability of the systems that organise it. Inventing a wider range of private means of payment does not undermine the central banks' influence. On the contrary, it reinforces it because complex payments, ever larger volumes and shorter lead times increase systemic risk. Private arrangements are incapable of controlling this risk because it threatens trust in money at its most fundamental level: the definition of the unit of account in an unconditionally acceptable monetary instrument. That is why the integrity of payment systems is much more than a merely technical issue. It must be seen in the context of the control of the economy by money via the financial sector.

## 4. Money and finance: the advance of control

We now have an idea of the forces that operate in monetary systems. The keystone is the definition of the unit of account, general acceptance of which confers social validity. This acceptance is the token of collective membership of the same



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monetary zone as a result of which money is the general medium of exchange. It is money which turns trade into an interdependent whole: the payment system. Within this system, the tension between the two indissociable aspects of money – the social coherence of payment obligations and the private power to accumulate money – is expressed. This ambivalence develops over time in the form of a structure of claims and debts. This structure – the financial sector – is the locus of reciprocal dependence and rivalry between creditors and debtors. When rivalry gets the upper hand, the payment system may be disturbed and a financial crisis with monetary effects can occur. The aggravation of malfunctions, when they cast grave doubt over the settlement of debts, can lead to a general deterioration of confidence in money, or even a full-blown monetary crisis culminating in destruction of the monetary system.

We can see, therefore, that the dual aspect of money, at once a collective relationship and susceptible to private appropriation, renders any self-regulation of money by commerce utterly impossible. When we understand that money is the operator of economic value and not a particular object on which value is conferred by the fact of trading it, we also understand that money requires social control. This control is accomplished in and by the financial sector, since that is the place where the tensions surrounding money are concentrated.

We have seen, from our consideration of the advance of abstraction in the definition of money, that several principles for establishing the unit of account have succeeded each other in the course of history. The links between these principles, which lie at the heart of monetary systems, and developments in finance suggest that the ways in which money is regulated change with the two major historical trends identified earlier, namely abstraction and centralisation. This fourth section seeks to give some idea of what these changes are, and how they come about.

### *Private debt and dysfunctions in payment systems in Ancient Rome*

The discussion below owes much to Andreau's work (2000) on the financial crises of the Republic in the first century BCE and the beginnings of the Empire (until 32-33). These crises have nothing to do with the definition of money. They are different from the monetary crises studied by Carrier, which rocked the 3rd and 4th centuries until stabilisation in 360 and gave rise to successive reforms in an attempt to halt the depreciation of the currency and restore confidence.

The Roman currency was closely linked to the power of the state. The state had a monopoly on minting money; money does not seem to have been minted privately. The state had no debt. Money was issued through public expenditure, trade with the eastern Mediterranean, gifts from the state and the redistribution to the political elite of the spoils of war and levies on subject peoples. Consequently, financial crises did not undermine trust in the currency, or in the way it



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was minted. On the contrary, these financial crises were private debt crises with deflationary effects, during which hoarding could paralyse payments. Trust therefore had to be restored by acceptable compromises or imposed solutions for the settlement of debts. In all events, financial rivalries took a back seat to political struggles, including civil wars between 91 and 80 BCE, the Catiline conspiracy (64 to 62 BCE), the civil war triggered by rivalry between Caesar and Pompey (49 to 44 BCE), and acute indebtedness under Tiberius (32 to 33).

There are considerable differences between private debt in Roman times and private debt in post-13th century capitalism. In capitalism, debt creates private money which is issued with a view to accumulating capital. In Rome, debt was linked to political careers. Those seeking access to the upper strata of the social hierarchy had to acquire considerable assets, which could entail contracting substantial debts with other members of the elite who had already achieved or inherited such positions. Political success was essential if the social climbers were to reimburse their debts and consolidate their fortunes thanks to the state sinecures to which such positions gave access. Struggles between creditors and debtors thus tore the Roman political elite apart. Debtors could gain the support of plebeians who were structurally in debt. The importance in the political arena of having assets meant that debtors resisted the sale of their estates, which would have caused land prices to fall, in order to settle their debts.

At times of acute political strife, financial crises could arise from a conjunction of circumstances, when a small group from the political elite monopolised the wealth of the state and the means of payment in circulation dried up. This could be caused, on the supply side, by insufficient state spending or a foreign trade deficit, but was more likely to result, on the demand side, from hoarding due to concerns about political instability. In this system, the relationship between financial pressures and monetary malfunctions was expressed by abrupt changes in the velocity of circulation of money. Absorbing the debt crisis was the precondition for restoring normal payments. This could be achieved by violence, as was the case with Cicero in 63 BCE, following a refusal to compromise by rescheduling debts or partially reducing them in principal or in interest, or by gifts or low-interest loans from the state.

The crises of the Later Empire in the 3rd and 4th centuries were quite different. The 4th century was marked by rampant inflation until 360, preceded by a general crisis in society in the 3rd century. The structure of monetary creation changed after 215 as new coins were issued in line with successive devaluations and attempted stabilisations. Until 270, apparently, the pace of devaluations was reflected in the price of precious metals in terms of units of account rather than in the price of staple goods. Inflation came roaring back after the failure of Aurelian's reform, interacting with currencies that had less and less metal content and circulated more and more quickly. Soaring prices prompted a reaction from private



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agents seeking a store of value. It is at this point that trust in the definition of money was lost. A split occurred between gold and the debased coinage in circulation. Gold and silver coins were treated as commodities sought after because they were an absolute expression of value. They became speculative objects, valued in terms of circulating money, which was increasingly rejected. The precondition for stabilisation was the state's capacity to push through a radical reform: requisitioning precious metals by weight, reimbursing them in debased coinage at a decreed tariff and re-establishing a system of monetary creation based on gold.

### *Easy and tight money in the dualist system*

Before the decline of the Empire, the prestige of the state governed the currency in the Roman world. The ups and downs of political life, much more than economic life, were the cause of malfunctions in the monetary system. With the emergence of capitalism in the 13th century, monarchs and overlords had to reckon with the vigour of private finance. Merchant bankers wrested franchises and organised themselves into merchant cities in Italy, along the Rhine and in the Hanseatic ports. A string of fair towns completed the financial marketplaces where bills of exchange changed hands beyond the control of the political authorities.

The vigour of private finance was linked to the long-distance trade in which financiers invested their money. That is why periods of easy and tight money alternated according to the comings and goings of fleets in European ports. Let us take as an example the circulation of capital between Venetian merchants and Florentine bankers in the 15th century. When the fleet was about to sail, money was at its tightest in Venice. Specie was rare and bills of exchange were issued on Florence in order to finance the commissioning of ships and their cargoes. The excess supply of bills of exchange caused their price to fall. Consequently, the florin appreciated in relation to the Venetian ducat. In contrast, when the fleet returned, if there had been no losses due to storms or piracy, merchandise from the east flooded into Venice and was sold on throughout Europe. Northern European traders in turn drew bills of exchange on Venice to remit the counter-value of the goods they had bought. Venetian debtors could settle their debts with their Florentine creditors and the ducat recovered against the florin. Furthermore, interest was camouflaged in the exchange rate. As the Florentines were structural creditors of the Venetians, they received camouflaged interest on their loans which, according to Einzig, ran at 8 to 12%. Florentine bankers received the interest in the settlement of bills of exchange in Florence on debt instruments issued in Venice.

These cyclical variations took place between two free cities that had continuous business relations, generating substantial volumes of bills of exchange which netted out over time and economised specie. The relations between private



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financiers and monarchs who altered units of account and manipulated the metal parities of minted coins to encourage or halt inflows or outflows of precious metals were more complex.

The monarchs' monetary policies were hardly transparent. They sought to prevent exports of precious metals and to limit the circulation of foreign specie in their lands. They required the holders of foreign coins to take them to the mint, where they would be melted down and restruck with a metal content that generated substantial seignorage. The level of these controls depended on how easy or tight the relative supply of specie was from one country to another. In the mid-14th century, for example, merchants perceived the effect of the scarcity or abundance of specie in different places on scriptural exchange rates through gold points. These were very variable, however, because they depended on the stringency of export controls on precious metals and the financiers' anticipation of the feared future mutations of the unit of account.

Let us then consider the contradictory effects of a prolonged tight period in a realm. The government tightens its restrictions on the export of precious metals and increases seignorage on the re-minting of imported foreign coins. The market value of gold therefore increases in relation to its official acquisition price at the mint. This widens the gap which determines the gold export point. But domestic hoarding is an initial obstacle to the government's achievement of its aims. At the same time, as we saw earlier, the scriptural exchange rate of the local unit of account depreciates during tight periods. When specie is scarce, more bills of exchange have to be issued. As exports of bills of exchange are less strictly controlled than exports of specie, the scriptural exchange rate depreciates by more than the difference on the market value of the metal. When the scriptural exchange rate falls substantially below the gold export point, the advantage of paying in specie in another country is so great that the controls begin to spring leaks. Specie exports combine with domestic hoarding to shrink the available supply of means of payment. The government then has to order a devaluation of the unit of account to encourage hoarders to put metal back into circulation and merchants to start importing foreign specie once more.

Thus, altering the unit of account was a crude way, brutal but essential, of regulating the money supply in the early days of capitalism. It had the drawback of exacerbating conflicts between the nations that were beginning to emerge. In the 16th century, the kings of France sought to counter the depreciation of the livre tournois against the maravedi (the Spanish monetary unit) by making it more or less difficult, through more or less stringent controls, to transport precious metals from Spain to the Netherlands. Banning remittances caused a rise in the price of debt issued in Antwerp and Amsterdam, a depreciation of the Spanish scriptural exchange rate and ultimately a devaluation of the maravedi.



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Alterations of units of account therefore had all the features of modern competitive devaluations or revaluations. However, the aim was not to export unemployment or inflation, it was to attract precious metals. In doing so, they rewarded hoarders and increased the risk premiums hidden in scriptural exchange rates for debt. When capitalism began to take root, they became an obstacle to its further spread.

### *Monetary order and financial regulation under convertibility*

As we saw earlier, the central issue of convertibility was the security of creditors. If accumulated capital is to flow through into the production of manufactured goods, it must be possible to assess the specific risks of committing capital according to the opportunities perceived by financiers. This differential assessment is based on the establishment of benchmark interest rates. Confidence in the workable stability of these benchmarks is the basis on which financial contracts are concluded and the structure of debt according to risk and maturity has evolved over time. Financial regulation by money is the process which generates the common good of stable benchmarks.

No other period in the history of capitalism seems to have maintained benchmarks stable for so long than the period of the gold standard between 1879 and 1913. It is doubtless on account of this that the period has been called the international monetary order. Flandreau's research (1995) can be used to extend this period of monetary stability. He showed that bimetallism in France in the three decades prior to the war of 1870 was managed in a way that generated extremely solid trust in convertibility.

Let us take the pure case of a group of countries which define their unit of account by stating it to be convertible into gold. Table 4 shows the very high level of confidence in the monetary order of the period, in contrast to the present day.

Short and long-term rates were much less volatile then than they are now, even though inflation is very low. The only exception is in the United States, for a well-known reason. The lack of a central bank in the United States under the gold standard generated a latent systemic risk which surfaced in recurrent banking crises. The whole economy paid the social cost of a fragile banking system in the form of excessively volatile short-term interest rates. Long-term interest rates were also remarkably stable under the gold standard. Long-term interest rates on government securities provided a very solid anchor for financial investments. They expressed the great measure of collective security that this monetary system gave to capital investment. It is remarkable that the most stable rates were indeed nominal and not "real" rates. It is also noteworthy that the general level of prices was not a matter of concern. There was no official price index. Recent econometric studies using reconstructed price series show that price expectations were stationary,



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Table 4. **Volatility of nominal interest rates (SD)**

| Period | United Kingdom | | France | | United States | |
|---|---|---|---|---|---|---|
| | LT | ST | LT | ST | LT | ST |
| Gold standard | | | | | | |
| 1880-1895 | 0.13 | 1.10 | 0.31 | 0.65 | 0.29 | 2.43 |
| 1896-1913 | 0.26 | 1.11 | 0.14 | 0.69 | 0.28 | 2.68 |
| Modern-day financial liberalisation | | | | | | |
| 1980-1990 | 1.87 | 2.24 | 2.64 | 2.82 | 2.20 | 3.26 |
| 1991-1997 | 0.96 | 2.20 | 1.15 | 2.64 | 0.78 | 1.16 |

Short-term rates are rates for 3-month Treasury notes.
Long-term rates are rates for 10-year bonds for the modern period, and for perpetual loans in France and the United Kingdom under the gold standard.
*Calculations*: Aglietta *et al.*, MINI-FORUM (Paris X), *Les crises financières sous l'étalon-or et aujourd'hui, une analyse comparative*, Report for the CDC Institute, March 2000.
*Source*: NBER for the gold standard and IMF International Financial Statistics for the modern period.

despite the fact that short-term industrial prices fluctuated more than they do now. The business cycle was more marked and shorter. This provides us with information about how trust works in a system based on convertibility.

Savers in the countries that had gone furthest down the capitalist road seem to have been guided by ethical trust. They believed that the nominal promises written into long-term financial contracts would deliver the return that was expected when they were performed. Short-term price movements were therefore rightly seen as being reversible, and were hence not incorporated into long-term nominal rates. Under these circumstances, the monetary authorities had no need whatsoever to concern themselves with price stability. The only thing that counted was obeying the rule of convertibility, *i.e.*, preserving the unit of account. In addition, the Banque de France, which had abundant reserves of gold, could allow itself to pursue minimum volatility in short-term interest rates, as can be seen from Table 4.

This international monetary system was nonetheless vulnerable to financial crises, because the expansion of short-term credit in the business cycle reduced the banks' liquidity. The convertibility requirement made discounting more expensive. The tightening of monetary conditions in which the law of reflux had to be obeyed forced the banks to limit their lending, accelerating the economic downturn. Recession did not necessarily always usher in an international crisis of confidence, but a financial accident occurring at a time of illiquidity could prove highly contagious. This was the case, for example, with the collapse of Barings in 1890, the panic in the banking sector in the United States in 1893 and the credit crisis in the "new economy" of the day in 1907.



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The Bank of England had to intervene in all these crises, lending gold to New York banks in 1893 and 1907. Certain situations, notably in 1890 and 1906-08, produced a form of *de facto* international co-operation which was nothing less than the intervention of an international lender of last resort. The Banque de France provided liquidity in support of the Bank of England to prevent short-term interest rates from rising too rapidly, because the existence of an integrated money market in the system meant that monetary conditions in France could not be isolated from the rest of the system. This pragmatic action at the source of the pressure, *i.e.*, on the London money market, enabled the Banque de France to defuse the international liquidity crisis for the needs of its own monetary policy.

### *Predominance or subordination of monetary policy in national currency systems*

From a brief review of the ways and means of monetary control in history it is possible to state the broad underlying principle. The aim is to maintain trust in the payment system, which mediates the interdependence of exchange and, beyond that, contributes greatly to social cohesion. Trust is threatened when uncertainty about the future of debt casts doubt on the durability of payments or the measurement of economic values on the basis of the unit of account. The first process is a financial crisis in which the reaction of economic agents to systemic risk can propagate the destruction of private wealth. The second is unchecked inflation, potentially leading to the loss of collective benchmarks without which economic agents are unable to make differential evaluations.

Regulation by controlling the money supply involves keeping the economy within a viable range between these pitfalls, so that the overall production of economic value is able to mobilise the resources of society as completely as possible. Controlling the money supply does not determine a single equilibrium, but a number of viable trajectories. Failures happen but they do not contaminate. Fluctuations that disturb prices occur in financial markets, but they remain transitory and reversible. Economic activity is subject to cycles, but it continues along an underlying trend which makes full use of resources.

As we saw in the second section, the great changes that took place in the 20th century freed units of account from the straitjacket of convertibility. The advent of self-referential national currencies shattered the monetary order of the gold standard, considerably extending and diversifying the areas within which national economies could be viable. But this shift did not take place without periods of chaotic transition between the two world wars. In Europe and the United States, organised national monetary economies did not come into existence until the 1950s. The nature of international monetary relations changed because of the nationalisation of currencies. Under convertibility, they were the media for an ethical form of trust which required monetary authorities to comply with the universal



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rule. International relations became a problem in all national currencies. In the last fifty years we have seen two major phases of monetary regulation, characterised respectively by the limitation and the flourishing of international relations.

National currencies modified the respective importance accorded to forms of trust. Hierarchical trust became the dominant form, because the growth of wage-earning societies generated powerful social forces which have not only rewritten politics but transformed the issues of democracy. The legislature has instituted social rights which in turn have provided a legal framework for the implementation of economic policies with social purposes that have their roots in common principles of social progress. But their ambition has been reflected differently in economic policy objectives according to the scale and manner of state intervention in market economies. From American free market capitalism, in which the federal administration steers macroeconomic conditions, to the mixed economies of continental Europe, governments have weighted their objectives differently. To some extent, they each follow their own growth paths.

These developments have had considerable implications for money. In the first phase, from the early 1950s to the early 1970s, the Bretton Woods system provided the framework for monetary control. An intergovernmental treaty, Bretton Woods sought to lay down rules of good conduct so that autonomous national policies would not degenerate into the rivalries which caused conflict and fuelled monetary instability between the two world wars. The aim was to create plenty of scope for economic growth, in which each government could conduct its own policy thanks to mutual recognition of the means for limiting the repercussions of one country's imbalances on another. One of the most important of these means was acceptance of the legitimacy of controls on international capital movements. In the second phase, monetary disorders resulting from the collapse of the Bretton Woods system caused governments to seek salvation in a somewhat unusual combination of greater monetary nationalism and financial liberalisation. In turn, this explosive mixture stimulated innovation at an institutional level, since it caused a widespread movement towards the independence of central banks.

At the time of the Bretton Woods system, currencies were heavily dependent on the state. Monetary policy was used to pursue governments' economic objectives. In compartmentalised financial systems, where interest rates on bank deposits were decided by governments and the deposits themselves were explicitly or implicitly guaranteed by the state, the currency was relegated to an instrumental role that the Radcliffe Report (Committee on the Working of the Monetary System, 1959) rationalised particularly well. The currency was subordinated to public expenditure and, in some countries, to the financial intermediation of public institutions. Until the late 1960s, the notion that the government was responsible for the nation's entire economic policy went unchallenged.



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This is not the place to examine all the difficulties of monetary policy in a protected financial system under the aegis of the state. Let us merely identify the weaknesses that came under such heavy fire in the monetarist debate in the late 1960s. One of the two pitfalls threatening money, namely systemic risk, had been removed by financial regulation and by the certain knowledge that the central bank would cover up any incident in the banking sector. In this case, the supply of credit responds flexibly to demand as described by Wicksell unless the central bank imposes direct credit restrictions on the orders of the Treasury. The financial sector is biased in favour of borrowers. Investment projects are financed, growth sustained and business cycles cushioned. But short-lived and shallow recessions in oligopolistic banking systems encourage the index-linking of prices and costs. Trust in the unit of account is slowly eroded. Monetary policy is undermined by a surreptitious deterioration of the nominal anchor. Inflation spirals upwards as attempts to check it fail. Holders of nominal claims, especially bank depositors, try to protect themselves against the devaluation of their assets. Insofar as the banking system fails to offer them any solution, mistrust spreads and translates into disintermediation. The search for ways of storing value generates growing pressure to liberalise the financial sector and open up access to international investments. Conflicts between creditors and debtors then become so acute that monetary policy is no longer able to set benchmarks for the evaluation of financial assets. Loss of confidence in the currency ushers in a phase of crisis and reform. This phase lasted for more than a decade, from 1968 to 1982.

Monetary nationalism and financial liberalisation were the twin offspring of the crises that followed the collapse of the Bretton Woods system. The breakdown of the code of international good conduct paved the way for floating exchange rates, and these in turn for individual governments' monetary experiments to restore price stability at any cost. At the same time, private agents and governments, depending on their circumstances, sought to obtain credit or to convert their nominal wealth in a wider lending and investment arena. The oil shocks exacerbated this trend and accelerated the formation of international financial markets.

The twist in the tale is the return of factors of instability that predated the introduction of convertibility, factors that were present in the dualist system. The first of these is exchange rate instability, *i.e.*, relations between units of account which no longer have a standard of equivalence. The second is the uncertainty of international credit, which aggregates the risk inherent in financial intermediation and monetary risk. The third is the way in which the global financial sector passes on the effects of countries' contradictory policies. Price distortions caused by exchange rates and financial crises have affected economies for the last twenty years or so.



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In the financial environment of the last two decades, the pitfalls that threaten monetary policy have changed completely. Financial liberalisation has stimulated competitive forces which have boosted technological progress and set in train powerful, endogenous anti-inflationary mechanisms. These processes have enabled newly independent central banks to organise procedures for co-ordinating anticipations about the prices of staple goods and services, called inflation targeting. Trust in the durability of the unit of account has been solidly re-established. But the other pitfall, systemic risk, has increased considerably. The challenge facing this new century is that of how unco-operative national monetary authorities are to regulate a financial sector that is global, unstable, and a carrier of powerfully contagious forces.

**Conclusion: the prospective new forms of money**

As we come to the end of this chapter, we now have a guide to help us assess emerging monetary innovations. We have seen that a threefold rationale of abstraction, centralisation and regulation can be used to analyse money over the very long term. While the first two highlight irreversible processes, an arrow of time, that is not the case with the third.

Abstraction concerns definition of the unit of measurement. These definitions are increasingly abstract, meaning that they are increasingly consistent with the essential characteristic of money, which is to be the pure form of exchange. This characteristic is expressed in a number associated with exchange: the economic value assigned to the objects of exchange, *i.e*, their price. Money is the operator which confers an exchange value tp. It is therefore logical that the path taken through history by definitions of the unit of account should culminate in self-definition. The unit of account is instituted by the sign which represents it, the mark of the issuing body.

But to define does not mean to preserve. If the unit of account is to be preserved, it must be generally accepted in the interconnection of payment instruments within a payment system. However, these systems are shot through with tensions deriving from the ambivalence of money: the system must establish the coherence of exchanges, but payment instruments are created by the separate and contradictory acts of private agents. The centralisation of payments is the process that results from the dual aspect of money. Once bank money develops, centralisation on the books of the institution issuing the unit of account is the only system that guarantees final settlement.

Unlike the two previous tendencies, control is not in the least progressive. As we have seen from studying the path taken through history by units of account, there are times of deteriorating trust when the unit of account suffers, undermined by inflation, and times when agents believe firmly in the maintenance of nominal



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values. There are times when the confrontation between creditors and debtors in the financial system generates a latent systemic risk and times when commitments can be honoured without difficulty. Financial crises have occurred for as far back as it is possible to observe the past. The permanence of money is therefore the permanence of ambivalence, which is indistinguishable from the permanence of social relations. There is nothing to suggest that control of money is leading societies towards greater cohesion, peace and harmony.

This brief reminder helps to dissipate illusions and to raise questions about the new monetary technologies. The confusion engendered by futurist predictions derives from a misunderstanding of the nature of money, and especially of the interaction between the threefold elements of its underlying basis. The changes which electronic money is expected to bring about may be assessed by the yardstick of this threefold rationale.

### *Private units of account, a common unit of account*

The growth of international financial transactions between private agents using electronic networks is a possibility which leads to the use of private units of account. However, a distinction needs to be drawn between three forms of private unit of account: index-linked systems, basket units of account, and units of account which are autonomous because they are linked to private payment systems. Only the latter form has any monetary effects. Is it a radical innovation? Not really, because it is hard to see how it differs from the units of account used by 15th century bankers in systems for clearing and settling bills of exchange. Just as these systems sought to remain as far removed as possible from alterations of official units of account, network electronic money could make payments without using large-value interbank payment systems and the units of account on which they depend. But what is the result as far as relations between units of account are concerned? A clear distinction must be drawn between the functional autonomy of payments (which we will come back to) and identification of the payment zone by the unit of account.

In the 15th century, the units of account used by communities of merchants and bankers could not help but confront the question of equivalence with official units of account, because private systems cannot be entirely self-sufficient. This will be even more true in the future. If electronic payment networks spread, there will be many of them in competition with each other. If they do not, they will be taken over by the banks and will become merely another technological option for making payments; as they will not affect the centralisation of payment systems, they will therefore use national units of account and foreign exchange transactions. However, it is conceivable that cross-border private payment systems, being more efficient in the clearing and settlement of international financial transactions, could give rise to an agreement between major financial intermediaries and net-



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work servers which would create a universal unit of account in this type of transaction. However, any such innovation would not concern the bulk of payments that constitute economic activity.

Being common is the core characteristic of a unit of account because it defines membership of the same monetary zone. Using a unit of account sets up a relationship between each economic agent and the society of traders as a whole. It is not a contractual relationship between private agents. Providing a unit of account therefore amounts to providing a collective good. So-called "private" units of account are in reality collective goods offered within specific payment communities. They must necessarily express the conditions of their equivalence in units of account defined by the undertakings of central banks, because it is these central bank undertakings which define the meaning of the words "dollar", "euro", etc. They establish the most general, and hence the most abstract, form of the social relationship. In order to be universally accepted, units of account defined by the liabilities of other issuers must prove their equivalence with units of account that are superior collective goods. Consequently, private agents who enter into contracts in these units of account, which are inferior collective goods, bear costs and take risks. If these costs and risks are to be offset, the payment systems based on these inferior collective goods must be more efficient. Can that be the case?

*Retail payments: the electronic purse does not have the edge over fiduciary money*

The forthcoming innovation in retail payments is the electronic purse. Of course, funds which are stored in this form are expressed in the unit of account linked to the money issued by central banks. But if the electronic purse were to replace fiduciary money entirely, it would contribute to the eradication of the last symbolic pillar of trust. The hierarchy of collective goods, which remains the principle that lies behind monetary abstraction, would no longer be sustained at all by the effigy of sovereignty. But Table 3 shows that the electronic purse does not have the edge over fiduciary money, since fiduciary money offers non-pecuniary advantages of liquidity, anonymity and security that the electronic purse does not have. The electronic purse may be used instead of fiduciary money in certain limited cases, but is not likely to replace it entirely. The electronic purse is more likely to occupy a position between fiduciary money and existing means for transferring money between bank accounts in order to extend the range of means of payment. In all events, it will have no impact on the regulation of money.

*Network electronic money or cybermoney: the illusion of a radical change in the centralisation of payments*

As we saw in the third section, the corollary of the development of private means of payment was the centralisation of payment systems under the aegis of



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central banks. Why should things be any different with the appearance of "real" electronic money? Payment systems which make settlements on the books of central banks have a nullifying competitive advantage. They are the only systems that can guarantee final settlement, *i.e.*, irrevocable and unconditional payment. They can do so because the settlement agent (the central bank) presents no default risk and acts as lender of last resort to the members of the system to stop chain reactions resulting from payment incidents or unforeseeable liquidity shortages (for example, a computer failure at the Bank of New York in November 1985 caused the Federal Reserve to inject $ 25 billion into the Fedwire payment system before the end of the day). In return for these advantages, the central banks are authorised to regulate the system and admit members into it. Of course, private subsystems exist which reduce costs by not according these advantages, but the central agents of these sub-systems are themselves members of at least one payment system supervised by a central bank, so that unsettled net balances flow onto the books of at least one secure payment system.

Could things be different in the future? Believing that to be the case demonstrates a profound misunderstanding of the nature of liquidity. Liquidity evaporates when trust collapses. But trust cannot be an entirely routine or actuarial matter in payment systems, because monetary flows within payment systems become extremely unstable as soon as doubt arises about the settlement of a large-value payment. Liquidity can be preserved in all circumstances only through a hierarchical guarantee, offered by a socially recognised and unconditionally accepted currency.

It is true, however, that payment technologies will change. The payment systems currently operated by bank oligopolies are highly inefficient, giving three- or four-day value dates for cross-border payments. The cost to customers is sufficiently great to generate competition from payments via electronic networks. Electronic money issued by non-banks circulates between computers on the Internet. This money lies outside the banking system and gross flows can increase very rapidly with the number of agents online. The profit opportunities and risks increase just as rapidly in such unregulated systems, because the conditions for converting the net cybermoney amounts acquired by the beneficiaries of payments into bank money are uncertain. They depend on the cybermoney issuers' reputation for meeting their commitments. But this reputation would be more than doubtful if electronic money were entirely deregulated and open to unchecked competition between issuers who would not have the option of turning to a lender of last resort.

This sort of science fiction vision of the future has no chance of coming true. The historical process of centralisation will also apply to electronic money. Non-bank agents such as large network servers and large telecommunication companies may become issuers of electronic money because they can offer efficient



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payment services. But they will be regulated and will have to prove their capacity to apply the principle of irrevocability by joining the payment systems run by central banks. Increasing the complexity of the hierarchical system offers an alternative to the direct incorporation of electronic money into existing payment systems. In this case, non-bank issuers of electronic money would have mandatory links with banks which would act as their lenders of last resort, and the retail banks would be accountable for their reputation.

The fevered imaginations of the futurologists have come up with another scenario, according to which issuers of electronic money would offer economic agents payment services that were more efficient than those of banks, especially for long-distance payments. However, they would use safe market assets to settle their reciprocal debts. In order to ensure the certainty of final settlement in the absence of a lender of last resort, all debt would have to be securitised, secondary markets would have to work round the clock and individual payments would have to be settled gross, transaction by transaction. This would be tantamount to the most extreme form of centralisation: a single global clearing house with no lender of last resort, operating on an irrevocable gross settlement basis! The cost of setting up such a system would be astronomical, involving both the destruction of existing systems and the construction of a new one. Leaving aside the fixed cost – and in whose interest would it be to pay for it? – the system would be exposed to liquidity risk, if not credit risk. The absence of a lender of last resort inevitably leaves the payment system vulnerable to log jams in the gross settlement system caused by unexpected variations in liquidity. It would therefore be more expensive for end-users than the systems run by central banks, since in order to work properly it would require more extensive reserves of the chosen means of payment. Building up these extensive reserves would generate opportunity costs that would inevitably be passed on to customers.

*Whatever form the centralisation of payments may take, the control of money will remain in the hands of central banks*

In modern economies with abstract units of account, monetary policy depends neither on fiduciary money nor on compulsory reserves. It is based on setting interest rates. As Keynes pointed out, there is a close and essential link between the institution of the unit of account and the role of the nominal interest rate as the lynchpin of financial evaluation. In an economy where money is the general form of exchange, there are no relative equilibrium prices, hence no real equilibrium interest rates that are independent of monetary policy choices. Money is never neutral. That means that the money market does not converge on some fundamental equilibrium interest rate in the absence of central bank intervention. The central bank defines the benchmark for all financial evaluations, the focal point on which private anticipations are concentrated. The most basic reason



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is that the unit of account defined in terms of central bank liabilities is the superior collective good. It is in this unit of account that financial contracts may be defined with the minimum of risk. In consequence, it promises future payments under the terms of those liabilities.

In any payment system where final settlement is made on the books of a central bank, the central bank determines the money market rate by setting a band between the rate at which it accepts deposits on its books and the rate at which it lends its liabilities in an emergency. As a sovereign monetary institution, it can steer interest rates according to broad considerations for preserving the unit of account. It is because the central bank does not have to seek to maximise its profits that it can exercise power over agents on the money market.

Even in the hypothetical case where settlements were made exclusively in market assets, the central bank could still steer the rate for such securities into a band by accepting overnight deposits and granting credit at its own rates. If the money market rate falls below the deposit rate, settlement creditors will prefer to sell market assets in order to acquire central bank deposits. If the money market rate rises above the central bank lending rate, settlement debtors will prefer to borrow from the central bank. The central bank will finance this lending by automatically increasing its own liabilities. In none of these cases will monetary regulation be compromised by the impossibility of settlement.



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*Chapter 3*

# The Future Technology of Money

*by*

*Zachary Tumin*
Financial Services Technology Consortium
United States

## Introduction

Where are we today with respect to the different technologies for electronic payments and money? What has been tried and failed? What are the critical success factors? What new opportunities will arise, how will technologies enable them, and with what prospects for success?

Over the past ten years there have been hundreds of electronic payment schemes – some representing new forms of money, others re-inventions of old – that have sought commercial acceptance. The list is long and notable for its successes and failures. Digital cash, digital wallets, stored value cards, micropayments have all, to date, failed to establish any significant beachhead or presence in the United States. Although P2P systems are emerging with interesting speed, 93% of all online transactions in the United States are still credit card-based.

Today, what do we have? Credit cards, cash and cheques dominate our money technologies. We do not expect any of them to disappear. In the coming few years some combination of today's electronic payment instruments (card, chip, and PC based), cheques, and cash will continue to dominate, though perhaps in a different mix.

It is important to note that the non-cash technologies – when used online – are still principally linked to slow-moving book-entry clearing and settlement systems. When a consumer makes an online purchase using a credit card, for example, the only information actually moving over the Internet is the credit card information itself.

This fact represents both the most significant challenge and opportunity for change in payment systems in the coming few years. Indeed, the opportunities and drivers for change are best seen to exist in the inefficiencies and other non-



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monetary cost aspects of current payment systems and schemes. We expect the market to drive developments in these areas – including innovations to address how fraud can be managed and who will bear its risk, the cost of hand-offs and processing times in complex payment systems, and changing profiles of customer concern for ease of use and security. Some of these may drive the development of new devices or chips that will create alternative payment methods in electronic commerce. Certainly, we do expect to see more and more computers, networks, and transitions to Internet technologies. Whether the technology now exists to do most everything we want on an Internet payment system can be argued. But the increasing acceptance and use of computers, networks and the Internet, coupled with the cost and risk of doing Internet-based business that is tied to book-entry type clearing and settlement systems, should open the door to a series of interesting technology-enabled solutions that will provide alternatives to today's payment schemes.

These may do nothing more than take advantage of refinements in current technologies or a new willingness of customers to use them to gain favour in the marketplace by rinsing costs out of the payment system, reducing or reapportioning risk, and engaging consumers with their ease of use, security and privacy.

### A track record of innovation and market indifference

The marketplace for new money technologies has been filled with excitement and promise over the past decade. Yet it has also been filled with risk. One recent MIT survey reported that by 1999, 50 e-money startups had in fact failed as businesses.[1]

Perhaps the greatest promise and failure in recent years has been electronic token currencies such as digital cash. Spurred on by the inventions of David Chaum and others, Digicash's "blind signature" encryption promised something much more than credit cards: anonymity of payment in online commerce, low transaction costs (one-third to one-half of a cheque or paper payment by some estimates), and immediate transaction processing. It also might make possible a new economy of micropayments for Internet-based commodities whose price was too low to warrant transactions via credit cards. If instead a system of micropayments could be devised that kept per transaction costs low, new realms of commodities could be priced and purchased with the currency – web clicks, software applets, pictures; music, articles, web services.[2]

Its promise of low transaction action costs, anonymity of payment, and immediate transaction processing notwithstanding, the market for micropayments did not materialise sufficiently to sustain companies that counted on it. Perhaps it was too early, but consumers balked at paying for digital content on a per-click or unit cost basis. Perhaps it was the requirement that consumers use a bank to convert



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their regular money into e-cash, or that banks shied from the commerce inasmuch as pornography was the huge and surprising beneficiary of such e-coinage. At the same time, card associations began to guarantee cardholders that they could shop online with no risk, with the result that consumers became increasingly comfortable with credit card purchases on the Internet. Moreover, the value of the average Internet purchase (which is now about $80) obviated the need for micropayments for most consumer transactions.[3] As a result, there was and continues to be difficulty in generating any critical mass for micropayments. Now, about $10 billion in credit card transactions occur using 128-bit encrypted SSL, at far less cost than the same result from SET – the credit card associations' first digital signature-enabled technology .[4]

Digicash in fact never achieved the critical mass of consumers, banks and merchants it needed to accept and use its electronic currency. As is well known, it filed for bankruptcy in 1998 and sold its patents and domain name. It might be said that consumers, at least in the United States, took Scott McNealy's admonition regarding the absence of any privacy to heart. They got over it in a hurry, and with new guarantees of security in this established channel, never lost their strong preference for credit card purchases.

Other micropayment or digital cash alternatives such as those offered by e-money issuers Cybercash and First Virtual holdings – the other two digital cash enterprises – also fell on fallow ground. Both concerns are also now out of the business, making the digital cash enterprises, in some respects, a perfect failure.

Comparable efforts have run into different and more difficult seas. E-gold – which stores gold in vaults and issues e-gold cyber money against customer's bank drafts – can be used to send money to other users or to pay for online services that accept it. E-gold is completely anonymous, offshore – and in all likelihood seems likely to fall under the steady rain of international efforts to counter money-laundering. This past spring an e-gold reseller in Syracuse, New York was raided by federal agents.

Some seem bound for the ash heap of history. Quirky Beenz, Flooz and I-dollars – all essentially minting their own virtual currencies – have failed to find profitable niches.[5] Barter sites Bartertrust, BigVine and Lassobucks are similarly interesting but limited.[6]

In the United States, stored value technology – chip-based transaction cards pre-loaded with electronic cash – has found nearly no acceptance.[7] With respect to credit cards, in the United States credit cards account for nearly all (93%) online transactions. Yet SET is itself moribund, and now accounts for fewer than 10% of all online transactions. Not surprisingly, banks were unwilling to pay to deploy the new technology inasmuch as it transferred risk from merchant to bank. Rather,



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there is every indication that vendors and card associations will soon shift their focus to promotion and enhancing online transactions using SSL.[8]

### *Peer-to-Peer/Person-to-Person* (P2P) *payments*

There has been tremendous growth in this niche, dominated by PayPal, which rode the EBay auction wave to success deploying an online payments technology people could use with credit card-like ease to pay for their purchases. In P2P, I can transfer funds to you by an email that includes access to the transferor's current account or credit card. You open the email, and funds go to your account.

Currently, PayPal, the leading P2P service (and the spawning progenitor to comparable services from banks such as C2it) claims 8 million customers and $7 million of transactions daily, which must be something of a record for new account generation unmatched by banks.[9] Most PayPal account holders are private individuals rather than corporations, and use PayPal for transactions under $20. Indeed, consumer-to-consumer commerce now comprises nearly 10% of all online commerce that involves consumers, with P2P payments the payment method of choice. PayPal's relatively low transaction fee –2.2% plus 30 cents, compared to Visa which charges up to 2.5%, makes it attractive. But credit card companies are not breaking a sweat responding to PayPal, which really is not a threat: although it is eating into the credit card dominance online, online sales still account for no more than 2% of all credit card transactions.[10] The vast majority continues to be mail order/telephone order and point of sale.[11]

### *Mobile payments*

Mobile payments are receiving a frosty treatment in the United States. Currently, there is no end-to-end security infrastructure for wireless in the United States – no means to authorise or authenticate transactions at high levels of integrity, with non-repudiation, integrity, and confidentiality built in. While some research organisations are indicating that mobile commerce will become an important revenue stream in the US wireless sector, others are telling their financial services audiences that, for now, m-commerce is not yet practical. Nonetheless, it is expected that the mobile phone and handheld computer will merge forcefully very quickly, with biometric security built into the wireless financial device, reading fingerprints and voice, and creating a pathway to ubiquitous use.

For now, then, cash, cheques – Americans write nearly 70 billion cheques each year – and credit cards have survived the onslaught of digital money and electronic payments. For the most part, these payment methods, even when applied over the Internet, are quite conservative, inasmuch as they use the established underlying clearing and settlement systems that sustain traditional point of sale, mail order, and telephone order transactions via book-entry methods. They have



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simply moved the exchange of information to the Internet, while maintaining the established backend systems – with all their inefficiencies, cost and risk – to clear and settle the transactions.

The attributes of established transaction modes hold important lessons for any future money or payments technology. But the very success of established payment technologies such as credit cards and cheques may also hold the ingredients of change as new technologies look to capture efficiencies from antiquated systems left for granted.

### Critical success factors

New payment products are notoriously difficult to introduce. From a business perspective, the barriers to entry, acceptance, and ubiquity are high. As analysts point out, new payment products must be low margin to compete, high volume to build critical mass and be profitable, receive favourable press treatment, be well-branded to gain customer confidence, achieve rapid uptake, and be differentiated from check and credit card so that consumers and merchants find reason to prefer and use them.[12]

As a result, there is a great deal of risk in rolling out new payment products or infrastructures. Few of these business factors have in fact come together for new payment products, and consumers have shown a notorious reluctance to switch too far out of their preferred channels. One would surmise that products (such as smart cards) that have incremental roll-out benefits would ordinarily be more likely to attract investment and succeed in the marketplace.[13]

Technically, the underlying attributes of new payment products also require certain factors to come together to succeed – if only because customers now enjoy these same attributes of financial transactions when they transact business face-to-face, with third parties present:

- I*ntegrity*: transaction data are transmitted and received unchanged and as intended.
- N*on-repudiation*: transactions have the quality of non-deniable proof or receipts.
- A*uthentication*: identities and attributes of parties engaged in commerce are established at some tolerable level of risk.
- A*uthorisation*: individuals are established and recognised as entitled to receive, send or view transactions.
- C*onfidentiality*: transactions can be protected from view except by those who are authorised.

Functionally, money technologies also need to achieve these operating characteristics:



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- P*rivacy*.
- R*eliability*: probability of failure in the transmission – send, receive, acknowledge – is low.
- S*calability*: ability to raise capacity over time: technologies can be brought forward and replicate transactions thousands or millions of times, as necessary.
- E*ase of use*: probability of customer acceptance is high – predictors are comfort, convenience, confidence and cost, as well as technology interface.
- V*endor/device/mode agnostic*: works no matter whether handheld, ear-borne, desktop, card-based.
- P*ersonalise-able*: device use, operations, interfaces can be tailored to individual preferences.
- S*eamlessness*: front-ground user interface operates with no impact from any vagaries of background infrastructure.
- I*nteroperability*: distinct hardware/software infrastructures can communicate and exchange data as if they were identical.
- W*rite once, apply anywhere*: interfaces, algorithms can be mapped to multiple modes, devices, systems with indifference.
- C*ost-effective*: risk/reward ratio is within tolerable business bounds.[14]

Against these requirements, we have an opportunity to understand some of the limits and possibilities of current and future technologies to generate needed critical mass in the marketplace.

### *Reduce the money cost of clearing and settlement*

Established clearing and settlement systems impose significant costs on transactions. Today's payment systems typically comprise four-party interactions between merchant, merchant's bank, consumer and consumer's bank, with constant handoffs and transactions costs at each. As they are principally batch-process systems, delays in clearing and settlement that can be counted in days are to be expected.[15]

Any system that promises more direct clearance and settlement – approaching nearly simultaneous clearing and settlement in the transaction – has the promise of driving unit transaction costs down and will be attractive in the marketplace. An immediately settled transaction should also reduce risk to the payee and be attractive on that score, as well as improve cash management for the payer. In the B2B space, immediate settlement – electronic, cash-like payment – could facilitate commerce in goods as diverse as utilities and securities, where transaction costs and risks of delayed settlement may be high and the benefits of immediate settlement large.[16]



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### *Reduce the money cost of fraud and risk*

To promote consumer confidence and use of online credit cards, card associations have lately guaranteed consumers that they will have no risk. But that risk is now borne entirely by the merchant, and it is quite high and costly.

Data now suggest, for example, that fraud in online credit card transactions exceeds 100 basis points – a full 1% (some estimates place online credit card fraud at 3% – 300 basis points.) At 1%, the online fraud rate is still 10 times greater than POS or MOTO rates. Indeed, online credit card fraud now comprises nearly half of all online chargebacks. Peter Thiel, a PayPal founder, refers to the "tsunami of fraud" and has expressed fears that it will overwhelm the entire company.[17] Worse still for the merchant, because of the possibility of fraud, some credit card transactions may not clear – meaning the seller will go unpaid – for up to 90 days.[18]

### *Reduce the exposure, risk and cost of paper instruments*

The cost of paper cheque processing argues for electronic versions. US Federal Reserve Bank studies show that the fully loaded unit processing cost of a paper cheque is $1. Any payment system that can reduce costs by truncating or using digitally signed authorisations instead of paper cheque transactions, even if they remain associated with established clearance and settlement systems such as ACH, stands a reasonable chance of finding a market.

### *Add convenience, comfort, security*

Consumers are slow to move to technologies they consider risky, frivolous, or lacking in convenience. But where consumers have balked at online purchase because of privacy fears, or where consumers may have online access, disposable income, but no available credit, or have credit but are concerned about the security of their accounts, the potential exists for new payment products to take hold that address all three concerns. This applies, also, to the unbanked – the roughly 25% of US citizens who do not have bank accounts at all.

### *Provide consumer protections, even at the extremes of anonymity*

The paradox of anonymity is this: true anonymity of cash may be self-extinguishing. It not only risks the wrath of money laundering-conscious governments,[19] it also makes possible fraud and theft that have no recourse in the system, and so should, by its nature some argue, fail to attract consumers whose digital cash would be valueless if the issuer went broke without any recourse. As several analysts have put it, the fact is that any money system, to enjoy consumer confidence and to compete for market acceptance, must be able to deal with the "bank rob-



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bery problem" – provide the assurance that at the end of the day fraud and theft risk being discovered and punished.[20]

To gain ubiquity, consumer protections for electronic payment products must be comparable to paper transactions. As in paper transactions, "… and then you go to jail" must be the ultimate backstop to any electronic payment product. This suggests that to prevail, anonymous electronic payment systems must therefore provide consumer protections that rely on some degree of traceable identities in transactions, or risk loss of marketability.[21]

What are some developments that could gain acceptance with merchants and consumers – the critical legs of the strategic triangle of electronic payments?

### *Digital bearer settlement*

What if trades – financial exchanges – cleared and settled instantly? As conceptualised by Robert Hettinga (*www.ibuc.com*), digital bearer trades of "cryptographically secure value-objects" can make possible instantaneous trades of everything from micropayments to macrobonds. Such transactions can, in principle, execute, clear and settle instantly, securely, and often anonymously.

The trading process relies on traditional securities underwriter/trustee business models. A consumer purchases a digital bearer certificate, or digital cash from an underwriter, via request and authorisation over the Internet through an underwriter, the underwriter's guaranteeing bank, and the consumer's bank. With good funds, the consumer's bank messages the underwriter to disburse the digital certificate or digital cash as per the consumer's request.

A merchant accepts the digital bearer certificates or cash in exchange or payment for other things of value, and in turn can use the certificate for his/her own purchases or redeem it at par from the underwriter.

Underwriters issue the certificates on the Internet, and have fiduciary responsibility for exchanging them into cash (or, as this might evolve, into other digital bearer instruments), and for building the market for the purchase and sale of certificates.

Trustees – in this instance, banks – hold the actual money that backs the underwriters' certificates, and are responsible for exchanging digital bearer certificates into book-entry assets. Thus the digital bearer certificates, issued by underwriters on the Internet, are collateralised by bank book entries.

The allure of instantaneous settlement is reduced cost and risk. If it can reduce or eliminate the multiple intermediaries involved in the execution of a credit card transaction – contrasted with the single intermediary of a digital bearer trade – the guess is that transaction costs will be orders of magnitude cheaper, as it must be if the true cost of a digital trade is, effectively, the cost of microprocessing



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and bandwidth. Such trades, whether in micropayments or macrobonds, inasmuch as they either clear instantly or not at all, are essentially non-repudiable, are quite low-cost, reduce risk to all parties considerably, and enhance cash management capability.[22]

### *Payment cards*

It is interesting to note that prepaid scratch cards are attractive to merchants and consumers for a variety of purposes, and are being redesigned and targeted for online use by those who have disposable cash but no credit (young people), or who have credit but who limit online purchases because of their fears relative to privacy or security.[23]

While there appears to be little consensus about the size of the market, the opportunity is driving an acceleration in the design and roll-out of prepaid cards as an online payment product. Cards that are already in one's physical possession can be activated via website (driving more web traffic to merchant's sites), or by magnetic strip and swipe at the point of sale.

As an alternative payment technology, the cards are quite attractive in terms of float, anonymity, low transaction costs, and building brand and customer loyalty. The trick is not in the technology *per se*, but inasmuch as barriers to entry are low, defending turf from competitors seeking to capitalise on successful roll-outs by early adopters is critical to success. Still, the challenge to ubiquity lies in aligning retailers, merchants and consumers. Large firms with established merchant relationships and processing infrastructures such as American Express have an advantage in this respect – in signing up merchants (*e.g.*, 7-Eleven Stores) to create and distribute a store-branded Internet shopping card that will be accepted by any merchant who accepts American Express. Merchant-branded gift cards (*e.g.*, the Gap) have also gained market traction for POS sales, and are now being migrated to online use, providing consumers with brand confidence and issuers with float.

### *Retailer payment systems*

Large retailers such as Wal-Mart and food store chains are in the forefront of pioneering new in-store payment products and systems. Insofar as they are extremely consumer-focused and in highly competitive markets, these retailers are good predictors of leading edge change. The reasons are clear: price pressure and competition keeps retailers' margins extremely low – 1% in some instances. At the same time, the cost of credit cards and debit card fees are quite high, sometimes exceeding the retailer's own profit. Indeed, some retailers report that bank card fees are the second highest expense after the cost of labour.[24]



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Retailers are taking advantage of new technologies to explore lower-cost alternative payment paths. Smart cards are attractive but require settling on national and international standards before acceptance and use can be at all ubiquitous.

Other technologies involve the use of radio frequencies and microtags embedded in each and every product on store shelves so that consumers might never have to enter a checkout line to make their purchases. Wal-Mart for example is exploring the use of tiny radio identifiers on everything it sells. Not only can they do all inventory logistics over bar code by wireless, but products will "talk" to everything on your card and come up with your bill.

Food chains are also embracing electronic cheque conversion to truncate the cheque at point of sale, benefiting both merchant and consumer with reduced handling, improved speed and lower costs. Store-branded ACH debit uses the ACH system for electronic debit from consumer's checking accounts at point of sale, initiated when the consumer swipes a store loyalty card, a bar-coded key tag, or a radio frequency wand such as the Mobil Speed Pass.

The opportunities in retailing may also drive the development of non-reconfigurable handheld devices – not the Palm itself, which is reconfigurable, but something that uses Palm technology to deliver "round trip" reconciliation data back into the device. This would amount to an electronic audit trail to the parties involved, a bi-directional handshake that relies on a capability, using a dedicated tiny platform on the consumer electronics side, to detect everything going on in the background (and to signal failure when it occurs). Infrared transceivers have become a commodity item, but await the development of a tiny communication module that has infrared and Blue Tooth capability and other short-haul wireless capabilities on a single chip, which will drive the cost of these devices downward and promote ubiquity.

### *Electronic cheques*

The original electronic cheque, designed by the Financial Services Technology Consortium, has spawned pilots and commercial applications. As a product, the eCheck was mapped to work with establishment payment systems. But it can also accommodate digital signatures as authorisations for ACH debits and credits. As such, it has the promise of ubiquity – anyone can use it to pay anyone else via electronic cheque – whether C2C, C2B, or B2B.

Applications so far include US Treasury department pilots, and B2B payment services offered by Xign and Clareon. Clareon Corporation and FleetBoston Financial, for example, recently announced a strategic alliance in which Fleet will offer its 500 000 customers PayMode, Clareon's business-to-business payment solution based on the FSTC eCheck technology.[25]



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**Summary**

Recent efforts to introduce new money technologies – principally, digital currencies – have encountered resistance in the marketplace and have failed, in their initial run, to gather a critical mass of acceptance. Technologies in use today such as credit cards and cheques may use the Internet to send information securely, but they still rely on backend clearing and settlement systems that are derived from the requirements of book-entry protocols. It is expected that the move to electronic forms of payment will continue as computers, networks and the Internet become increasingly ubiquitous. With that, opportunities exist to create new payment products that solve problems associated with the established clearing and settlement systems. Immediate settlement of micro and macro trades, prepaid cards, and innovations in retail payment systems, for example, all hold promise against the cost and risk of e-commerce by credit card or cheque. In the near term, cash, credit card and cheque will continue to dominate. Yet emerging opportunities presage the possibility of new payment products that target inefficiency, cost, and risk in current payment products and systems.



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*Chapter 4*

# Intangible Economy and Electronic Money

*by*

*Charles Goldfinger*
Managing Director, Global Electronic Finance
Chairman, Financial Internet Working Group (FIWG)
Belgium

## Introduction*

Money is a fulcrum of paradoxes. It is, in the famous characterisation by Simmel, heartless – and yet, according to Zelizer, deeply emotional, ubiquitous but elusive, uniform and endlessly varied. The paradox to be explored here is that of the relationship between money and economic systems. This relationship is simultaneously tight and loose. It is tight to the extent that money appears as a fundamental dimension of the economy, a yardstick by which its growth and wealth accumulation are measured. The difference in monetary systems can be used to discriminate among various economic systems. Thus, fiduciary money was the dominant monetary system in the feudal economy, and the emergence of the capitalist economy was accompanied and facilitated by the development of scriptural money. Monetisation of the economy – the general use of money to effect transactions and establish prices – was seen as a major vector of transition from the feudal to capitalist economy. But the relationship goes deeper. Money has been the lever of power, whether economic or political, in what Carlyle [and more recently Fergusson (2001)] called the "cash nexus". It is also a vector of statement and measurement of social value and preferences.

And yet, relationships between money and economic systems can also be characterised as – if not loose, at least relatively autonomous. Both fiduciary and scriptural money were created long before the emergence of feudal and capitalist systems. The path of their evolution has been long rather than short, circuitous rather than linear, agitated rather than smooth – and rarely guided by a grand

* Opinions expressed in this paper do not constitute an official position of the European Commission or FIWG members.



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overriding design. Most often, changes in monetary systems result from limited actions aiming to solve particular problems. It is an accumulation of incremental changes that periodically leads to massive systemic shifts. Money itself is a multifarious phenomenon. The two broad categories cover a wide variety of specific currencies, which are backed by distinct institutional arrangements for issuing and settling them. Over time, these arrangements have become ever more complex, a fact stemming partially from the coexistence of various currencies and forms of money. Thus fiduciary money managed by central banks coexists and interacts with scriptural monies managed by commercial banks. National, regional and global monetary systems are all composite; their internal structure and boundaries are constantly changing.

Clearly, the evolution of monetary systems has been strongly shaped by economic and political requirements: trade facilitation for the private sector, debt funding for the public authorities. But the causality has been bi-directional, with monetary developments strongly impacting economic systems and their performance. This impact has not always been symbiotic. Money has often proved a recalcitrant instrument, its logic defying goals imposed by its putative masters and triggering, in the apt sentence of Charles Kindleberger (1978), "manias, panics and crashes". Management of money has never been a deterministic endeavour that could be put on automatic pilot. Rather, it is a discretionary undertaking requiring constant attention and a deft touch.

The relationship between monetary and economic systems is a dynamic process. There is a broad public consensus that the underlying trend is one of a growing importance and visibility of money. As money becomes more ubiquitous throughout the economy, it morphs into a self-sustained financial system, simultaneously the support and the object of economic exchanges. Its complexity increases, its transparency decreases and its behaviour becomes ever more difficult to comprehend and to predict. The omnipresence of markets has changed the nature of value determination. Value is no longer established by reference to objective and immutable rules and yardsticks but by a trading process, which makes it unstable and path-dependent.

As a result, the economic system is subject to chronic volatility and frequent shocks. The invisible hand becomes conspicuous, but more importantly its benevolence can no longer be assumed. For many observers, the financial system got out of hand and the hypertrophied "artificial" financial economy is literally a vampire that drains the "real" economy. And money, electronic, global and uncontrollable, is the weapon of destruction. For instance, Joel Kurtzman – who, having worked as Editor of *Fortune* and *Harvard Business Review* and having collaborated closely with Michael Milken, can hardly be suspected of an anti-capitalist bias – deplores the emergence of "megabyte money", which he believes will destabilise the world economy and provoke financial chaos (1993).



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Criticism of the excessive importance of money is a long-standing tradition in social sciences. There is, however, a crucial difference between past and current criticism. Thinkers such as Marx or Simmel (1900) accused money of being a tool that put society at the service of the economy. They saw money as the all-powerful lever of economic uniformisation and integration. New critics agree on the pervasive nature of money but paint the financial system as a mechanism that destructures and destroys the economy. They question its utility and rationality.

The financial economy also has its vocal and enthusiastic defenders, who applaud its ability to transfer resources and allocate capital rapidly and massively. They see it as a vehicle of creative destruction, a ruthless but efficient mechanism to promote innovation and eliminate obstacles to growth and development.

In any case, the view that the financial economy is running amok is an oversimplification. Its hypergrowth has not taken place in a vacuum but is favoured by the peculiarities of the evolution of the real economy, which will be discussed below. Furthermore, this evolution has impacted the nature of financial markets.

The history of the relationship between money and the economy is instructive as a general framework to provide broad analogies. Revolutionary change is a useful example of such an analogy. We live in a period of radical transformation of the economy, comparable to that of the earth-shattering transition from feudal to capitalist economy. To the extent that this transition was accompanied and stimulated by the emergence of an institutionalised banking sector and the concomitant development of scriptural money, it can be asked whether the current economic transformation will stimulate the emergence of the new financial intermediaries and a new form of money. This indeed seems the case: the emerging new economy, which we call the "intangible economy", fuels the spread of the market as the primary intermediation mechanism and the deployment of electronic money, both of which in return accelerate the transition.

History can also enhance our understanding by highlighting critical differences between the past and the present. One such difference is in the technology of money. Both fiduciary and scriptural money require specific technologies and infrastructure to produce, circulate and settle currency. However, these technologies were confined to the monetary realm and thus tightly controlled by the money issuers, who did their best to keep them away from public scrutiny. In the case of electronic money, technology is pervasive and transcends the monetary domain. The technology of money becomes more visible and hence more widely used. At the same time that technology becomes embedded in money, it becomes more difficult to control by those who traditionally regulate the monetary and financial systems.

This chapter will elaborate on the postulate of a close and mutually reinforcing relationship between the intangible economy, the triumph of markets and the



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flow of electronic money. It will first review the key characteristics of the intangible economy before looking at the dynamics of markets. It will then examine various definitions of electronic money, before providing an alternative definition that stresses its systemic character. Afterwards, it will outline the core alternatives for future developments of money and highlight their interactions. Future developments will then be reviewed from the viewpoint of the risks and opportunities they are likely to generate. The chapter concludes with a look at the future trajectory of electronic money and its critical policy challenges, the need for new technology-based governance frameworks.

## 1. Background: the new economic landscape

### *Measurement gaps and Griliches' paradox*

That the economy is undergoing far-reaching changes would seem a largely incontrovertible statement, practically conventional wisdom. Knowledge Economy, Digital Economy, Information Society, Third Wave... names for the new economy proliferate to the point of becoming omnipresent buzz words. Yet, can we say that we really understand the current economic evolution? Do we agree on its rationale and development path? The answer to those questions is clearly No. Economists and statisticians, whose role it is to explain the workings of the economy and to provide performance and value metrics, are perplexed and bewildered. Despite increased data sophistication and availability, substantive deficiencies concerning such key economic variables as productivity, foreign trade, investment and financial accounting measures remain. According to Zvi Griliches, author of ground-breaking work on measurement, the share of economy measured with a degree of accuracy by official statistics fell from 50% to 30% between 1947 and 1990. Weaknesses are most pronounced in the areas that are most dynamic and trendsetting, such as services and information technology. Call it Griliches' paradox: in this age of "information revolution" and "knowledge economy", measurement systems shed little light on activities where information and knowledge are generated.

### *Three key trends*

This paradox may seem amazing, to the extent that the key trends appear well-established and documented. We can identify three such trends:

- *The changing profile of employment and the output structure*. The shares of industry and agriculture in both total output and employment are falling steadily. Services represent the lion's share of both employment and output, and constitute the principal source of employment growth.



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- *Globalisation*. Foreign trade has been growing more rapidly than the world's output for decades. International organisations such as the World Bank and IMF base their activities on the assumption that world trade will continue to grow at roughly twice the rate of world output. The international trade of final goods is accompanied by a massive cross-border deployment of production facilities, distribution networks, technologies and people. Global deployment of supply resources, in particular foreign direct investment (FDI), has been growing at an even higher rate.

- *The ubiquity of information technology*. IT – computers, telecommunications and associated products and services – is recognised as a structural vector that influences all economic activities. The speed and magnitude of technical progress are staggering and combine tremendous increases in quality with a continuing decline in prices. A Pentium-based PC today offers several thousand times as much processing power as the mainframe of the 1970s, at a price that is less than 1% of 1% of the latter. Increase in the capacity of telecommunications and concomitant price reductions are even more impressive. The development of IT has engendered a huge economic domain, whose global size is estimated at between $600 billion and $1 100 billion. In the United States, since 1991, capital investment in information technology exceeds investment in traditional machinery and equipment.

While there is broad agreement on the existence of these three trends, there is no real consensus on their magnitude, their underlying drivers or, more importantly, on their economic impact. Each trend is a subject of intense yet inconclusive controversies.

Although services represent the largest share of GDP and employment in all OECD Member countries and their share continues to grow, their measurement is still based on what can be called a "residual" approach: services include all activities that cannot be classified as either manufacturing or agriculture. This results in a tremendous heterogeneity. Services range from low-paying, low-productivity, labour-intensive and very local activities such as restaurants to highly paid, high-productivity, capital-intensive and global activities such as financial trading. Some services are immobile and non-tradable, others are extremely mobile and highly tradable. Certain services are subject to diseconomies of scale (household services), while others are the prime beneficiaries of economies of scale (telecommunications). This heterogeneity makes it difficult to agree on a meaningful aggregate definition of services.

In turn, confusion over the definition of services is a key element of the controversies about globalisation and information technology.



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The conventional view of services is that they are less tradable than physical goods. This view is apparently corroborated by international trade statistics, based on IMF balance-of-payments data, showing that services represent some 20% of world trade, a share that remains relatively stable. There is, however, compelling evidence that trade in services grows much more rapidly than trade in goods. More importantly, cross-border services flows – telecommunications, media and finance – constitute the very lifeblood of globalisation. International voice traffic has been growing at some 16% a year. Based on firm-level information, the cross-border data traffic is growing much more rapidly than voice. According to a study by Varian and Lyman in 2000, the global production of magnetic support data grows by 70% a year.

Direct satellite and mixed satellite-cable networks flood our TVs twenty-four hours a day, seven days a week, with streams of images from around the world. Each year, some 40 million hours of original TV programming are produced, corresponding to over 100 000 hours per day, of which 10% to 20% is exported.

Global financial transactions dominate physical trade flows: the value of foreign currency trading alone averaged $1.1 trillion a day in 2000, more than 50 times greater than the daily physical trade volume of approximately $20 billion.

Yet despite their size, visibility and intensity, global telecommunications, media and financial flows remain at the periphery of conventional economic measurement frameworks. This leads to misleading statements such as the claim that the level of globalisation today is not higher than it was in the 19th century. That assertion is based on physical trade data but ignores the other flows, which weave an ever more dense global mesh of economic activities and entities.

The economic impact of information technology remains highly contentious. The controversy revolves around what Robert Solow called in 1987 a "computer paradox": computers are visible everywhere except in the final output. Actually, the period of massive IT investment in the 1980s coincided with a productivity slowdown, particularly apparent in services.

The computer paradox prompted a large number of studies, many of which were based on detailed sectoral and firm-level data. Yet, opinions remain as polarised at ever. One group of analysts affirms that the computer paradox is simply a by-product of inadequate data and that detailed studies show a significant technology payoff, with return on investment often in excess of 50%. They believe that IT investment was a major factor in the excellent performance of the US economy in the late 1990s. Thus, Dale Jorgenson believes that information technology has permanently raised the long-term growth rate of that economy. On the other hand, sceptics persevere. For instance, Robert Gordon forcefully argues that the impact of IT has been limited and temporary.



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Despite their intensity, the apparent wealth of data and the critical importance of their subject matter, controversies about the economic impact of services, globalisation and information technology remain inconclusive. Beyond the arguments about data accuracy and measurement approaches, the core issue is the relevance of underlying conceptual models and assumptions. The crucial assumptions of the existing macroeconomic framework – focus on the production and trade of physical goods, stable sectoral groupings and classifications, neglect of non-material cross-border flows – are grounded in a specific vision of the economy, fundamentally unchanged since Adam Smith, that postulates the production of physical goods as the main source of value. These assumptions and the underlying vision can no longer be considered universally valid. Alternative approaches such as the service economy or the information economy are widely known, but there has been little progress in making them conceptually more robust or operationally more relevant. Both approaches remain largely on the periphery of mainstream economics and statistics.

### *Defining trend: shift to the intangible*

The need for a new conceptual framework for the modern economy remains paramount. Such a framework should build upon the contributions of service and information economy approaches, but should be broader to encompass other significant trends such as the financial markets explosion.

This chapter proposes an alternative framework, based on an all-encompassing trend: the shift from tangible to intangible. The economic landscape of the present and future is no longer shaped by physical flows of material goods and products but by ethereal streams of data, images and symbols. On the demand side, we consume more and more content-based artefacts of information and entertainment. On the supply side, intangible assets such as brand, human capital, intellectual property and knowledge have become major determinants of companies' performance and value. Welcome to the intangible economy.

The well-known three stages theory of economic evolution can thus be reformulated. At the core of the agricultural economy, there was a relationship between man, nature and natural products. The core relationship of the industrial economy was between man, machine and machine-created artificial objects. The intangible economy is structured around relationships between man and ideas and symbols. The source of economic value and wealth is no longer the production of material goods but the creation and manipulation of intangible content.

The shift to the intangible is general and long-lasting. It affects all sectors and all aspects of economic life. According to Peter Drucker, the relative share of raw materials in manufacturing output has been decreasing at an annual rate of about 1% a year since the end of the Second World War. Conversely, since the 1880s, the



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Table 1. **Evolving price-weight relationships**

| Product | Price in USD | Weight in lbs | Unit price USD per lbs |
|---|---|---|---|
| Pentium III | 85l | 0.001984 | 42 893 |
| Viagra | 8 | 0.00068 | 11 766 |
| Gold | 301 | 0.06254 | 827 |
| Mercedes Benz E-class | 78 445 | 4 134 | 19 |
| Hot rolled steel | 370 | 2 000 | 0.20 |

*Source:* G. Colvin, "We're Worth Our Weight in Pentium Chips", *Fortune,* March 20, 2000.

relative contribution of information and knowledge to manufacturing output has been growing at the same rate. The upshot of this trend is the remarkable increase in economic value added per unit of weight, as shown in Table 1.

The shift to the intangible is often seen as a purely technology-driven phenomenon, hence the frequent characterisation of the new economy as the Internet or digital economy. This is a misleading oversimplification. Although IT is a cardinal vector of the intangible economy, it is not the only one. The emergence of the intangible economy owes at least as much to basic trends in consumer behaviour and in the business environment. The shift towards higher relative demand for leisure, information and knowledge is a long-lasting trend in consumer behaviour: for instance, the share of services in household consumption in France has increased from 42% in 1970 to 51% in 1990. Business innovations such as brand-driven competition and cost-based accounting led firms to pay greater attention to the management of intangible assets.

The point here is not to argue a specific causality relationship – an arduous and ultimately futile task – but rather to avoid the fallacy of technological determinism. While the trend toward digitalisation and network proliferation is unmistakable, the economic and business impact of that trend remains unclear and the range of potential outcomes is wide open. The intangible economy is non-deterministic and transcends Negroponte's opposition between bits and atoms the same way that quantum physics transcends the opposition between particles and waves.

Difficult to ignore, the intangible economy remains nevertheless hard to define and does not easily fit into standard economic categories. To under-



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stand the intangible economy, it is best to approach it from three different but complementary perspectives:

- Demand perspective: *intangible artefacts* – final output for household consumption.
- Supply perspective: *intangible assets*, used by firms to establish and maintain their competitive position and survival. These include brands, intellectual property, human capital, research and development information and know-how.
- Economic system perspective: *logic of dematerialisation*: – an interrelated set of trends and forces that affects all economic activities, changing the nature of economic transactions and market structures.

### *Intangible artefacts*

Intangible artefacts include various forms of information and communication, high and low culture, audiovisual media, entertainment and leisure, and of course financial services, the ultimate intangible.

All artefacts are joint products, combining intangible content with physical support: a song with a magnetic disc for an audio CD; history and a building site for a classical monument. Traditionally, content and support were tightly linked, making them unique or reproducible on a small scale only. The development of storage and content replication technologies loosened the links. Like a dragon in a tale, identical content appears in various shapes and disguises: a song can be sung live, pressed on a CD or shown as a video clip. The dissociation of content and support led to the proliferation of intangible artefacts in two ways. First, it lifted capacity constraints. Previously, a sports game could be watched only by those who could physically get to the stadium. Today, television can multiply the number of spectators ad infinitum. One could argue that stadium attendance and watching a sports event on TV are two distinct artefacts, with different consumption, distribution and pricing characteristics. That is precisely the second dimension of proliferation: the same content provides the source for a family of artefacts. Thus a book can be offered as a hardcover, as a paperback, as a CD-ROM or online. The ability to generate these families is what makes companies such as Disney successful: each film concept generates not only movies but also videos, park attractions, books, toys and other sources of revenue, thus leveraging the content by a factor of two to four.

The consumption of intangible artefacts displays specific and interrelated properties:

- It is joint (always consumed with other products, tangibles or intangibles).



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- It is non-destructive: the same artefact can be consumed repetitively either by the same consumer or by a different one.
- It is non-subtractive (or non-rival): one's consumption does not reduce anyone else's consumption. In other terms, the opportunity cost of sharing is zero.

Intangibles such as information are often presented as a "public good", comparable to fresh air or to national defence, whose consumption cannot be limited to a single consumer and therefore is inherently collective. A preferable term is "shared good", to the extent that sharing is a notable property of intangible artefacts. It can be sequential or simultaneous. However, simultaneity in time does not mean unity in space: information technology makes it possible to consume the same artefact in several locations. Intangible artefacts create their own space-time, which lifts the constraints of geography.

Sharing affects critical aspects of intangible artefact transactions, such as the allocation of property rights. While a seller of a physical good loses his property rights to it, an intangible artefact seller continues to hold them.

### *Intangible assets*

The shift to the ethereal is not limited to demand. On the supply side, it is stimulated by the growing importance of intangible assets.

At first glance, intangible assets appear better defined than intangible artefacts. Statisticians and accountants have long recognised that capital accumulation and asset deployment mean more than the acquisition of physical plant and equipment.

The share of intangible investment is expanding relative to physical investment. According to the French national institute of economic and statistical information (INSEE), intangible investment represented 30% of total investment in 1992 in France and was growing at a quicker rate than the traditional fixed assets. Partial evidence suggests that in other countries, such as the United Kingdom, the percentage is even higher.

The notion that the intangible assets are more important to business performance and the survival of a firm than its physical assets is now conventional wisdom. For consumer goods companies – Coca-Cola, Nestle, Danone – brand management is the top priority guiding all strategies. Brand is also essential for IT companies such as Intel and Compaq, which are spending substantial sums to build it. Attempts are being made to quantify this "brand equity". An American business monthly, *Financial World*, each year publishes a brands valuation survey. For leading brands such as Coca-Cola, Marlboro or Intel, brand valuation largely exceeds their total balance sheet.



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Acknowledgement of the importance of intangible assets is not limited to brands. Intellectual property – patents, trademarks, technological know-how – is considered a critical competitive weapon, particularly in software, electronics and biotechnology. Its control is often a matter of life and death for companies. It is through intellectual property litigation that AMD managed to preserve its foothold in microprocessors, despite Intel's domination. In merger and acquisition transactions, apparently extravagant amounts paid for media assets such as Hollywood studios or newspapers is justified by the value attributed to brands, contents and publishing rights.

The problem of intangible assets is not the dearth of measurement. Rather, it is the consistency of approaches. While managers live and die by intangible assets, many accountants are still reluctant to include them in official accounts. Microsoft considers software development, its core competence, as an expense and writes it off in the year incurred. English football clubs do not include the value of their players in their accounts. Reuters, the leading electronic information provider, acknowledges that its balance sheet does not include the global databases of financial information or its software and other intellectual property.

Just as intangible artefacts differ markedly from material goods, intangible assets are not like tangible assets. First, they are heterogeneous: one hour of software programming does not equal another hour of programming. The revenue-generating capacity of an intangible asset is much more uncertain than that of a physical one. When a plant adds a machine, it can easily quantify the potential output increase. On the other hand, when a computer department hires a programmer, it cannot predict with certainty either the quantity or, more importantly, the quality of his/her contribution. Also, intangible assets are difficult to separate from current expenditures. Whether an advertising outlay can be classified as current expenditure or investment depends on its purpose. Similarly, not all training or software expenditures can be treated as investment.

Because intangible assets are, by definition, non-physical, they do not follow the classical progressive depreciation rules. Some assets depreciate very rapidly; others, like a good wine, appreciate with age; still others follow non-linear and often unpredictable life cycles.

Thus traditional asset valuation methods cannot be applied. The historical cost of acquiring or creating an intangible asset is largely irrelevant. Asset heterogeneity makes it difficult to calculate the opportunity costs. A market or transaction-based approach also has serious pitfalls. For most intangible assets, markets are very narrow and extremely imperfect, and transaction-based values are subject to wide fluctuations. Thus, the range of methods used to value intangible assets is getting larger, making the consensus on measurement of their value ever more elusive.



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*Dematerialisation logic*

The impact of the intangible economy is not limited to intangible artefacts and assets. The logic of dematerialisation is omnipresent and affects all sectors and activities, new and old. It profoundly transforms the ways in which firms and markets are organised and their economic transactions carried out.

Dematerialisation logic is unsettling: it runs squarely against some of the key tenets of the conventional logic of economics. Conventional logic is concerned with scarcity, dematerialisation logic with abundance. The former stresses equilibrium; the latter, disequilibrium. Obsolescence, redundancy and volatility, perceived in the past as pernicious epiphenomena, now constitute essential and necessary vectors that shape consumption patterns and supply-side resource deployment.

- Abundance: the wager economy and the bookstore effect

The intangible economy is structurally abundant. Abundance, of course, is not a new phenomenon. The productive potential of the industrial economy is enormous. However, physical goods are subject to physical decay and their consumption marks the beginning of the end of their economic life. Intangible artefacts, on the other hand, are not eliminated through consumption. The intangible economy superimposes on the abundance of production the abundance of accumulation. Financial systems generate too many transactions; Hollywood, too much entertainment; the Internet, too much information. The ongoing deregulation of markets for intangibles, along with technological evolution, continues to extend the magnitude of the gap between supply and demand of intangible artefacts. For instance, the number of television channels in the European Union increased from 40 in 1980 to 150 in 1994 and over 200 in 2000. Moreover, the gap is self-perpetuating: to navigate through the information overload we need catalogues, indexes, documentation, whose very proliferation calls for more cross-references, hypertext links and so on. Information about information is a growing business.

A crucial implication of supply abundance is the ubiquity of failure. Flops are the rule, successes an exception. In Hollywood, one movie is made out of a hundred scenarios under development, and only one in six movies released makes money. The flop rule is not limited to intangibles. In the pharmaceutical industry, one in 4 000 synthesised compounds ever makes it to market and only 30% of those recover their development costs. In consumer goods, over 80% of new products launched in the United States fail within two years. Furthermore, the cost of a new product launch is rising rapidly: $50 million for a movie, $250 million for a new drug, several billion dollars for a new car.

And yet, despite this dismal outlook, the pace of introduction of new products is not slackening. This has become a wager economy: higher and higher



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stakes against lower and lower odds. As long as a player remains at the table, she has a non-zero probability to recoup her losses. Only if she quits does her loss become final.

Another reason for continuous new product generation is what can be called the "bookstore" effect. The best bookstore is one that offers the widest choice and thus stimulates browsing, which leads to greater consumption. It is not enough, however, to have a wide assortment; it is also important to keep it current, hence the need for continuing new product introductions. The bookstore effect explains, for example, why Reuters maintains 20 000 pages of data in its online financial information services, while the overwhelming majority of its clients use only four or five. The value of its databases is derived not only from particular pieces of information but also from the total inventory of data.

Structural abundance also has a major impact on the notion of capacity and the use of productive assets. While in the industrial economy excess capacity is synonymous with costly inefficiency, in the intangible economy it is widespread, functional and inexpensive. It is functional, as it enables users and producers to cope with demand volatility. Excess capacity is inexpensive because the key flows are those of information rather of physical goods. The economics of adding capacity for information flows are very different from that for physical goods handling. The latter is clearly subject to diminishing returns and thus its marginal costs are high. In the information technology realm there might be diminishing returns at some point, but they are unlikely to be reached in the foreseeable future. The long-term trend is for an exponential progression mode and for a dramatic fall in unit processing and transmission costs.

- The changing nature of the firm

The intangible economy undermines traditional frontiers and distinctions. Sectoral boundaries are crumbling: previously separate activities of telecommunications, informatics, electronics and audiovisual media are now overlapping. Time-honoured distinctions between work and leisure, home and workplace, intermediate good and final output, consumer and producer, product and service, become blurred. Not only are the boundaries porous and overlaying, they are unstable. This is not a one-off effect but a fundamental trend. The intangible economy does not follow the rules of binary logic, of exclusivity, but those of fuzzy logic, of overlapping.

The interpenetration profoundly changes the nature of the firm and its relationships with the environment. Internal links, between firms and their employees, become weaker; external links, between firms and suppliers, become stronger. While employees are told to work at home, suppliers are invited to work on the premises. Functions traditionally considered as central to the very existence of



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the firm are now subcontracted or outsourced. Nike, a leader in sports shoes, does not manufacture any shoes. Nor does Dell, a leading supplier of computers, own any production plants. In computer services, outsourcing is one of the highest growth sectors.

Dematerialisation logic ends the information asymmetry between producers and consumers and thus alters the market power balance. Today in many businesses, the customer knows as much about products and markets as the supplier. This entails not only substantial end-user price declines due to the loss of the supplier's market power, but also an unbundling of the production and assembly processes. The unbundling is particularly apparent in the information technology domain. Software applications and corporate networks are often designed and built by customers, using inputs from different suppliers. Of course, they can also be created by suppliers with inputs from customers. "Make-or-buy" decisions are becoming more convoluted. The nature of competition changes: for computer services suppliers, such as IBM or EDS, their biggest competitors are not the other suppliers but their clients.

These developments suggest that the traditional rationale for the existence of the firm, articulated by Ronald Coase (1937) as the minimisation of transaction costs, is no longer universally valid. An alternative and broader rationale for the firm needs to be developed, one that would stress the brand umbrella, the intellectual property repository, and control of distribution channels as key cohesion factors and functions of the firm.

### *The changing nature of value and value discovery mechanisms*

The intangible economy changes not only the fundamental nature of economic value but also the value discovery and capture process. Conventional pricing mechanisms are largely inadequate to capture the economic value of intangible artefacts. The two standard approaches are difficult to apply. Production costs/marginal costs cannot be used as a guide for pricing when marginal costs are falling or nil. Moreover, there is no proportionality between inputs and outputs. Mass consumption does not imply mass production. Economies of scale for intangible artefacts are often determined by consumption rather than by production.

The willingness-to-pay approach also has serious pitfalls, given the ease of replication and sharing and associated externalities. For intangible artefacts, purchase does not equal consumption (how many people read all the books they buy?) and consumption does not necessarily imply purchase: in newspapers and in broadcast television, the number of "free riders" far exceeds that of paying consumers. Another problem, which particularly affects informational artefacts, is what Stiglitz (1985) called the "infinite regress": it is impossible to determine the value of a given piece of information without having this information.



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Traditionally, the pricing of intangibles was a function of convenience and was based on the support rather than on the content. Thus, the price of a book was determined by its thickness and the quality of the printing, and largely ignored the content variation: the price of an excellent book was the same as the price of a bad one.

The greater dissociation creates opportunities for unbundling: the content can now be priced separately from the support. Price discrimination becomes more common. Commercial online services, for instance, differentiate between standard and premium services, which are sold at higher prices. Yet bundling has its advantages, in particular the simplicity of administration. It facilitates pricing of composite artefacts (multimedia software or amusement parks). Bundling also allows cross-subsidies between artefacts that are profitable and those less profitable but nevertheless essential for a full service offering. In financial services for instance, equity research is bundled into brokerage commissions. Thus, the range of pricing schemes for intangibles is getting broader and more complex. Furthermore, different pricing arrangements can apply to apparently similar artefacts. Computer software can be sold as a stand-alone product, or it can be bundled with hardware or be distributed as a shareware or freeware over a network.

The Internet provides a fascinating laboratory of pricing approaches through various combinations of selling, sharing and giving away. The debate over the respective merits of those approaches is quite lively. Some argue that the development of metering technologies, which measure the detailed use of a given software, makes variable usage-driven pricing feasible. Others plead in favour of a fixed access charge, independent of actual use. Still another group considers that the ease of replication makes content practically free and therefore the only feasible approach is to charge for ancillary services.

As pricing of intangibles focuses more on content it highlights an inherent instability, and the volatility of valuation becomes structural. Fixed yardsticks and benchmarks lose their relevance. It is no longer possible to define absolute value: everything becomes relative. Economic value is now highly context-dependent and time-sensitive: from one transaction to the next, the price can change dramatically. This structural volatility contagion affects not only intangible artefacts but also traditional industrial goods, as well as production inputs.

### *Markets for intangibles and intangible markets*

The loss of stable benchmarks leads to greater use of markets as the prime value discovery and transaction mechanism. The growing importance and visibility of markets constitutes one of the essential traits of the intangible economy. This is the era of markets triumphant and, as Bryan and Farrell (1996) put it, unbound.



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At the same time, markets themselves undergo a substantive alteration. Their main purpose is no longer to support the trading of physical goods but to facilitate exchanges of intangibles, such as information. This does not mean that markets for physical goods have disappeared or become irrelevant. They are alive, well and growing. However, markets for intangibles are growing considerably faster. Furthermore, the evolution of physical goods markets is heavily influenced by the dematerialisation logic.

The peculiar characteristics of intangibles lead many analysts to argue that they should not be traded through traditional markets. Ronald Coase attacked this argument (1974) and suggested that the market for ideas should be approached in the same manner as the market for goods. To put forward a variation of this suggestion, markets for goods should be treated as a special case of markets for intangibles.

In any event, the distinction becomes increasingly tenuous; all markets become more and more intangible, both in terms of underlying products traded and in the way they operate. Take their most visible form, the financial markets. Over last thirty years, these have become enormous: the foreign exchange transactions volume is close to $1 100 trillion a day. While international trade is growing at a single-digit rate, international financial transactions grow at a double-digit rate. Capital markets became a principal conduit for funding technological innovation, accelerating its diffusion and, in the process, radically changing traditional notions of economic hierarchy and capital mobilisation.

This rapid growth would not have been possible without a comprehensive substitution of intangible data for physical objects, made possible by the massive use of information technology. What changes hands in those markets are not banknotes or stock certificates but book entries in digital databases holding banking or securities accounts. This dematerialisation and the resulting drop in transaction processing costs is one of the explanatory factors behind the explosive growth of financial transactions.

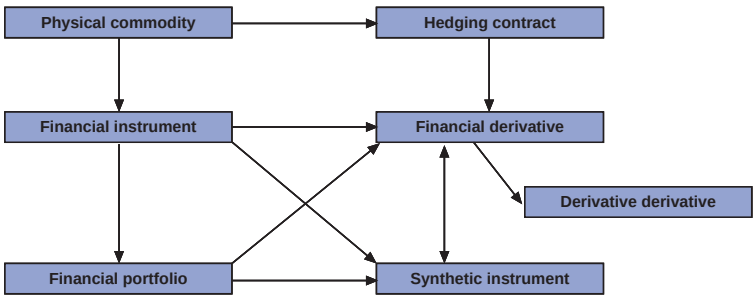
Furthermore, progress in financial economics theory has led to the creation of new markets that trade dematerialised derivatives of traditional products such as foreign exchange, interest rates or equity portfolios. Derivatives markets, futures, options, swaps, etc. have dramatically expanded the notions of tradability and risk management. They are growing more rapidly than cash markets in the underlying instruments.

The financial markets explosion is information-driven. The globalisation of the economy and the increasing variety of economic transactions create greater uncertainty and thus generate a strong and continuous demand for information. Financial markets are a web of conduits for displaying and exchanging such information. Exchange of information, viewpoints, judgements and opinions has



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Figure 1. **Growing abstraction of market instruments**




*Source:* Global Electronic Finance.

become their main function. Higher levels of risk and uncertainty also create a strong demand for information about the future. Derivative markets can be seen as an aggregation of collective views about the future.

## 2. Financial markets and electronic money

### *Money in the intangible economy*

With the new economic landscape now outlined, let us return to money. Not surprisingly, in the intangible economy, money is also becoming increasingly intangible. The relative weight of non-cash monetary transactions now exceeds the value of cash money by a factor of ten. Money and payments are almost entirely delivered via electronic networks as data bits and database entries. At the wholesale level, money representation and manipulation are fully automated. Dedicated payment networks such as SWIFT and payment clearing systems such as TARGET or CHIPS are at the core of scriptural money.

Beyond the alteration of the appearance and mechanics of money, there are deeper structural changes. The triumph of markets means that money is increasingly used to settle multilateral market transactions rather than bilateral commercial transactions. This functional evolution in turn leads to profound modification in the design of clearing systems and networks, which need to handle larger volume, work in real time, and offer more open access. While banks continue to play a key role in the management of these systems, external pressure to open them to other actors grows more intense.

Moreover, money itself became a tradable commodity. Markets for various forms of money and monetary instruments are bigger than markets for equity or



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for any commercial goods, and they fix the key money variables, interest rates and exchange rates.

These changes make money more visible and pervasive but also less stable, more volatile in its value, and more elusive. Monetary policy becomes more important as a lever of economic management at the same time that the classical monetary aggregates – M1, M2, M3 – lose their reliability as signals of future economic growth and inflation. Charles Goodhart (1975) has formulated a monetary equivalent of Heisenberg's uncertainty principle:

> "Any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes."

Because information is its key resource and output, the intangible economy is highly data-sensitive and intrinsically self-reflective: it continuously monitors and measures its own behaviour. As soon as authorities announce a monetary aggregate target, financial intermediaries adopt strategies that minimise its pertinence and causality.

### *Electronic money debate*

The elusiveness of money explains the persistence of controversy as to whether or not the transformation of money has led to the emergence of a new category: electronic money (or e-money). Like the other controversies mentioned above, disagreement is deep and remains inconclusive, due essentially to the difficulties of definition. Academic, business and regulatory experts appear deeply divided over the question.

Some analysts define electronic money as any form of money that is stored and moved over computer systems and data networks. This implies that the bulk of scriptural money is now by and large electronic. One example here is Kurtzmann's "megabyte money", which is nothing more than a large-amount, cross-border interbank payment.

Others characterise it in more restrictive terms. One commonly used definition stresses the innovative use of technology. Frequently mentioned examples of technology-driven e-money are the smart card-based electronic purses for small value payments (Proton or Mondex) and encryption software-based digital cash (token) schemes (Digicash or NetCash). Another definition focuses on novel uses such as air miles – more than half of which are generated and used on the ground – or multibrand loyalty schemes. The interest of use-based e-money schemes is that they are originated and operated by non-banks.

The differences in definition are of more than academic interest. They have substantial regulatory implications. In September 1998, the European Commission (EC) issued a proposal for an electronic money directive. The result of several



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years of discussion among official bodies and between the public and private sectors, the proposed directive offers a legal framework for regulation of e-money issuance by potential non-bank actors.

In the directive proposal, the EC defines e-money as a multi-purpose instrument. In other words, e-money is construed as a payment instrument that can be used to settle more than one kind of transaction, while the traditional definition of money stresses its universal dimension. The new definition leads to a broader and more ambiguous definition of the issuer of electronic money. A non-financial institution, a retailer or an Internet service provider that issues an electronic instrument appropriate for several types of transactions (buying physical goods with selected merchants, buying intangible goods such as information, participating in an auction, etc.) can thus be considered as an electronic money issuer. The proposed directive explicitly acknowledges the possibility of non-banking e-money issuers and defines a specific regulatory and prudential framework for them.

The proposed directive is still under discussion. It is highly controversial and afflicted by the middle-of-the-road syndrome. For e-commerce enthusiasts, it may create an additional burden and deter innovation. For regulators such as central banks, it may be too light. Thus the European Central Bank (ECB) would prefer that the issuance of electronic money be limited to credit institutions and that the definition of credit institution be enlarged to include all issuers of electronic money. Under this approach, electronic money is assimilated to scriptural money on an electronic support and as such does not require a fundamental overhaul of the regulatory and institutional framework of monetary systems. According to many central banks within the European Union such as Banque de France, e-purse and e-cash are prepaid instruments that resemble in substance traveller's cheques, except that the latter are not divisible. No new status or regulations are required for traveller's cheques, and therefore no new status is necessary for e-money.

As for loyalty schemes, their use is restricted and they are not broadly redeemable (except within the designated set of merchants). Therefore, they cannot be considered as money.

Beyond questions of definition, technology-based and use-based schemes raise other substantive issues.

Both e-purse and e-cash ran into serious market acceptance hurdles. The most successful financial e-purse scheme, Proton, has achieved a cash substitution rate of less than 5% and its transaction rate is insufficient to attain profitability. E-cash schemes fared even worse. Despite considerable media coverage and excitement among the digerati, practically all the systems run into difficulties, sometimes fatal. Digicash, tireless promoter of e-cash – which had moved from Amsterdam to the promised land of Silicon Valley in April 1997, acquiring substan-



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tial funding and prestigious investors, including Negroponte – was liquidated in September 1998. The early market leader, Cybercash, is struggling, has changed its strategy and top management several times, and in early 2001 delisted itself from NASDAQ. In France, KLELine, which specialised in e-merchant acquiring, was closed by its owner, BNP-Paribas, in Spring 2000. Another company, backed by all the French banks, which sought to combine Internet and smart card technologies – Cyber-comm – was wound down in early 2001. Micro-payment, which was considered in the mid-1990s as a potential killer application and a preferred mechanism for intangible goods transactions (information, online entertainment…), has so far failed to take off.

The main problem with these Internet payment initiatives is that they have not focused enough on customers' behaviour and attitudes. As a result, most of them appeared as solutions in search of a problem, suffering from technological overkill while lacking marketing and business sophistication. They were aimed primarily at small-value business-to-consumer payments and were basically conceived as substitutes for card- or cash-based payments. Thus, even if they had been successful, it is not certain that they would radically transform the existing monetary systems.

Use-based e-money schemes, many of which can boast millions of loyal users and are becoming ever more sophisticated, raise the same question: what difference do they make for existing money systems?

As a new generation of e-money initiatives emerges – some of them quite successful (Paypal, for instance, which claims over 8 million customers) – the question of what is electronic money becomes ever more topical.

### E*lectronic money: elements of a definition*

Electronic money should be defined as a new category and its starting point should be a reference to two existing categories – fiduciary money and scriptural money. The definition should be systemic, considering the ways in which the given category articulates the three basic money functions – unit of account, exchange medium and store of value – and its institutional framework. It is also essential to look at the entire monetary process: not only at the issuance, where most of e-money discussions tend to focus, but also at settlement and clearing. In effect, clearing and settlement are as essential in the determination of the scope of acceptability and universality of money (whether fiduciary, scriptural or electronic) as the issuance. Furthermore, it is in this area that widespread IT use has had the strongest impact. Back-office automation facilitated and stimulated the explosive growth in the volume and scope of electronic payments, wholesale and retail, national and global.



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Fiduciary money tightly links the three functions. Its issuance is strictly controlled. To the extent that cash is self-referential, the clearing and settlement process is quite straightforward and seeks to ascertain that the currency is genuine. Fiduciary money is not really suitable for multilateral market transactions.

Scriptural money combines unit of account and exchange medium functions. The value is immobilised. The issuance of scriptural money is regulated. The clearing and settlement process becomes more complex: it is necessary to verify not only the instrument but also the identities of both the payer and the payee; the exchange medium and underlying value need to be reconciled and exchanges recorded. Thus scriptural money requires detailed accounting and dedicated clearing and settlement systems. Such systems are tightly supervised by central banks and their access is hierarchical, with commercial banks acting as gatekeepers. When the scriptural money is paper-based, the system is costly and difficult to scale up. Hence the emphasis on automation, in order to replace the exchange of instruments by account transfers. However, automated clearing and settlement systems have for the most part retained access restrictions and banking control. On the other hand, dematerialisation of the exchange function made it easier to use scriptural money for market transactions settlement. It also facilitated the emergence of new instruments based on bank accounts, such as direct debit or debit and credit card.

Electronic money unbundles the unit of account function, which becomes completely dematerialised. In the intangible economy, where all values are relative, values are calculated as indexes and all index computations are widely and readily available. Furthermore, the value is not necessarily fixed at the time of the exchange. On the other hand, electronic money combines exchange medium and store of value functions. It is not tied to a single exchange medium but can be embodied in a variety of instruments. Similarly, the store of value is not limited to a banking deposit. Various types of intangible assets, information, intellectual property, etc. can be used as a counterparty for e-money. E-money can be seen as a digital value contract, and e-money transactions as a digital barter. The issuance of e-money is quite open. On the other hand, clearing and settlement systems are regulated to ensure redeemability and convertibility into other money categories. The access is no longer restricted to banking institutions. Nevertheless, those who have access privileges need to satisfy defined regulatory and prudential requirements. The distinction between commercial and market uses of e-money becomes irrelevant as most commercial transactions are mediated by the markets.

This definition of electronic money is admittedly quite generic. Some of its elements are already in place, while others are still in various stages of gestation. Nevertheless, it provides a blueprint that should facilitate the understanding of the ongoing e-money emergence process.



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## 3. Looking forward: from the cash nexus to the market nexus

There is certainly no dearth of studies and essays about the future of money. Most of them, however, tend to confuse current innovations with long-term trends. Thus, discussions on the subject tend to oscillate between two extremes. On the one hand are the "apocalyptic enthusiasts", who view e-cash, e-purse and similar initiatives as the four horsemen of the apocalypse, which will destroy the financial system as we know it. For instance, Tatsuo argued in 1996 that digital cash has a "potential to cause conflict between cyberspace and nation states". On the other hand are the "sceptical incrementalists", who, having ascertained the hard slog of e-money innovations, tend to see the future of money as more of the same, with technology-based innovations being assimilated into the mainstream of the scriptural money framework.

The author's view is that neither of these extremes illuminates the way forward. Electronic money is a major systemic innovation. However, as with the other monetary system innovations, its deployment and dissemination will be a lengthy process that should be measured in decades rather than in years. Furthermore, electronic money will have a significant impact on the existing forms and categories of money, without necessarily eliminating them. Various monetary systems will be closely integrated with intangible markets. The cash nexus will become a market nexus.

In order to highlight the systemic nature of electronic money, this peek into the future of money will begin with a discussion of relevant intangible economy trends, in particular the evolution of intangible markets. Against this background, the chapter will examine emerging forms of money and the core alternatives of its evolution.

### *Cross-currents: strategic schizophrenia*

The intangible economy has strong momentum. However, the logic of dematerialisation is not deterministic. It does not point to a single optimal trajectory. It actually widens the range of choices and alternatives. Instability and volatility, which govern the demand for intangibles, become pervasive and affect all aspects of the economy, national competitiveness, business hierarchies and market structures, prompting frequent and often brutal financial and economic shocks. The hierarchy upheaval is particularly dramatic in business: out of 500 American corporations that comprised the Fortune 500 ranking in 1980, 40% disappeared by 1992. Market dominance can be achieved with unprecedented speed and lost with equal if not greater rapidity, particularly in fast-growing sectors such as telecommunications and the Internet.

Upheavals in the marketplace are accompanied by radical reversals of opinions among business watchers. In the early 1990s, big multinational companies



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were called "dinosaurs" and condemned to inexorable decline. By the late 1990s, size and global reach mattered again.

Instability and volatility are not only sequential but also simultaneous. At the core of the intangible economy, conflicting forces are at work: economies of scale and increasing returns on the one hand, the shift of value to the consumer and market upheaval on the other. Its trajectory is buffeted by contradictory cross-currents: globalisation and localisation, concentration and fragmentation, vertical integration and horizontal competition.

At times, it appears that the guiding principle of business strategies and economic policy making is schizophrenia. While competition has never been keener, the fight for market share more brutal or the rivalry between firms more intense, alliances proliferate in all sectors and management theorists extol the virtues of co-operation and sharing. This coexistence of competition and co-operation has led to the emergence of a bridging concept – "coopetition."

The intangible economy has not killed distance but transformed its nature: topography is less relevant and topology has become essential. Distinctions between proximity and remoteness remain highly pertinent. Increases in connectivity do not necessarily lead to either a levelled or a uniform field. If anything, the communication landscape is becoming more picturesque and varied. The explosion of potential links leads to a greater selectivity and proliferation of communities. Density of links, connections and relations is highly uneven. Moreover, virtual and physical contacts are complementary rather than mutually exclusive.

### *Market and networks*

Thus, contrary to some high-profile pronouncements, the intangible economy is not frictionless. Actually, the level and intensity of frictions is likely to increase. Specific intermediaries such as travel agents may be threatened by the wide availability of information and ease of communications, but this threat does not entail complete disintermediation. As a matter of fact, the abundance of information, opportunities and relationships increases the need for new intermediation structures and mechanisms.

Markets are more important than ever. It is no accident that one of the key players in electronic commerce, which emerged relatively unscathed from the dotcom debacle, is E-Bay, a wide-open electronic marketplace with 30 million users, seeking to trade "practically anything on earth". In the B2B segment, the proliferation of private and virtual marketplaces has been a dominant growth driver. Even if there has recently been a pronounced slowdown in their deployment, it seems likely that the increasing proportion of inter-business transactions will be mediated through these marketplaces. If they follow the logic of dematerialisation, they may provide a platform for generalised asset trading, where compa-



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nies will be able to acquire either the (tangible or intangible) asset itself or various derivatives offering defined rights to use it.

### *Toward netmarkets*

As markets are growing increasingly dematerialised and virtual, traditional distinctions between markets and networks blur. The two concepts converge, each providing useful tools for the other:

- M*arkets as networks*. Markets display strong network externalities: the greater the number of users, the greater the benefits to every user. In the case of networks, the primary benefit is connectivity; in the case of markets, it is liquidity. As markets become more open, they need to make their access rules less rigid and more similar to those of traditional networks such as telecommunications. Markets also have to address and implement smooth and transparent interconnection, the core competency of networks.
- N*etworks as markets*. As networks become dissociated from the physical infrastructure, the management of access and capacity becomes more complex. Network designers use market negotiation mechanisms to optimise management and guarantee a defined quality of service. Similarly, the use of networks as a conduit for electronic commerce transactions creates a need to enhance counterparty identification and trust building procedures, long established in financial markets.

Thus, while markets seek to enhance their connectivity, networks look to embed trading capabilities in their design. Hybrid forms of business and economic organisations emerge, which can be called netmarkets.

## E*merging forms of electronic money*

### *e-fungibility and digital barter*

In the intangible economy, the notion of fungibility acquires a new meaning. The traditional meaning refers to fungibility among various forms of money, say between cash and scriptural currency. The new term e-fungibility describes the possibility of substitution and exchange between various types of intangible value: money, information, intellectual property, communications. To the extent that they all share a common technological substratum of digital storage, it is easy and cheap to exchange money for information, information for access, access for intellectual property acknowledgement, and so on. Each of these can be used alternatively as a store of value and/or exchange medium. Thus e-money can, for instance, take the form of:

- Intellectual property money, where the value is based on the content and its protection.



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- Communication money, where the value is based on access and related services.

E-fungibility makes it possible both to calculate exchange parities between different forms of value and to carry out exchange transactions, through what is really digital barter.

*Intelligent money*

As monetary transactions become more complex, the role of enabling technologies becomes crucial. These technologies, network and database design more specifically, have allowed the creation of highly reliable and secure networks and systems. In the future, another technology is likely to play a critical role: object software design and programming that increases the intelligence of various system components. The intelligent agent technology is already frequently used in the design of trading systems to allow them to respond automatically and appropriately to delicate and complex situations (large trades or linked trades, where execution of one transaction is contingent upon execution of one or more other transactions).

It is only a matter of time before the intelligent agent approach is applied to the design of money systems and money instruments. These will be endowed with sets of behavioural rules and, at a later stage, with a learning ability. If successful, the intelligent agent application will result in the emergence of intelligent money (I-money). Such money will for instance vary its value and response function, depending on specific transactions and counterparties. Monetary systems will consist of sets of I-money and rules for their interactions.

## 4. Core alternatives for the future money landscape

Let us now try to put the future development of e-money into a broader perspective. If history provides any guide, it suggests two main lessons:

- The development of electronic money is unlikely to be a smooth, linear or harmonious process. In all probability, it will be a rough, meandering and contentious journey.
- Various money systems will coexist and interact.

To apprehend the future money landscape, we can try to identify what could be called "core alternatives". These are not full-fledged and internally consistent scenarios but narrow beams into the future, structured around a simple hypothesis. Three such alternatives can be identified:

- The private currencies alternative.
- The global currency alternative.
- The market nexus alternative.



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### *Private currencies*

The private currencies alternative postulates a proliferation of issuers and currencies. It is a variation on an idea first formulated by F.A. Hayek in 1976. He argued forcefully against the government monopoly on money and in favour of competing private issuers. This was seen as a way of avoiding the monetary manipulation which, according to Hayek, caused inflation and the "boom and bust" cycle.

More recently, two other private currency models have emerged. One is the community currency model, where the value store of money is constituted by a range of local services. Community money is then used to build a common account base and thus facilitate a broader exchange of these services. Nevertheless, community money remains fundamentally local and is not intended for redemption outside the boundaries of the community. Probably the best-known examples of community currency are the Local Exchange and Trading Schemes (LETS), which were first launched in the late 1970s in British Columbia and really took off in the 1980s, thanks to the efforts of Michael Lipton.

The other private currency model is the corporate currency model. The underlying idea is that many corporations have a stronger balance sheet than most banks and their activities are extensive and global. Thus, if a corporation such as IBM or Microsoft issued currency, to be redeemed against its products or products of affiliated companies, it would be as credible as any bank-issued money; the corporate issuer would have no difficulties attracting affiliated merchants, who would accept the IBM or Microsoft dollar. Other "natural" candidates for corporate currencies are the network suppliers and operators. It could be argued that loyalty programmes offered by GSM operators such as Vodaphone, which are redeemed either as additional minutes or against goods and services offered by affiliated merchants, constitute a private currency. Moreover, these operators deal with sophisticated networks that already offer financial functions such as micro-payment accounting, real-time credit checks for international roaming, and roaming clearing centres to settle operators' liabilities.

So far, private currencies remain either at the idea stage or are confined to marginal local situations. Corporate currencies also remain limited to schemes such as Disney dollars, redeemable in various Disney attraction parks, or GSM loyalty points.

Nevertheless, the wide availability of enabling technologies, providing tools both for issuance and clearing and settlement, lead many analysts to believe that private currencies will take hold and constitute a preferred form of electronic money. Community currency in particularly has attracted vocal and passionate support. Keith Hart (2001) sees it as a lever of greater economic and political democracy.



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### *Single global currency: the geo*

This is the polar opposite of private currency: it postulates the emergence of a single global currency. That would be a logical consequence of a broad globalisation trend, a monetary translation of deepening economic integration. The example of the euro demonstrates – although some observers question how convincingly – the feasibility of a single currency in a multinational framework. It is interesting to note that another Nobel Prize winner – Robert Mundell, who played a major role in providing the conceptual underpinning for the euro – has more recently advocated creating a composite global currency, initially backed by gold. Thus, from the euro, the dollar and the yen could emerge the geo.

The technology for the global currency is available (although not as widely as the technology for private money) and the task, while challenging, is not excessively complex. What would be required is a creation of a single clearing and settlement system for geo-denominated transactions. Such a system would be based on Real Time Gross Settlements methodology adopted by all the major central banks, and would be built on the architecture and experience of the TARGET system used by the European Central Bank to settle interbank euro transactions.

The critical success factors for the geo are not technological; they are economic and political. Economically, countries entering a common currency system need to accept a common macroeconomic discipline. Politically, there has to be a strong will to create a global common currency. The geo will not arise spontaneously from the interplay of market forces.

It is probably for that reason that the geo alternative has had a considerably lower profile than the private currencies alternative. However, over the next ten to twenty years, the question of a global currency is more than likely to return to the top of the public policy agenda.

### *Market nexus*

This alternative builds upon the hypothesis of an ever growing integration of monetary systems and financial markets. It postulates strong development and ever broader coverage of e-money in the form of digital value contracts (DVCs). The "digital value" notion refers both to the medium – DVCs will be software-based and electronic network-resident – and the substance – they encapsulate various types of values that are e-fungible. Combining value and medium of exchange, DVCs are not unlike Lewis Carroll's Cheshire Cat, obeying the disconcerting rules of fuzzy logic: they are simultaneously value and representations of value, unique and ubiquitous, standardised and customised. Although they may be privately issued, DVCs are widely tradable on various public and private markets.



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This makes them distinct from private currencies. As markets interconnect, DVCs will be increasingly fungible with each other. This will enable their greater use as collateral and security, and thus enhance their store of value function.

DVCs are used to facilitate exchange of value in a multilateral and uncertain environment. They are widely used for risk management, whether on the cautious (protection) or audacious (speculation) side. The marking trait of DVCs' evolution is their ever expanding coverage. After having conquered the realms of basic commodities and financial instruments, they are being readied for use in energy management and environmental protection. Thus, trading of carbon dioxide emissions permits is seen as a way of reducing pollution more rapidly and effectively than the better-known alternative of the political process and tough regulatory regimes. This confidence is based on the successful results of the existing United States Sulfur Dioxide Allowance Program, which achieved high rates of compliance with stringent environmental goals at a low overall cost to the economy. Regulated sources have enjoyed maximum flexibility to choose their means of compliance with environmental regulations, and government administrators have found emissions trading to be politically attractive, efficient, and simple to maintain.

Two other areas where DVCs are likely to play a major role are the B2B markets and social protection.

In the B2B domain, DVCs will enable the transition from procurement of direct and indirect inputs to generalised asset trading. By extending the range of contracts and applying financial derivatives techniques, DVCs will enhance the liquidity of B2B marketplaces. Already, they are being used to reduce the volatility of markets for such critical components as DRAM memories, and to better manage network capacity through bandwidth trading. A new category of DVCs is likely to be developed to allow greater tradability of such intangible assets as intellectual property or customer databases.

Social protection use of DVCs is still at the concept stage. One can argue that company stock options, widely used in technology companies, could be construed as a form of DVC. However, as shown during the severe market correction, stock options offer less-than-perfect downsize protection.

A more ambitious project to use DVCs for protection against long-term economic and social hazards such as unemployment or substantial drops in income has been formulated by Robert Shiller, who proposed setting a new market category for these hazards. Designed to manage society's largest economic risks, "macromarkets" (as Shiller called them) could be used for instance to mitigate the transition from pay-as-you-go to funded pension schemes, and to make these transferable. In the future, the use of DVCs as a tool for solving public policy problems will become commonplace.



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### *Key questions*

*Displacement or coexistence?*

Relationships between the three alternatives are ambiguous and highly context-dependent. Under certain conditions they are conflicting, even mutually exclusive. Hayek's vision of "denationalised" money clearly runs against the concept of a single global currency. Private currencies and DVCs are possible substitutes. Large corporate entities may prefer to issue DVCs rather than corporate currencies for the same reasons that they prefer negotiable instruments to bank loans.

In other circumstances, core alternatives are compatible and could actually be complementary. The geo can very well coexist with corporate currencies and with DVCs. Some observers argued that the euro introduction should have been used as an opportunity to promote new forms of money, which could have reduced the demand for cash currency. Even if this opportunity has not been taken, introduction of the geo would entail major changes in the handling of traditional fiduciary and scriptural money and thus favour financial innovation.

*How quickly and strongly will the new alternatives emerge?*

At present, DVCs have the strongest growth momentum and potential. Private currencies, despite considerable media coverage, remain a largely marginal phenomenon. They experience difficulties to scale, to expand beyond particular local circumstances. The geo is far from the top of public policy makers' agendas. It should not be assumed, however, that over next twenty years the relative position of the three alternatives will remain unchanged. Private currencies may enter an explosive growth trajectory under the impact of new aggregation and peer-to-peer technologies. The geo could be catapulted to the forefront in the aftermath of a major global crisis.

The range of futures of money is quite broad. Nevertheless, one thing appears certain. Electronic money will continue to emerge, rendering the overall money landscape more intricate and multifarious.

## 5. Opportunities and risks

The emergence of electronic money will create a wide range of benefits:

- It will align the monetary system more closely with the overall dynamics of the intangible economy, thus making resource and asset allocation more efficient.
- It will facilitate the development of new products and services, not only in the financial sector but also in various forms of electronic commerce. Many



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of these products and services will be highly innovative and offer high growth potential.

- It will sustain the design and deployment of new business models such as multitier third party payments and multistream revenues generation, which allow easier capture of value of intangible artifacts and assets such as content and knowledge.
- It will offer speed, global reach and granularity, which facilitate the customisation of payment solution to particular customers and situations.

Yet, the progress of electronic money also creates risks.

### *Conceptual confusion*

The first is one of conceptual confusion about electronic money and its implications. We have seen above the difficulties of defining electronic money and the more general problems of apprehending traditional money. The monetary system is increasingly complex. It never was really stable, but the pace and the scope of change are now greater than ever. Historical precedents are only of limited relevance. Money practitioners, analysts and regulators all grope for conceptual tools that would make those changes more intelligible and provide actionable guidelines. But their quest is far from over.

### *Unstable institutional framework and governance*

One of the major symptoms of confusion is the concern about disintermediation. That term has several meanings. Traditionally, it means the decreasing role of banks in financial activities such as lending. In the new economy context, it describes the sweeping elimination of all intermediaries and the generalisation of peer-to-peer relations. This type of disintermediation is unlikely. However, the changing role of banks in the economy is unquestionable. So far, while banks have been losing share in many of their traditional strongholds, they have maintained a dominant role in the management of monetary systems, particularly the clearing and settlement function. This was not only due to their market prowess but also to a firm stance taken by regulatory authorities, notably central banks. Nevertheless, political pressures to open the existing monetary management and clearing system to greater competition are growing. Neither private currency nor DVC approaches place banks at the heart of their governance. In the electronic money context, the very notion of financial institutions becomes more ambiguous and difficult to define. The existing institutional framework is thus under pressure to evolve, but there is no well-defined and agreed blueprint for an alternative framework. It is not even sure that a single framework will emerge. After all, financial markets and financial services often operate within different frameworks and



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distinct regulatory regimes. In any case, the governance, operational management and regulatory oversight are and most likely will remain in a state of flux.

### *Loss of control*

The upshot of conceptual confusion and institutional instability is a widespread sense of the loss of control. This goes beyond the difficulties of conducting monetary policy and supervising financial institutions that are active across all continents and offer a huge range of services. Many observers, some of whom have extensive inside knowledge, believe that the evolution of monetary systems is undermining the traditional political structure of nation states. Walter Wriston, ex-CEO of Citicorp, called this the "twilight of sovereignty" (1992). Financial markets have taken away the economic policy making power of governments. This power has not so much been transferred as diffused across a wide range of actors with often conflicting interests.

### *Extreme volatility and increased fragility*

As a result, financial markets are unstable. The volatility of financial prices is widespread, persistent and contagious: foreign exchange markets have been volatile since 1973, interest rates since 1979 in the United States and the mid-1980s in Europe; equities became more volatile during the 1990s. Volatility results not only in wide swings of value but also in large gaps between financial and economic value. In turn, those gaps lead to financial "bubbles". As bubbles cannot inflate indefinitely they burst periodically, often brutally: hence the increasing frequency of financial crashes. Global equity markets crashed in 1987, in 1989 and again in 1998 and 2000; bond markets collapsed in 1987, 1994 and 1998, every time wiping away hundreds of billions of dollars of market value. So far, despite those crashes, the global economy continues not just to function but to grow and prosper. Nevertheless, the sense of fragility is exacerbated. National and international regulatory authorities live in a mode of permanent crisis management.

### *Social backlash*

To the extent that the ascendance of global electronic markets is seen as a dictatorship of blind economic forces, it can and does generate social backlash. Electronic money is widely seen as one of the most pernicious aspects of globalisation – hence, the continuing interest in the Tobin tax proposal. An international association to support this proposal, ATTAC, became one of the most active and visible promoters of the anti-globalisation movement, which vehemently criticises the World Bank, IMF and WTO.

The development of the intangible economy is likely to further exacerbate the backlash, as it entails a continuing extension of the scope of intangible



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markets and DVCs. For many people, feelings and ideas should not be subject either to the economic calculus or to market vagaries.

### *Growing dependency on technology*

Electronic money, in its different forms, becomes practically impossible to dissociate from its technology, which is not only its support but also its substance. This creates a strong dependency on technology and its evolution, and that dependency in turn triggers risks. Some of these are well-known – system breakdown, security breach – and are being treated with a high degree of priority. Such treatment requires an extensive use of technology, thus aggravating the dependency.

The evolution of technology is likely to set off qualitatively new types of risks. Its major thrust will be to endow systems and its components with increased intelligence and ability to learn. Both markets and money will become intelligent. Transactions will be automated, carried through machine-to-machine, agent-to-agent dialogues and transactions. This entails a decreasing involvement of humans. It is even possible to envision situations of conflict between intelligent systems and their human operators. Some future watchers go even further. Thus, Bill Joy, chief scientist of Sun, conjectures a future that "does not need us" (2000).

## 6. Conclusion

A new category of money is emerging: electronic money. Underpinned by the broad shift to the intangible economy, it is likely to become not only commonly used but a dominant system for determining and exchanging economic value. Its trajectory is clearly ascending. Yet, it is not linear or two-dimensional. There is no "one best way": the range of its possible evolution is very wide. More importantly, both economic agents and public policy makers have latitude to act and to influence both the process and the outcome of electronic money's gestation.

The configuration of electronic money will be the result of interactions among economic agents, public policy makers and structural trends of the intangible economy. This configuration may be stable but will not be fixed: the ability to adapt will be its built-in feature.

To facilitate the emergence of electronic money, it is important to be open-minded, to accept innovative visions of money and monetary transactions. At the same time, it is essential to recognise that many of these visions will either never be implemented or fail the critical test of customer acceptance.

For policy makers, the critical challenge is that of new forms of governance. In the new landscape, the roles of financial and non-financial institutions as well as those of the enabling technology providers and regulatory authorities need to be



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redefined. Does the combination of business and technological trends imply that finance is being rendered commonplace? Does it reduce barriers to entry to a point where any network can become a market, any computer can become a clearing system and anybody can issue electronic money? In the new environment, what is the meaning of financial transaction, financial intermediary and money?

The openness of electronic money means that governance structures and conduct will need to be more open than they are at present. They are more likely to be structured as a network than as a hierarchy, interconnected rather than centralised. They may even include elements of competition and negotiation among various structures.

More importantly, they will need to integrate the technological dimension. Lawrence Lessig (1999) considers that information technology and computer code have regulatory power. In other words, computer code can be used to define and control the rules and behaviour of a given system and its components, not only in cyberspace but also in the physical world. For instance, privacy and decency rules built into the system architecture constitute an efficient alternative to legislation and administrative laws and decrees. Financial systems already include code-based rules, which govern access and risk management in real time. Interbank clearing systems, for instance, verify funds availability in real time and automatically limit the credit exposure of system participants. Such automated rules were introduced because usual rules and control mechanisms were simply impracticable. This approach may be extended and raised to a higher level of governance. The International Financial Architecture has been extensively if rather inconclusively debated at the most senior levels of international co-operation with the aim of improving the stability and the security of the global economy. This discussion acknowledged the risk of technology but has not considered its potential advantages, in particular its integration into the regulatory framework. Is it naive to believe that one way to advance this debate is to introduce the concept of International Financial Technology Infrastructure?



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*Chapter 5*

# New Monetary Spaces?

*by*

*Geoffrey Ingham*
University of Cambridge
United Kingdom

## Introduction

It is generally believed that communication and information technology (CIT) is eroding the power of nation states in a number of economic, social and cultural spheres. This is said to be occurring from two directions simultaneously – globally from the "outside", and locally from the "inside". Transnational economic, political and cultural developments have begun to challenge the hegemony of all but the most powerful of states; but localised and, largely, informal cultural and political movements have also expanded. In the economic sphere, the advance of transnational capitalism and global e-commerce has been paralleled by the revival of local and "informal" economies. Both developments make use, in part, of new forms of money, based on CIT. It widely thought that these could successfully challenge the state's monopoly and control of monetary production.

Two aspects of this debate need to be distinguished from the outset. First, CIT is literally *transforming* money. After its commodity and paper incarnations, money is now (it is widely thought) becoming "virtual" – as in, for example, the electronic transmission of payments in the banking system, or in "electronic purses" (see for example Solomon, 1997). This change in the mode of monetary transmission has some important implications; but perhaps we should note at this early stage that there is a great deal of rash hyperbole on the novelty of "dematerialised" money. After all, the "book money" in 16th century Italian banks was just as "virtual" when it was transported through time and space by the stroke of the pen.

There are a number of issues here concerning fraud, money laundering, tax evasion, and so on. It is not clear whether electronic forms of money will lead to an increase or reduction of such activities. This is largely an empirical question and until we move nearer to a cashless economy we cannot be confident about the



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outcome. Other things being equal, however, no form of money can be as anonymous and untraceable as hard cash, the foundation of the large "black" economies in even the most economically advanced societies. However difficult it might be in practice, electronically transmitted money is traceable.

Much more interesting issues are raised by a second, different set of arguments that suggest this same technology makes it easier to create authentically alternative new forms of money that might erode or even displace state money. The development of the "global" and the "local" both imply the "denationalisation" (Gilbert and Helleiner, 1999) or "deterritorialisation" of money (Cohen, 2001). There are a number of disparate developments on both levels. At the globalised upper level of capitalism, for example, large transnational corporations might issue their own "scrip" as media of exchange on Internet transactions (Greenspan, 1997; Lietaer, 2001; Weatherford 1997; Kobrin, 1997). In a more extreme vein, others argue that Internet barter-credit transactions might even bring about "the end of money" and the redundancy of central banks. At the other end of the scale, the informal sectors of many modern economies have developed into organised local trading systems with their own local media of exchange. As the very essence of the sovereignty of the state is based upon the *twin* monopolies of money and coercive force, there are many possible consequences of such a leakage of money from its control. Most obviously, denationalised and localised money could evade monetary regulation and the reach of the tax authorities, with obvious consequences for macroeconomic management and social welfare programmes. Debates on money's "future" are one element of more general economic liberal and social communitarian hopes for the Internet as a potential force for human emancipation from the state (Hart, 2000).

However, we need to be clear about what exactly money is before embarking on an examination of the consequences of its new forms. Unfortunately, this question has proved to be surprisingly difficult to answer (see the articles in Smithin, 2000). Indeed, it will be argued in this chapter that almost all of the recently fashionable conjectures on e-money and "the end of money", or the existence of "virtual money", are based upon a fundamental misunderstanding of the nature of money. It is usual to define money in terms of its functions of medium of exchange; means of payment (settlement); money of account; store of value. Orthodox economic theory implies that *medium of exchange* is the most important function, and that the others simply follow from it. Nearly all of the recent analyses of e-money and its consequences are guided by these assumptions, but it is here argued that they are mistaken. There is a tendency to confuse *specific forms* of money – metal, paper, electronic impulses, etc. – with the *generic properties* of money as *measure* and *bearer* of *abstract value*. As expressed in the opening lines of Keynes's A *Treatise on* Money: "Money-of-account, namely that in which debts and prices and general purchasing power are *expressed*, is the primary concept in a theory



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of money" (Keynes, 1930, p. 3, original emphasis; for further analysis of the fundamental importance of money of account, see Ingham, 2000; Grierson, 1977; Hoover, 1996). These qualities are generated by the *social relation* between the issuer and the user (Simmel, 1978 [1907]; Ingham, 2000; Aglietta and Orlean, 1998; Innes, 1913; Smithin, 2000; Wray, 1990, 1999; Schumpeter, 1994 [1954]). M*onetary spaces* are created by social and political relations that exist independently of the exchanges between transacting economic agents. The *form* of money and its *mode of transmission* are of secondary importance.

The discussion that follows has two main parts. The first section will expand a little on these conceptual problems, outlining the two basic theories of the nature of money. The second part describes the different forms of money that have recently emerged – from "above" and "below" – and that appear to challenge the modern state's monopoly of money. An attempt will be made to assess how far these challenges might progress.

## 1. Theories of money

"There are only two theories of money which deserve the name", Joseph Schumpeter accurately observed almost a century ago, "… the commodity theory and the claim theory. From their very nature they are incompatible" (quoted in Ellis, 1934, p. 3). Each theory gives different answers to the basic questions about money – that is to say, those concerned with the functions of money; its historical origins; how it gets into society; and how it gets and maintains (or loses) its value. Both theories have long and complex pedigrees; but the following subsections simply summarise those points that are important for the discussion of the substantive issues of the new kinds or money – or rather, "monetary spaces".

### *i)* M*oney as a medium of exchange*

In the most general sense, the understanding of money in orthodox economic analysis remains based on the analytical structure of the commodity-exchange theory of money. Here money is seen either as a tradable commodity, or the direct symbol of commodities, that functions as a medium of exchange. In mainstream economic theory, only the "real" properties of the economy – "capital" and "commodities" – are of fundamental importance. There is no analytical difference between barter exchange and monetary exchange.[1] Money, in J.S. Mill's view, merely enables us to do more easily that which we can do without it. It is in this sense that money is a neutral veil over transactions. In classical and neoclassical economic analysis, the existence of money is explained as a spontaneous evolution that resolves the problem of the inefficiencies of barter. The market, comprising rational economic agents, is capable of solving its own problems; it is self-equilibrating and self-correcting. Consequently, money originated as the most



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tradable (liquid) commodity that would be held by traders in order to maximise their exchange options (Menger, 1892; see also the more recent literature in this tradition that is cited in Klein and Selgin in Smithin, 2000). It is primarily, and in some cases exclusively, seen as a *medium of exchange*. From an analytical standpoint, there is no essential difference in terms of money between, say, the "cashless" euro and the use of cigarettes as a medium of exchange in prisons.

The progressive "dematerialisation" of money in the modern world has created difficulties for this theory which, as we shall see, continue in the recent confusions in discussions of the end of money and virtual e-money. Over the last two centuries, there has been a seemingly interminable dispute in economic theory over the role of "paper" and "credit" as symbols or representations of the "real" value of commodity money, or of the "real" value of the other commodities in market exchange. As a result of its intellectual origins in commodity theory, this conceptual framework has resulted in a preoccupation with the actual *form* taken by the "money stuff" referred to above. Consequently, orthodox economic theories have, in general, maintained that the value of money is determined by the ratio of the *quantities* of money and goods. Perhaps the last complete incarnation of the theory was seen in the "monetarism" of the late 20th century. But the economic mainstream continues to conceptualise money and its qualities as "things" that constitute "stocks" or that "flow" or "circulate" at variable "velocity". The current debates on e-money are a continuation of this difficulty in understanding so-called dematerialised money.

There are, however, a number of problems with this theory, which relate in one way or another to its concept of money as a "thing". The question of the significance and the origins or basis of a *money of account* is the most important. As Keynes noted, money of account is all that is necessary to establish the essentials of complex economic activity, *i.e.* price lists and debt contracts. However, the commodity-exchange theory of money cannot provide an explanation of money of account – that is, of the *concept of abstract value* (Grierson, 1977; Ingham, 2000). It is exceedingly difficult for barter exchange to extend beyond establishing bilateral exchange ratios; for example, one hundred goods could yield 4 950 exchange ratios (Davies, 1994). Without making implausible assumptions, it is difficult to see how an agreed money of account could *spontaneously* emerge from barter. As the numismatist Grierson explained (1977), tobacco was used as a medium of exchange in 16th century Virginia, but it only became money when its price was *fixed* at three shillings a pound. Money is a commodity, but it has to be constituted as money, according to an abstract money of account, *before* it becomes a commodity.

Secondly, the identification of the quality of "moneyness" with the "money stuff" of the medium of exchange – rather than in the abstract quality of money of account – constitutes a "category error" that has led to hasty and mistaken conclu-



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sions when the form of money evolves. Money, as we shall see in the next section, consists in a "promise to pay" – that is, in a "social relation". This has taken myriad technologically determined forms over the centuries – clay tablets, coins, paper, book entries, plastic cards, electronic messages. All these forms of money, including precious metals, only become money when they are *expressed* in abstract money of account.

Third, the analytical primacy given to money as a *medium* for the exchange of existing value diverts attention from its obvious role in the capitalist system. Like all money, bank credit money is created in a complex set of social relations of credit and debt. But the social relations that constitute money are most clearly apparent in modern capitalism. As post-Keynesian economists argue, loans make deposits of money – that is to say, money-*capital*.

Finally, we should note that the hypothetical evolution from barter to commodity money to "dematerialisation" and forms of credit money is not borne out by the historical record (Innes, 1913, 1914; Aglietta and Orlean, 1998; Wray, 1999; Ingham, 2000).

Almost all of the most recent conjectures about new forms of money are to some extent informed by this commodity-exchange theory. It is assumed that economic agents in global or local markets are themselves able to create their own, possibly more "efficient" forms of money – as Hayek, the "free banking school" and economic liberals have always maintained. Communication and information technology has made this easier to achieve by overcoming the technical and information problems that hitherto have necessitated the "public goods" role of the monetary authority.

### *ii)* Money as credit – a "claim" on goods

In this conception, money, *regardless of its specific form or substance*, is always a "token" claim to goods. It is a socially constructed abstract value – that is to say, purchasing power denominated in a money of account, as Keynes emphasised. For example, the values in Charlemagne's money of account were never minted (Einaudi, 1953 [1936]); it was the first "cashless" euro! Money of account may be linked to some material standard of value – but this is always first established *authoritatively*, not by the market.[2] In this theory, it is the social and political *relationship* between the issuers and users of money that is of central importance in the creation of money. Issuers establish both the "description" (money of account) and what form of money "answers" the description (Keynes, 1930, pp. 3-4).

All money is created and maintained by the social relation of credit-debt (Innes, 1914; Ingham, 1996, 2000; Aglietta and Orlean, 1998; Simmel, 1978 [1907]). Issuers of money issue "claims" or "credits" and holders of money are "owed" goods. These relations create the monetary *space* – that is, a *social* sphere in which



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*impersonal* exchange takes place. This theory argues that such spaces are social and political, in that they cannot be constituted *exclusively* by the exchange relations of economic agents. This socially constructed space is logically anterior and historically prior to the market. Without money there can be no market, whereas orthodox economic theory sees money as a convenient medium of exchange that enables a pre-existing – primordial – market to function more efficiently. A genuinely competitive issue of money would entail a competition of nominal moneys of account; anarchy would follow (Hoover, 1996; Ingham, 2000; Issing, 1999).

Historical evidence supports Knapp's state theory's focus on taxation (debts to state) as the basis for creation of monetary spaces (Knapp, 1973 [1924]; Wray, 1999). States issue money in order to get it back in taxes. Tax debts to the state can only be paid by acquiring, through economic activity, the money that will be accepted (Wray, 1999). In this regard, it is important to bear in mind Knapp's important but widely misunderstood distinction between *valuableness* and *value*, *valuableness* being the quality conferred by authority and *value* being actual purchasing power. In other words, *all money is, in a very important sense, "fiat" money*.

"Private" or "market" money exists; but two important points must be borne in mind. First, there is no known case where entirely private money has been able successfully to maintain its own unit of account over the long term. Secondly, early capitalist bank money or market money was chronically unstable until it "hybridised" with the public banks of the early modern states (Boyer-Xambeu, 1994; Ingham, 1999).

A further important feature of the credit theory of money is that abstract value in the form of the social relation of money is value *sui generis*.[3] A specific feature of money is not so much the utility of medium of exchange in "spot" exchanges, but rather the projection of *abstract* value through *time*. Without this quality, the "endogenous" creation of money through the creation of debt and capitalist financing would not be possible (for a survey of post-Keynesian and "monetary circuit" theory, see Parguez and Seccareccia in Smithin, 2000).

## 2. New monetary spaces

New electronic and digital forms of money and new media for transmission appear to promise the actualisation of the economic model in which money is defined by its role as a medium of exchange. This underlying conception of money is shared by two quite diverse and opposed ideological positions, both of which hold to the possibility that a "spontaneous order" could exist without the state. In short, communication and information technology has revitalised those two old 19th century visions: the liberal conception of a global market "cosmopolitanism", and local "communitarianism".



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### *i)* E*lectronic globalisation, market capitalism, and national currencies*

Leading academics and figures in the monetary world have argued that CIT will remedy the information and communication deficiencies that have, hitherto, impaired the perfect functioning of the market mechanism (Cohen, 2001; Kobrin, 1997; Greenspan, 1997). Some, as we shall see, have a vision of a truly transcendental global order: a vast "moneyless" market, made a reality by a vast barter-credit clearing system based on a fabulously more powerful successor to the Internet (King, 1999*a*, *b*). Others believe that "with the arrival of electronic money, money creation will become increasingly privatised. Hayek's vision of a world of unrestricted currency competition could, for better or for worse, soon become a reality" (Cohen, 2001, p. 21). These possibilities are questioned by a second group of writers on the grounds that states will have both the will and the capability successfully to challenge any technologically-based threat to their monopolies, if it is in their interests to do so (Helleiner, 1999).

The author broadly agrees with this second assessment, but his scepticism is also based on a slightly different argument. As suggested earlier, the possibility of *viable* "denationalised" electronic or cyber money that emerges in the course of e-commerce is based on a misunderstanding of the nature of money. In order to become more than a "convenient medium of exchange" in e-commerce, money needs authoritative foundations – that is to say, some autonomous social and political bases. Narrowly "market money", whether a 16th century bill of exchange or today's e-money, remains embedded in and restricted by its economic network and is, consequently, only as viable as the network itself.

The most extreme interpretation of the monetary potential of CIT finds expression in the "New Monetary Economics", which surmises that the modern generation of computers could make the Walras's economic model of barter-credit equilibrium a reality (Smithin, 2000). Their ideas were recently popularised by the Deputy Governor of the Bank of England, Mervyn King, in his contemplation of the "end of money" (King, 1999*a*, *b*). The 20th century, he argued, has seen the inexorable rise of central banks; but he wondered, as a result of the "impact of technological innovation", whether they would exist at all by the 22nd century. Central banks' control of their monetary systems could disappear if individuals or, more pertinently, capitalist firms were able to settle their exchanges by the direct transfer of wealth – in the form of, say, financial assets – from one electronic account to the another. Pre-agreed logarithms would determine, according to the value of the transaction, which financial assets were sold by a purchaser. "The key to any such development is the ability of computers to communicate in real time to permit *instantaneous* verification of the creditworthiness of counterparties" (emphasis added). The realisation of this possibility would make money's unique role as the means of final settlement redundant.[4] If final settlement could be made without



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recourse to the central bank's money, the bank itself would cease to exist. Present monetary policy preoccupation with the need to limit money creation would give way to the more "technically neutral regulation" of the integrity of the computer systems that verify the creditworthiness of the counterparties' assets.[5] King concluded that societies have managed without central banks (their monopoly of the supply of money) in the past and "may well do so again in the future".

Standing aside from the dazzle of information technology, it is possible to see that the *underlying structure* of the kind of scenario described by King has existed for some time at the upper reaches of world capitalism (Ascheim and Park, 1976). Moreover, there are numerous historical examples of "moneyless" systems of complex multilateral settlement with payment in kind – for example, 18th century Massachusetts and present-day Russia. In essence, these are no different to King's conjecture. The quite complex economy of mid-18th century Boston had no issued currency. Farmers' and traders' debts were recorded in a *money of account* based on the English currency, which of course did not circulate. The means of payment were heterogeneous goods priced in an agreed unit of abstract value (money of account). In strict terms, such systems, including King's scenario, are not moneyless but cashless. In order to function at all, these monetary systems only require an abstract money of account.

King understands this point and, consequently, that the liquid financial assets for settlement of debt would need to be priced according to a money of account. But in his focus on medium of exchange as money's *essential* property, he appears to consider the question of money of account to be unproblematic. However, it is not. Following economic orthodoxy, King simply asserts that a *commodity standard*, based on the prices of a "basket of commodities", could produce both a unit of account and a benchmark standard of value. The construction of a money of account, he suggests, would simply be a "matter of public choice", and its regulation would be no more difficult than existing weights and measures inspection. But this reduction of the problem of producing a measure of abstract value to a technical question misunderstands the essential quality of money as "the value of commodities without commodities" (Simmel, 1978 [1907]).

The "New Monetary Economics" position, outlined by the Deputy Governor, rests on two basic errors. In the first place, economic value is not "natural" like the relatively constant properties of, say, distance and weight. Indeed, it fluctuates in response to the distribution of social and economic power, and this is precisely why money of account is logically anterior to and historically prior to market exchange and market value. Second, the standardisation of the unit of account in relation to any standard of value has to be established by an authority. Monetary promises to pay are abstract, and they function because the question of their value is partly *removed from the free market process*. Space does not permit a thorough examination of this question, but in the era of precious coinage, monetary policy



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involved manipulation to maintain parity between market value and the abstract money of account. By buying gold at a fixed price, central banks' promises to pay were in fact fixing and manipulating the so-called market in order to provide the stability which, left to itself, the market could not provide (Innes, 1914).[6] "End of money" futurology is no more than a re-description of the 19th century liberals' misunderstanding of their monetary system and, perhaps, a repetition of their vain hope of a world without politics.

Doubts about the theoretical underpinnings of this extreme case do not mean, however, that we need not consider the possible effects of the appearance of new and varied media of exchange and changes in the means of monetary transmission. There are two possible developments that could fragment and erode national monetary spaces. First, it is suggested that the proliferation of limited-purpose media of exchange that appeared in the late 1980s – such as prepaid "smart cards" for rail or air travel, mobile phone calls, cable TV, and so on – could go beyond the credit card limitations. [For a regularly updated guide to e-money see *www.ex.ac.uk/~Rdavies/arian/emoney*; also Godschalk and Krueger, 2000 on *www.durham.ac.uk/economics/krueger*.] At present, like credit card debt, smart card accounts must be paid for by transfers from conventional bank balances. However, the technological possibility exists for balances of the different limited-purpose media to become readily exchangeable in payment for an ever widening range of goods. The next generation of PCs will have the necessary smart card slot. For example, a mobile phone company might accept unused rail card balances as payment (Boyle, 1999). Indeed, it is in the interest of companies to encourage the formation of such multilateral payment networks. It is argued that as e-commerce became more extensive, these limited media of exchange would begin to take on the function of means of payment and final settlement, and would approach the status of private money (Lietaer, 2001). The award of "loyalty credit" for purchases of a range of goods whose suppliers comprise a linked trading network might also operate in a similar way in the production of limited media of exchange. The Internet has enabled these media of exchange to extend their scope, and in the late 1990s a number of so-called cyber currencies emerged – for example, *www.beenz.com*; *www.ipoints.co.uk*; and, more recently, PayPal ("Dreams of a Cashless Society", *Economist*, 5 May 2001; Solomon, 1997).

It is argued that these could spread to a point where they challenge existing state moneys. Cohen (2001), for example, believes that Internet money can exist in "new circuits of spending, based on alternative media of exchange, that make no use at all of a country's traditional settlement system – 'rootless' money circling in cyberspace" (Solomon, 1997, p. 75). It is acknowledged that the development of trust is a problem. However, it is assumed that trust in cyberspace money will grow simply as a direct function of the volume of electronic commerce. In Cohen's view, this would be no different to the way in which cigarettes in prisons or chew-



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ing gum in postwar Europe became "money". In general, then, this range of views is based on the belief that money is fundamentally a commodity that functions as a medium of exchange and is produced by a market process.[7]

Secondly, is it really only "a matter of time", as Alan Greenspan has suggested (1997), before the largest global corporations, whose assets far exceed those of many states, issue their own promises to pay? As a recent commentator explains, the "real goods and services of companies" would back the private issue (Lietaer, 2001).[8] However, in addition to the overwhelming historical evidence that money is indeed a "creation of the state" (Keynes, 1930), there are good reasons to doubt that private corporate money could ever become more than a minor adjunct to legal tender. Quite simply, the structure and mode of operation of what Fernand Braudel called the "capitalist jungle" is inimical to the creation of corporations with the necessary longevity and trustworthiness to produce money that could successfully compete with states' issue. Capitalism, as Schumpeter stressed, prospers through "creative destruction" in which even the most powerful firms eventually fail or are swallowed up by their competitors. If the pattern of the 20th century continues, only one in three of the largest US corporations will survive the next twenty-five years (*Financial Times*, 12 April 2001). Finally, it has not been convincingly demonstrated that it would actually be in the economic interest of corporations to issue money. As the 20th century has shown, the dominant states whose money has been used globally have, at times, found this to be a costly burden (Ingham, 1994).

One must guard against exaggerating the actual extent, scope and novelty of these developments (Godschalk and Krueger, 2000). But it is more important to be aware that, in order to be fungible, the new forms of money would have to be part of a monetary space that is circumscribed by a *dominant money of account*. Charlemagne grasped the point over a thousand years ago in his attempt to bring order to the monetary anarchy created by myriad competing currencies across Europe. In fact, e-money is *structurally* no different from the multiplicity of local media of exchange, corporate and government scrip and private bank money that existed in all advanced capitalist societies in the 19th century (Davies, 1994). For example, in "… the 1830s… Britons could at different times and at different places have understood gold sovereigns, banknotes, or bills of exchange as the privileged local representatives of the pound… the pound as an abstraction was constituted precisely by its capacity to assume these heterogeneous forms, since its existence as a national currency was determined by the mediations between them" (Rowlinson, 1999, pp. 64-65). These media were displaced not by technological innovation, but by the political interests of states in tax collection, and stabilisation of their currency by participation in the international gold standard.

It is to misunderstand the nature of money to argue that "[j]ust as early forms of paper monies eventually *took on a life of their own*, delinked from their specie base,



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so too might electronic money one day be able to dispense with all such formal guarantees…" (Cohen, 2001, p. 6 – emphasis added).[9] No money can simply take on a "life of its own", or have a "rootless" existence. To think that this is possible is the result of the preoccupation with the *form of money* and economic transactions rather than the *social and political relations* between the issuers and the users. Money is essentially "rooted" in the money of account and the final means of settlement that is, of necessity, established by an authority.

Fundamentally, then, the question of new monetary spaces based on CIT is not technological or even economic – it is political. Aside from the essential role of an "authority" in maintaining a money of account and means of final settlement, the extent of any developments in even very limited purpose media of exchange depends on the state (Helleiner, 1999). The European Central Bank, for example, has taken a strong stance with regard to competing private e-money. In addition to requiring that e-money must conform to existing banking supervision, including the reserve requirement, the issuers of e-money are, if requested, to be legally obliged to redeem it at par against central bank euros (European Central Bank Report, quoted in Lietaer, 2001, p. 216). In other words, it is the ECB's intention that any new issuers of private e-money become part of the existing banking system. Out of concern for the United States' lead in e-commerce, the Federal Reserve is, as yet, more tolerant of e-money. However, the US Internal Revenue Service has opposed the part payment of income in "frequent flier miles" that were potentially negotiable.

There is one final consideration that we should examine. It receives little or no attention in the literature, largely because orthodox approaches assume that money – whatever its form – is "neutral" in its effects. It is just conceivable that e-money might become a *transmission mechanism* for currency substitution on an extensive scale for a global financial elite. The Internet might produce a more extensive and promiscuous circulation of national currencies, as occurred in Europe before the consolidation state system of the 18th century. Or, could there be, for example, a non-bank version of the 1960s Eurodollar market?[10] The amount of globalised private investment is large, and growing at a fast rate – from $1 trillion in 1981 to $4.5 trillion in 1993 (Thygesen, 1995). Rather than being merely offshore, as they were forty years ago, the new markets would be in cyber-space. Currency X could be exchanged into e-money and thence into currency Y and other liquid financial assets. The existence of such offshore – or rather, cyber-space – wealth would lead to a further shrinkage of sovereign states' tax bases, affect welfare and exacerbate existing trends towards increasing inequality.

Again, the outcome will depend upon any common interest that states might have and their willingness to regulate and control, such as in the current European initiative on private offshore banking. Some states permit domestic use of foreign currency in order to discourage their wealthy elite from exporting their financial assets (Helleiner, 1999, p. 150). Anything that enhances the fungibility of a global



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plutocracy's assets will tend to force national governments and their monetary authorities to act defensively in this way. Could this be another path to an insidious global "dollarisation"?[11]

In addition to further economic polarisation and reduction of national tax bases, the existence of global economic elite networks would probably reinforce another trend that has a less obvious but possibly deeper significance. In the 19th and early 20th century, the limitations of information and communication technology and the relative immobility of labour in the tertiary and secondary sectors of the economy tied the economically dominant classes more closely to their particular locale. They had a stake in its economic, political and social health. Today these links are becoming increasingly tenuous. It has been argued that this retreat has led to the general degeneration of local communities. But, in an ironic twist, could local community action based on local media of exchange fill the void? The very same technological possibilities are invoked as the foundation for a recovery of the "real wealth" of the "community" by the "community" (Hart, 2000; Lietaer, 2001).

### *ii) Community exchange systems and local monetary spaces*

Two periods of global economic recession in the 20th century have given rise to local self-help schemes and local moneys. In the deflation and monetary contraction during the 1920s and 30s, local media were used to enable basic economic exchange to take place. Some vestiges remain, but the vast majority were unable to withstand the assault from their respective banking systems or the effects of the Second World War. The second wave of local moneys that emerged in the 1980s appears to be more robust and, significantly, their growth has continued into a period of economic prosperity. From fewer than 200 in the early 1980s, local money systems have grown to over 2 500 worldwide (Lietaer, 2001, p. 159 for a list of websites). Many believe that these are not simply the response to economic deprivation but represent the other dialectically opposed side of the globalisation "coin".

The advocacy of community money, controlled by users rather than by the banking system and monetary authority, is prominent in populist, guild socialist and communitarian writing (Hart, 2000, pp. 280-281). It is thought that it could unlock the "real" human and social capital of the people that is rendered impotent by the lack of money-income from the formal capitalist economy and its banking system. Despite belonging to a very different ideological tradition, this conception of money is very close to the idea of the "neutral veil" in liberal economic thinking. Here also, it is maintained that real capital and wealth resides only in the actual physical, material and technical resources of an economy. Lacking a medium of exchange that unemployment and the loss of income bring about,



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these lie idle in times of recession. Like analyses of global e-money, the crucially important questions concerning money of account and money as a store of *pure abstract value* that could constitute final unilateral payment are not dealt with by these theories. Money is seen to be nothing more than a symbol of the goods and services of the "real" economy. Secondly, the communitarian vision is essentially the same as the Hayekian liberal belief that money emerges "spontaneously" – that is to say, without any need of an authority or state.

There are two main forms of alternative and complementary money that occupy a marginal position in relation to the mainstream of legal tender money. First, there are local exchange trading systems/*systèmes d'échange local* (LETS/SEL). Second, authentic local currencies – most notably "Time Dollars" in the United States – have emerged (Bowring, 1998; Williams, 1996; Leitaer, 2001; Hart, 2000). Third, local mutual credit associations have grown in number. For some writers, the capability of CIT raises the possibility that local cells might become connected into strong networks that define economic spaces outside those of national moneys and currency blocs. The Internet, they argue, has the potential to transform the local into the global (Hart, 2000).

LETS/SEL

The original local exchange trading scheme/*système d'échange local* (LETS/SEL) was founded in Vancouver in 1983, and such schemes have now begun to spread throughout advanced capitalist societies. In the United Kingdom, for example, the first appeared at Norwich in 1985 and the number had reached only five by 1992; but in 1999 there were 450 schemes in operation. However, with about 30 000 participants and an annual turnover of only £2.2 million, these schemes remain, at present, very marginal to the UK economy, and the situation is not significantly different elsewhere.

Strictly speaking, LETS/SEL are barter-credit networks in which offers and wants of goods and services are matched. The schemes occupy a position between simple bilateral barter and a fully developed money economy. Media of exchange credits are usually issued to participants in the form of paper chits that shadow their national currency but sometimes signal the locality, as in "Bobbins" in Manchester and "Tales" in Canterbury, England. [In France, "*les grains de sel*" evoke the era of authentic commodity in Menger's fanciful account of the transition from barter to money (1892).]

After a transaction, the media are placed in local collection boxes or posted to the clearing house where members' accounts are debited or credited. LETS go some way towards overcoming the well-known impediments to barter trade that occur in the absence of a "double coincidence of wants". A level of multilateral exchange and separation of transactions in time is achieved, but LETS demonstrate



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the limitations of "special purpose" forms of money that are restricted to the role of simple medium. LETS chits or notes are "a convenient medium of exchange" (Keynes, 1930); that is to say, they do not function beyond the direct representation of the actual goods and services to be exchanged. The successful operation of LETS requires frequent, regular trades and a very high level of velocity of the chits. To discourage hoarding, "demurrage" – that is, a type of negative interest or deliberate depreciation – is often employed; and there must be a constant readiness to trade (Lietaer, 2001; Bowring, 1998). In other words, LETS media are not stores of abstract value and means of unilateral settlement, like full money. This has two significant effects. First, there are not the price-lists that result from the use of purely abstract money. The terms of trade in each transaction are almost always bilateral – like pure barter. Second, as the LETS chits cannot store value, there is less incentive to drive a hard bargain which in turn further inhibits the production of stable prices. Consequently, this reinforces the "localisation" of LETS to closed circuits and casts doubt on their ability to grow into wider networks of truly alternative monetary space. Of course, these characteristics are precisely those that are valued by some of their proponents; LETS are as much concerned with the intentional creation of co-operative behaviour and communal reciprocity as they are with producing economic welfare (Lietaer, 2001; *www.transaction.net/money.com*).

The *actual* benefits of LETS are yet to be thoroughly assessed; but it is clear that they can help to combat economic disadvantage and foster social solidarity. The unemployed are disproportionately represented, but a large percentage of LETS members are from the self-employed middle class who follow an environmental and "alternative lifestyle" ethos (Williams, 1996). However, there is evidence to suggest that the effects of LETS might not be as unequivocally beneficial to the disadvantaged, as is generally argued. In unintended ways, they might even *increase* levels of inequality. For example, middle class resources like tools and equipment and scarce skills and knowledge earn media of exchange credits with very little expenditure of time. Conversely, the lower classes typically offer time-consuming, labour-intensive services. Moreover, if – as some have advocated – LETS schemes were to expand and penetrate the mainstream economy as a complementary currency, then this would almost certainly be to the advantage of the middle class possessors of legal tender. The possessors of legal tender would only participate in LETS if it were to their advantage and, for example, the middle classes could accumulate LETS credits at a very favourable rate of exchange with which to hire female domestic servants (Bowring, 1998, p. 104). Unless LETS remain relatively closed and marginal to the wider economy, they could perversely intensify inequality.

### *Local currencies*

Local currencies are closer in structure and operation to proper monetary systems than LETS/SEL. The idea of an alternative value standard has, of course, long



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been a part of socialist egalitarian writing; but the modern version of Time Dollars was devised by the Washington law professor Edgar Cahn in 1986 (Boyle, 1999). The essential idea is that the Time Dollars circulate freely, as opposed to the matched offers and wants of a LETS/SEL. Most local currencies are to be found in the United States, but there are signs that these are now spreading (Boyle, 1999; Lietaer, 2001). The best known local currency, Ithaca Hours, was launched in 1991. It is estimated that this currency is used by over 2% of the population of Ithaca (27 000), including 300 businesses, and by 1996 had financed $1.5 billion transactions (*The Wall Street Journal*, 27 June 1996). The system is organised by a group of community activists who meet twice monthly to make decisions about the supply of the Ithaca Hours notes and to draft the newspaper that lists those businesses that will accept them in full or part payment.

Some rather confused claims have been made for the time standard of value. Some argued that this unit of currency does not reproduce inequality in the formal economy "since every hour worked… is equivalent in value" (Bowring, 1998, p. 109). But of course this would only be true if an authority had forged a *monetary space* by the imposition of a money of account and standard of value – by consensus, coercion or a mixture of both. Moreover, unless the possessors of marketable skills and commodities are willing to accept such an egalitarian non-market standard, the systems tend to reproduce the pattern of inequality of the social structure in which they are found. In fact, Ithaca Hours are a "shadow" currency in so much as each unit has a value of $10, which is around the hourly average minimum wage in the area. In some of the smaller local currency systems, where an attempt is made to maintain a genuine time standard, there is evidence that non-market exchange norms might develop. But, as in Montpelier (the state capital of Vermont), lawyers charge five Hours per hour and babysitters half an Hour per hour (*Economist*, 28 June 1997, p. 65).

As with LETS/SEL, the relatively narrow range of goods and services on offer reduces the liquidity of local currencies. In the words of a participant of the Montpelier scheme: "You can only have so many massages and aromatherapies in your lifetime" (*Economist*, 28 June 1997, p. 65). Where local currencies are authentically complementary and expand, they will, at some stage or other, attract the attention of the state's tax authorities.

In any event, unless they can be used to form a basis for a shadow banking system, local currencies also are limited to a medium of exchange function, and restrict their holders to a relatively passive role in the capitalist economy. Like their close relation LETS/SEL, whatever advantages local currencies confer, they do so precisely because they are local. They are embedded in local trading networks in which money is a "neutral veil", as in conventional economic theory. But, local currencies do not give rise to the creation of pure abstract value in the form of the social relation of credit-debt; consequently, no money in this sense is created



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"endogenously" through the extension of bank lending. Only in a very small minority of atypical cases – as in Harvey, North Dakota (population 2 300) – have local banks accepted deposits of local money (*The Wall Street Journal*, 27 June 1996). Significantly, these are lent interest free in order not to compete with the formal banking system. However, it is argued that LETS/SEL and local currencies would provide more effective self-help if they were to be integrated with existing credit unions.

*Credit unions and micro-finance*

Credit unions are mutual savings and lending associations; they are usually non-profit-making. They are commonplace in Anglo-American-type economies – apart from the United Kingdom. One in four Australians belongs to a credit union, but in the United Kingdom the figure is only 1 in 300. However, credit unions are expanding everywhere (Lietaer, 2001). Since their first appearance in the modern era during the 1930s, they have been subjected to regulation that is designed to minimise any encroachment on the formal banking system's right to create credit money. In general terms, regulative controls require that credit unions be embedded in some social collectivity with a "common bond" or "bond of association" – such as a local community or occupational group.

On first inspection, credit unions would appear to be unequivocal examples of mutual communitarian self-help; but, to an even greater extent than other forms of local money and finance, they have contradictory effects. Obviously, if loans are to be provided from savings, credit unions cannot be composed entirely of the dispossessed and financially "excluded"; and this feature has a perverse consequence. In the formal financial system, higher income groups have excess savings over debt, whereas the converse is the case in lower income groups. However, it has been found that this relation is often reversed in credit unions where, in order to take advantage of the low interest rates, the higher income groups have excess borrowing over saving; and lower income groups save more than they borrow. As they stand, then, many credit unions are sources of inequality as they effect transfers from the poor to the rich. In almost every country, any serious attempt to relax the constraining "bond of association" is resisted by the banking system and, if the local exchange systems were to join forces with the banks, the opposition would be that much more vigorous.[12]

**Conclusions**

The extent to which CIT has produced and could produce alternative or complementary money has been exaggerated. However, there are now clear indications that the early euphoria has been tempered. E-money has not grown as expected, and there have been some recent failures of leading "moneys"



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(*The Industry Standard: The News Magazine of the Internet Economy*, 5 February 2001; *www.thestandard.com.au/artcile_print*/0,1454,12508,00). The viability of these new forms of money is usually discussed with reference, first, to their efficiency considered in relation to user costs and benefits (Godschalk and Krueger, 2000) and secondly, in relation to the reaction of states to any encroachment on their monopoly of issue. However, it has been argued here that much of the conjecture and almost all the hyperbole of the early work on e-money has been the result of its conceptualisation of money *exclusively* in terms of the function of medium of exchange. Many of the debates are strikingly similar in their confusion to those that arose with the acceleration of the transition from metal to paper during the 19th century.

However, strong doubts about the revival of these 19th century hopes should not lead us to overlook the consequences of any possible small-scale erosion of legal tender. Monetary fragmentation into localised media of exchange networks is made easier by CIT. However, these would most certainly not be neutral or as benign as is generally assumed; rather, they are more likely to increase inequalities of the kind outlined above. Furthermore, even the development of the extensive electronic transmission of money in the established payments system would not be without similar consequences. Obviously, to use electronically stored and transmitted money one must have the appropriate hard- and software and be part of a network. If, as seems to be the case, these systems prove to be more cost-efficient, the gap between the privileged global elite and the excluded monetary circuits will widen further. Moreover, governments wishing to strengthen monetary networks for those excluded from the mainstream will face strong opposition from the banking system – as occurred in the 1930s. Established banks are reluctant both to participate in such schemes and to permit such potential competition. For example, the British New Labour Government has had to dilute its proposal to set up a "universal bank" and electronic giro network for low-income groups (*Financial Times*, 2 May 2001).

Circuits of economic exchange obviously have been able to create their own *media of exchange* that are based, to some extent, on *interpersonal trust and confidence*. But if the base for the confidence has no foundation beyond the economic exchanges themselves, then the media of exchange will remain what anthropologists refer to as "limited purpose money". The Internet is seen by some as the means for a limitless extension of such networks (Hart, 2000). The creation of extensive monetary spaces requires social and political relations that necessarily exist independently of any networks of exchange transactions. The extension of monetary relations across time and space requires *impersonal trust and legitimacy*. Historically, this has been the work of states. However, it must not be forgotten that, before the money of the realm came to be the trusted and beloved symbol of national sovereignty, states were compelled to maim and execute those who would not use it. Monetary space is circumscribed by the authoritative money of



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account that defines the abstract value that constitutes the legal means of payment for the unilateral settlement of debt. There are compelling theoretical, empirical and historical grounds for rejecting both the Hayekian conjectures on the advent of truly competitive money and also the Walrasian "end of money" scenario. The romantic communitarian and socialist vision of the expression of the peoples' "real" wealth in their own money is equally flawed (Hart, 2000, p. 311). Narrowly economic relations between people cannot form the basis for monetary space that enables the extension of these relations across time and space. Although the Internet extends the *technical capacity* to expand the economic exchanges to an almost infinite extent, it cannot provide the *monetary space* that would enable this to happen. The world cannot be "run on Windows" (Hawthorn, 2000).



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## Notes

1. For a concise explanation of the concept of the "real" economy, see Schumpeter, 1994 [1954], p. 227.
2. With the cessation of minting after the fall of Rome, there occurred – to use the great French historian Bloch's term – a "décrochement" of media of exchange and moneys of account across Europe. Charlemagne established by fiat an abstract money of account in pounds, shillings and pence in the ratios of 20: 12: 240 (see also Einuadi, 1953 [1936]; Innes, 1913). These values were never minted, and later the value of the various silver coins in medieval Europe was established nominally by the sovereigns and not by their metallic content.
3. Critics of the credit or claim theory of money argue that money cannot be created *ex nihilo* in this way. But this unremitting materialist argument cannot understand that the promise to pay is not *ex nihilo* – it is a social relation. Ultimately, the goods for money to buy must be available, but that is another matter.
4. The real world would, at last, have provided an answer to Samuelson's famous question as to why bonds and other financial assets could not be money. See Samuelson, 1966 [1958].
5. These assets are the equivalent of Menger's most tradable commodity, in his account of the transition from barter to money (1892).
6. Moreover, the gold standard was actually a gold-sterling standard, based on the credit-creating capacity of the City of London – which, in essence, was an expression of Great Britain's hegemony (Ingham, 1994).
7. See the extreme economic liberal view that "[u]ltimately, the competition for the standard of value should be no different to the competitive market of multiple providers we see for toothpaste and shoes" (Matonis, "Digital Cash and Monetary Freedom", quoted in C. Denny, "Electric Currency Could Trash Cash", *Guardian*, 4 November 1999).
8. It should be noted that the pivotal question of money of account, typically, is not addressed in these speculations.
9. Cohen approvingly cites Walter Wriston's completely inaccurate economic liberal historical conjecture that "[a]s in ancient times, anyone can announce the issuance of his or her brand of private cash and then try to convince people that it has value" (Wriston, 1998, p. 340).
10. At that time, US deficits led to the accumulation of very large foreign holdings of dollars that, in conjunction with loose regulation in the City of London, eventually put pressure on the postwar Bretton Woods system (Ingham, 1994; Helleiner, 1999).



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11. Cohen stresses the importance of "dollarisation", but does not appear to see that this contradicts his argument at least to some extent. The existence of e-money transmission would enhance the ability of the global plutocracy to move into the strongest currencies.
12. In the United States, for example, a relaxation of the bond of association rule in 1982 led to a great expansion of credit union membership. In 1998, however, the Supreme Court decided in favour of the banks' petition that the relaxation violated the original Federal Credit Union Act (1934). If new legislation permits relaxation, it appears that banks would try to swallow the credit unions with attractive schemes that offered greater security and larger loans (see *www.nolo.com*). In some instances, banks have forged links with credit unions and have set up loan facilities for those groups who fall below the credit rating threshold.



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*Chapter 6*

# Singapore Electronic Legal Tender (SELT) – A Proposed Concept

*by*

*Low Siang Kok*
Director (Quality), Board of Commissioners of Currency
Singapore

The Board of Commissioners of Currency, Singapore (BCCS) was established on 7 April 1967 by the enactment of the Currency Act (Chapter 69). It has the sole right to issue currency notes and coins as legal tender in Singapore. The implications of legal tender are as follows:

*a*) Currency notes and coins issued by the Board are legal tender for the purpose of discharging debt or paying for goods and services where the method of payment has not been previously stipulated.

*b*) Any creditor who refuses to accept currency notes and coins from the debtor is discharged from the debts though he can still recover the debt, but only by court action. In such an event, the debtor is entitled to recover the costs of the action from the creditor.

*c*) Providers of goods and services in the market are free to set conditions upon which they will supply goods and services. If a merchant stipulates that he will supply a service only if payment is made electronically, he can refuse the service if payment is offered by some other method.

BCCS has been exploring ways and means of improving the efficiency of currency operations and reducing the cost of cash handling. A survey conducted by the *Asian Bankers Journal*, covering East Asia and the Pacific Rim, has found the cost of handling physical cash in Singapore to be the lowest.[1] Nevertheless, it still cost the economy S$656 million in 1998 to support local currency in circulation, and the cost of handling cash is projected to exceed S$1 billion by 2006. It is therefore necessary to continue the search for a cheaper medium of exchange.

Currency issuing authorities of several developed countries have also been examining the feasibility of issuing electronic legal tender. The US Trea-



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sury, the Bank of Canada[2] and Bank of Japan[3] have studied the impact of electronic money on monetary policy and currency in circulation and the issue of electronic legal tender. No conclusions have yet been reached by the US Treasury or the Bank of Canada. The Bank of Japan had, in their report "Implications of Central Bank E-Money", indicated that ultimately e-money would be issued by the central bank, reducing the use of commercial banks' deposits as a means of payment.

But BCCS envisages that an electronic legal tender system would reduce the cost of handling physical cash, improve the efficiency of business transactions and boost the cashless business environment for Singapore. It would also support the government's drive to turn Singapore into a cashless society. At its strategic planning seminar in 1998, BCCS set as its corporate vision the introduction of a Singapore electronic legal tender (SELT) within 10 years. The project is only at the conceptual stage.

### Reasons for SELT

The sole function of BCCS is to issue currency that is legal tender in Singapore. In addition to an annual expenditure of some S$50 million incurred by BCCS to manage the currency issue function, a survey conducted by the *Asian Bankers Journal* has found that it cost the economy S$656 million in 1998 to support local currency in circulation, and the cost of handling cash is projected to exceed S$1 billion by 2006. BCCS's quest for an alternative form of legal tender to physical currency notes and coins is driven by the high and rising costs of handling notes and coins.

The importance of the role that legal tender plays in any economy cannot be taken too lightly. This is because a country's legal tender currency is a crucial part of the country's economic infrastructure to facilitate trade and commerce. Given the evolution of money and the development in cryptographic and smart chip technology, the transformation of paper and metal currency to electronic currency would be inevitable.

Like all other government departments, statutory boards and government-linked companies, each of which has a role in improving the country's economic and technological infrastructure, BCCS has to search for a more efficient legal tender and to establish a system that could bring about overall efficiency in micro-payment transactions. The issuance of a legal tender currency, whatever form it takes, remains the responsibility of BCCS. BCCS has to act responsibly to adapt to the rapidly changing environment. Other reasons for SELT are:

#### *Banks*

The switch to SELT will reduce their costs associated with processing, storing and safeguarding currency. Banks also stand to gain from not having to incur capital



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expenditure for renewing and replacing cash counting, accepting and dispensing equipment. In terms of ATMs alone, there are currently near to 1 000 units installed throughout Singapore.

### *Retailers*

Retailers too would benefit from a reduction of costs associated with processing, storing and safeguarding physical cash. More importantly, SELT facilitates speedier business transactions, thereby reducing queues and increasing customer satisfaction.

### *Consumers*

SELT, with its offline capabilities, offers convenience to the ordinary consumer who will also pay less bank charges. The incorporation of a password to lock the smart chips is an added protection for the ordinary consumer against criminal acts such as theft and robbery. Another point to note is that subject to the design of the system, the consumers could earn interest on unspent SELT.

### *Government policies*

SELT is in line with the Singapore Government's effort to create a pro-enterprise e-commerce and cashless business environment. On the other hand, BCCS's perpetual issue of currency notes and coins is not consistent with the government's cashless payment policies.

### *Evolution of money*

Barter trade has been practised since time immemorial. In many ancient communities, cattle, including cows, sheep and camels, were the first and oldest form of money. With the advent of agriculture came the use of grain and other vegetable or plant products as standard forms of barter.

China was the first to use cowries, the shell of a mollusc, as money. Many other societies had also used cowries as money, and even as recently as the middle of the 20th century cowries had been used as money in some parts of Africa.

Metal money has been in use for some 3 000 years. Bronze and copper cowrie imitations were first manufactured in China. Metal tool money, such as knife and spade monies, was also first used in China. These early metal monies developed into primitive versions of round coins. Chinese coins were made of base metals, often containing holes so they could be strung together.

Outside China, the first coins were of precious metal, usually in the form of lumps of silver. They soon took the familiar round form of today, and were stamped with the images of gods and emperors to mark their authenticity. These



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early coins first appeared in the 7th century BC in Lydia, which is part of present-day Turkey, and the techniques were copied and further refined by the Greek, Persian, Macedonian and Roman empires.

The first currency notes were used by North American Indians. They were pieces of white deerskin, each about a foot square, with colourful borders. The first paper banknotes appeared in China about 500 years ago.[4] Elsewhere, paper currency appeared in Sweden, issued by the Bank of Stockholm, about 400 years ago.

Currency will continue to change and evolve. Developments in cryptography have brought about digital currency. The science of cryptography, which is the science of keeping digital data secure, makes this possible. The eventual transformation of paper and metal currency to SELT is inevitable. This transformation began in the early 1990s in Europe in the form of Mondex, Setpurse, Danmont and Proton cards. As the technology and people were not ready then, these projects were not too successful. But technology is improving rapidly and people are now better educated. SELT will become an important new currency of the future.

### Why SELT?

BCCS sees SELT as having many advantages over cashcards issued by private banks.

Firstly, the widespread use of cashcards would eventually lead to the demise of legal tender and the re-emergence of free banking, a system of competitive issue of bank notes by private banks that led to serious crises in the banking system in some countries in the 19th century. The crises, which were massive defaults in the full redemption of notes issued, led to public demand for government intervention, and subsequently governments the world over took over the currency issue function. The Bank of Japan in their e-money study concluded that ultimately, e-money would be issued by the central bank.

Secondly, we contend that although banks in Singapore are well-regulated, they can still fail, as evidenced by the 1997 Asian financial crisis.

Thirdly, the currency issuing authority benefits from seignorage, which is the difference between the face value of the currency and the cost of issuing this currency. With private banking, the seignorage would be lost to the banks.

### SELT concept

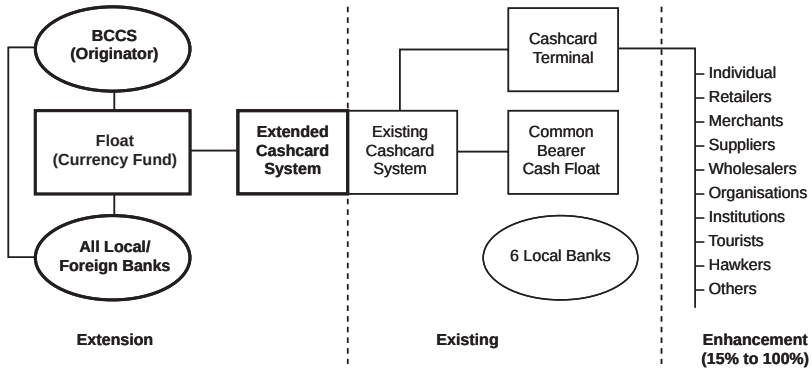
BCCS is taking advantage of the NETS infrastructure for the SELT system and building on it, through enhancement and extension. This approach allows the government to minimise capital investment and to implement SELT quickly.

We conceptualised that SELT would be generated in the form of electronic pulses and issued as Singapore dollars. Each bank would draw SELT in Singapore



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Figure 1. **SELT Concept**




dollar value from BCCS and SELT would be loaded remotely into the bank's designated computer.

Any person who requires Singapore currency could draw down from their account with the bank and download SELT value onto smart chip devices such as handheld computers, mobile phones and watches. The system would enable any person to transact using SELT any time, anywhere using any device.

SELT can then be used to make a payment to a merchant or anyone having a compatible smart ship device. To protect the consumer, the smart chip can be set to hold only a limited value.

### Cost of the SELT system

The cost of enhancing and extending the NETS existing infrastructure to all parts of Singapore is estimated at S$360 million, to be spent over seven years.

### *Monetary supply and policy consideration*

BCCS has consulted overseas and local economists on the possible implications of SELT for Singapore monetary policy and money supply. The conclusion was that the issue of SELT would have minimum impact on Singapore monetary policy and money supply. This advice was confirmed by MAS Economics Department. MAS does not see SELT affecting the Singapore monetary policy framework.



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### *Social and cultural implications*

The proposed introduction of SELT was reflected in the 1999 BCCS Currency Survey. In that survey, more than 85% of the respondents were in favour of introducing SELT. BCCS has also considered the impact of SELT on households, small businesses, hawkers, professionals, students, the visually impaired, tourists and people from other walks of life.

BCCS's preliminary conclusion is that SELT will be convenient for households and students. School children will have no problem since it is already in the government's plan that the school pass come with a smart chip. SELT could be incorporated into the student pass that could be used for payment of meals, public transport or books. Remote booking of facilities such as tennis courts and concurrent payment could be accomplished with the touch of a finger.

Housewives will find SELT safe and easy to use since it will be accepted everywhere in supermarkets, neighbourhood shops and even wet markets.

As for itinerant hawkers, they could be provided with affordable wireless terminals to accept and dispense SELT. But such hawkers have disappeared. A good example is the road-side cobbler. Gradually, he is being replaced by the "Mr Minit" key and shoe stores in shopping malls and supermarkets. As all trades and businesses evolve and transform over time, so must the mode of payment to facilitate commerce. SELT will be an appropriate medium of exchange.

Professionals will probably be the least affected as they are likely to be IT-savvy and adapt well to new technology. An added attraction for professionals is that it would be cheaper to use than credit cards.

There are low-cost audio devices to help the visually impaired accept and dispense SELT. Technology is also currently available to allow the collection of small charity donations electronically. In addition, BCCS could work with the STPB and tourist agencies to address the needs of the tourists. Cross-border terminals could easily be set up as in the case of NETS Cashcard terminals at the Causeway Checkpoints. The concept of anytime-anywhere-anydevice will enable SELT transactions to be carried out virtually anywhere.

However, there remains a need to change deeply ingrained habits and mindsets. A communication and education committee will be set up to mount a massive publicity and educational programme prior to the launch of SELT.

### *Consultation*

Consultation with other government authorities on SELT began in 1998 and they have given their support. To date, BCCS has also discussed SELT with CASE, banks and the public transport companies and they have also given their support.



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BCCS also has the support of e-commerce expert and former President of CASE, Dr Toh See Kiat.

The proposed introduction of SELT was also included in the 1999 Currency Survey. In that survey, more than 85% of the respondents were in favour of introducing SELT. A communication and education committee would be set up to mount a massive publicity and education programme prior to the launch of SELT.

**Alternatives**

One alternative to SELT is to let NETS cashcards and other stored value cards be issued alongside physical cash. BCCS would passively continue to issue cash on demand. This continued issue of paper and metal currency would not be consistent with the government's policy to create a cashless business environment in Singapore. Moreover, so long as BCCS perpetuates the issue of currency notes and coins, the momentum to go cashless would be impeded as, given a choice, people would opt for the familiar medium.

The second alternative is for MAS to continue to regulate the issue of common-user stored value cards, but in addition government would legislate for electronic payments to be accepted as legal tender. In this approach, merchants covered by the legislation must then accept electronic payment if tendered. BCCS could stop the issue of legal tender. This approach would be tantamount to legalising private banking.

The third alternative is for BCCS to play the role of a regulator to regulate, set standards and act as an underwriter of electronic money. The proposal by Associate Professor Lu Ding of NUS is a system of competitive issue of electronic money by commercial banks and for BCCS to guarantee such issue. The proposal requires the government to bail out banks which fail.

BCCS does not think that any of the above alternatives are better than BCCS actively developing and implementing the SELT system.

**BCCS strategies**

Viewed from all perspectives, SELT does have many advantages over physical currency. As the economy becomes increasingly digitised, the majority of the population will by then be on the right side of the digital divide. They would prefer to transact in the virtual mode, rather than in the physical mode, and at electronic speed, using a wide range of portable devices. The use of physical currency will inevitably lessen, possibly disappearing altogether as a means of payment one day. SELT would be a most appropriate substitute for currency notes and coins.



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Table 1. **Phase I Cost Estimates**

| | Component breakdown | Cost estimates S$ |
|---|---|---|
| 1 | Technical Feasibility Study | 500 000 |
| 2 | Upgrade NETS and banks applications and software for Pilot Testing | 1 780 000 |
| 3 | Provision of smart-chip cards to 10 000 participants on the pilot test @ S$20 per card | 200 000 |
| 4 | Provision of terminals and devices to 100 retailers, banks for the pilot test @ S$200 per device | 20 000 |
| | Total estimated cost | 2 500 000 |

Some would argue that notwithstanding the advantages, the public would continue to use physical cash because they are familiar with and trust in currency notes and coins. Although BCCS expects only initial resistance, particularly from the less IT-savvy strata of the population, it has mapped out the following strategies to address all perceivable issues:

*a*) Strategy to overcome social misconceptions of SELT.

*b*) Strategy to overcome the IT divide.

*c*) Strategy to overcome fear and resistance to change.

*d*) Strategy to make SELT the right choice.

*e*) Strategy to develop the cheapest electronic legal tender system.

*f*) Strategy to position SELT as the next generation payment system to replace all other cards.

*g*) Strategy to patent SELT and provide consultancy services for the development of electronic legal tender.

**Action plan**

In view of the substantial investment to be made on the SELT project, as well as the impact it would have on the entire Singapore population, the project should be taken forward in phases.

In Phase I, NETS is to be tasked with enhancing and expanding the system application and support software to develop a prototype and conduct a small pilot test by 2003. The cost estimates of Phase I are set out in Table 1. At the same time, BCCS would ask its lawyers specialising in IT and e-payment systems to



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examine the legal and legislation issues in consultation with the attorney-general's chambers. Policy and financial issues would also be examined and resolved.

Phase II would focus on SELT system development and defining how the system would accomplish what it is supposed to do. This phase would include data modelling, process modelling, interface design, and partitioning the system's requirements into versions that can be delivered in rapid succession. Phase II would also involve another pilot test covering a wider area, *e.g.* one HDB estate.

Phase III is the system evaluation and review phase. It would allow NETS to obtain customer feedback, evaluate their initial design and modify it to better meet the needs of the customer. Incremental changes to or refinement of the existing application software and support systems thereafter would be expected.

Phase IV would be a national roll-out targeted for 2008.

## Notes

1. "The Cost of Handling Cash: Cash Handling Strategies for Asia", *Asian Bankers Journal*, 1998.
2. "The Electronic Purse: An Overview of Recent Developments and Policy Issues", Bank of Canada, 1996.
3. "Implications of Central Bank E-Money", Bank of Japan, February 2001 (see Appendix 5).
4. A *History of Money from Ancient Times to the Present Day*, Revised Edition. Cardiff: University of Wales Press, 1996.



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# Addresses by

- **Ms *Lydie* Polfer,** Vice Prime Minister and Minister of Foreign Affairs and External Trade, Luxembourg;
- **Mr *Donald* J. *Johnston*,** Secretary-General of the OECD;
- **Mr *Luc* *Frieden*,** Minister of Treasury and Budget, Luxembourg;

on the occasion of the opening of the OECD Forum for the Future conference on "The Future of Money", 11th July 2001, in the "Hémicycle européen" of the Kirchberg Conference Centre, Luxembourg.



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# Address by Ms. Lydie Polfer, Deputy Prime Minister and Minister of Foreign Affairs and Trade, Luxembourg

"Money is an illusion". Those words, which appear in Aristotle's P*olitics*, can serve as our guide throughout this opening session of the conference on "The Future of Money", organised by the Organisation for Economic Co-operation and Development in collaboration with the Luxembourg public and private authorities, to be held until 13 July here in Luxembourg. They remind us that from its earliest appearance, money as a sign of value has been marked by an abstract, symbolic nature. We may even ask whether the movement we see today toward a growing dematerialisation of monetary signs actually corresponds to the very essence of the concept of money. On the other hand, whereas the bank money switchover to the euro went off without any major hitches, can we not – paradoxically – see in the unprecedented operation of putting euro bank notes and coins into circulation the extent to which the material, concrete dimension of money remains a major preoccupation, one we need to take fully into account? We must provide real answers to questions that can arise here and there in view of the profound process of change that we are experiencing, a process that will be completed early next year.

I would also like to mention the invention of the electronic purse, a recent innovation that places the electronic money revolution at the level of our everyday purchases. From the global financial economy to everyday consumption, it is clear that the subject is vast, and the political, social, economic, monetary, prudential and consumer protection-related questions are numerous and important. The development of electronic commerce, which the Luxembourg Government is committed to developing in and from Luxembourg, will accentuate a development already well under way.

Between the virtual and the concrete, between the bank notes you can touch, the coins that jangle in your pocket, and the current realities of the financial economy, which can move colossal sums of money around the globe instantly, money remains an object that fascinates but may also be problematic – as illustrated by



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the phenomenon of money laundering, so difficult to control. Whatever we think, money leaves no one indifferent, especially as to its future.

In attempting to provide answers to the numerous questions triggered by the advent of new virtual forms of money and credit, we are particularly delighted to be able to welcome to Luxembourg the OECD and its Secretary-General, Mr. Donald Johnston, who – through his "Forum for the Future" – launched the idea of organising this conference on "The Future of Money" two years ago. This idea, developed by Professor Michalski and taken up at the time by Mr. Robert Goebbels, was welcomed with great interest by the Luxembourg authorities, in particular the Ministry of Finance, the CSSF, and the Minister of Foreign Affairs, as well as the actors of the financial sectors, the ABBL and Profil.

I gave my full support to this OECD initiative from the outset, because I believe that an important financial centre like Luxembourg should be open to major changes – current and future – both to assess the innovative potential and to measure the possible dangers. This is now a reality and the large and prestigious audience here this evening bears witness to the fact that there is real interest in the topics that will be discussed during this conference. I have no doubt that the contributions that follow mine and the conference discussions tomorrow and the day after will provide some answers, and may even give rise to new questions that will advance the international debate on the subject. I hope that the Luxembourg conference will mark an important moment in that essential debate and contribute to formulating the operational conclusions that are indispensable.

Mr. Secretary-General, as you know, the OECD and Luxembourg have a solid, long-standing association. A founding Member of the OEEC, set up in 1947 to manage the Marshall Plan, and a founding Member of the OECD which took over in 1961, Luxembourg has always considered it an opportunity and a privilege to be able to actively participate in an organisation that has established a lively and permanent dialogue among the main developed economies. It is worth remembering that the organisation you lead, which now has 30 Members, represents countries responsible for two-thirds of the world's production of goods and services. But through the quality of its work and intensity of its relationships with a large number of non-member countries, the OECD's reach also goes well beyond its membership.

In fact, all the political and social actors, all the economic and financial players here in this room today will agree with me when I say that the work carried out by the OECD and the publication of its reports constitute points of reference that cannot be ignored in the public debate. And the very fact that an idea or proposal put forward by the OECD can give rise to a debate, even a controversy, clearly demonstrates that the OECD's action is not without effect and that the organisation fully plays its role of stimulus and inspiration in the debate over public poli-



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cies. The peer pressure method and the exchange of good practices are very useful instruments, and our country has on several occasions benefited from them.

The debates between high-ranking officials organised under your supervision by the OECD in areas as varied and important as managing globalisation and sustainable development – the central topic of our ministerial meeting this year – human capital, electronic commerce and food safety, among others, show that the OECD remains an irreplaceable forum in which the political dialogue among European, American, Asian and Oceanic countries is a living reality that leads to greater mutual understanding, and even a common awareness and shared vision of the major problems of both today and tomorrow. And I can confirm, if confirmation were needed, that Luxembourg intends to be an active participant.

This strategic positioning of the OECD and the renewed visibility of the organisation owe much to your activity as Secretary-General at the head of the organisation since 1996. It was through your impetus that extensive internal reform was carried out, as much at the managerial level as within budget and finance. In addition, there was a major reordering of the work agenda, allowing the OECD's activity to integrate more fully the realities of the 21st century.

Allow me, Mr. Secretary-General, to take this opportunity to offer our heartfelt congratulations on your recently renewed mandate, a clear indication of the confidence that OECD Members – Luxembourg, of course, among them – place in you.

We are all the more pleased that, following your predecessors MM. Van Lennep and Paye, you were able, at the beginning of this second term, to pay an official visit to Luxembourg. During your brief stay you met with His Royal Highness Grand Duke Henri, and many political officials and socioeconomic players whose collective and concerted action have enabled the country welcoming you today to manage its future in its own way. That management may sometimes surprise, but it has also produced – at least at a level commensurate with our scale – results in which we are sufficiently immodest to take pride.

Mr. Secretary-General, ladies and gentlemen, to conclude these brief introductory remarks, and before handing the floor to the other participants in this opening session, allow me to tell you once again how delighted I am that Luxembourg is hosting this important conference on "The Future of Money", an event which also testifies to the close collaboration between the OECD and Luxembourg. And allow me to thank all those who have helped make the event possible, and to wish you full success in the work to come.

I thank you for your attention.



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# Address by Donald J. Johnston, Secretary-General of the OECD

It would seem trite to announce to you that we are in a period of unprecedented change driven by extraordinary advances in science and technology. Some of these scientific and technological advances have led to the phenomenon of globalisation, which carries with it enormous opportunities for the creation of wealth, in both the developed and developing world, through enhanced trade and investment and more competition which will stimulate more innovation. In fact, changes today are coming so quickly, and in so many different areas, that it is difficult for one to imagine what the world will look like even twenty-five years from now, never mind fifty or a hundred.

Pervasive advances in our near future in such areas as information and communications technology, biotechnology, new materials, nanotechnology, transportation, energy and medicine will, I am confident, overshadow the economic and social implications of technological advances flowing in the two centuries following the industrial revolution. I seem to recall a prominent scientist at the end of the 19th century who declared that everything that could be discovered or invented had been discovered or invented. I doubt that anyone would make the same judgement today.

Indeed, the changes today that are taking place through science, technology and rapid innovation derive from the active engagement in research and development of hundreds of thousands of scientists around the globe, who are now well networked through information and communications technologies. It is like one giant computer network of human genius. Compare this with 1799, at the time of the founding of the Royal Institution of Great Britain, when only a handful of people pursued natural sciences. Apart from a small number of them, the absence of communication networks which we enjoy today made synergies between their work extremely difficult.

Despite these positive advances, one can observe much fear of and resistance to globalisation. Can we not attribute this attitude to the rapidity of these changes coming upon us and the feeling of the general citizenry that perhaps things are somewhat out of control? That the move to market liberalisation on



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virtually a global scale, domestically, internationally, has in some way reduced the role and authority of nation states? That it has transferred increased autonomy and authority to the business sector, especially to multinational enterprises, and has raised the commercial interests of a few above the well-being of the populace as a whole? And that the individual, even dutifully exercising his or her own right to vote, has little to say in the evolution or shape of our societies? It seems to me that the demonstrations we witness on a regular basis against globalisation, against genetically modified food, against nuclear energy and so on, and the concomitant rise of the presence of non-governmental organisations (NGOs) in opposition to progress in these areas, are a reflection of this concern.

Indeed, changes and innovations, which historically have generally taken place over a decade or more, now evolve in a much shorter time frame. In other words, we could apply the notion of Moore's Law in computer technology to many other fields as well.

All of this raises important challenges, the most important perhaps being how to bring these rapidly unfolding developments into line with people's ideas of what is a desirable future. How can public policy be developed quickly enough and well communicated so as to relieve the anxiety that has taken hold as a result of an unprecedented breadth and depth of many of the changes within an increasingly one-world community that is central to globalisation?

In this respect the OECD plays a major role, not just by providing a setting where governments can compare policy experiences, seek answers to common problems, and work to improve the international compatibility of policies, but also by acting as a pathfinder – identifying new policy issues, exploring new horizons, and creating new frameworks and platforms for advancing policy discussion and international co-operation. The OECD plays this pathfinder role across a wide spectrum of issues and activities – from biotech, food-safety and competition policy to regulatory reform and climate change.

Having been a Cabinet Minister in the Canadian Government in the early 1980s, I know how difficult it is for politicians to look beyond the election horizon. That is one of the downsides of democracies, because success in politics is measured by electoral success. To what extent, then, does the future have a constituency within that process? This is where the OECD has a key role to play. While an intergovernmental organisation, we are linked to governments both at the level of senior officials and experts, and at the political level. Hence, we are not only in a position, but we are also obliged, to look beyond the next election which, of course, usually has a different date in each one of our Member countries. So we must capture those issues of the future which governments must start preparing for today. I have just cited a few such issues, but the challenge of ageing societies is a very good example. The financial and social impacts of ageing



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societies will start to kick in around the year 2015, initially in Japan and then in other OECD countries. Current social security and pension arrangements are not adequate to address that challenge if they remain unchanged. Therefore, the message of the OECD to Member governments is, start preparing now with the necessary reform measures.

Let me give you some more concrete examples.

On e-commerce, where the OECD is at the forefront of international debate, work has been going on for several years now to promote coherence in analysis of various issues, most notably consumer protection, privacy protection, authentication, infrastructure, analysis of economic impacts, development of statistics, and taxation. This policy work stresses, among other things, the dialogue among stakeholders in the new digital economy, particularly consensus-building on policy between governments, business and civil society, and an integrated approach to regulation and self-regulation. The work has so far resulted in OECD guidelines for consumer protection, practical guidance for privacy protection, and taxation principles.

The OECD is on the leading edge of policy research and innovation in education and learning, focusing more recently on human and social capital and their links to education and lifelong learning. New ways are being explored to ensure that people of all ages make effective use of resources for lifelong learning, for example systems of recognition of competencies, earmarked savings for education and training, and so on.

Much effort has also been devoted to the issue of the digital and knowledge divides that are opening up between industrial and developing countries, but also between rich and poor within industrial countries, as a result of the move to a computerised, knowledge-based society.

OECD Ministers this year were presented with a report on the sources of growth in which the contribution of information and communications technology to economic activity was examined. In the long term, growth clearly depends on building and maintaining an environment that is conducive to innovation and the application of new technologies. This involves ensuring the generation of new knowledge, providing the right skills, making public investment in R&D more effective, and establishing the right incentives for product, process and organisational innovation.

Finally, and more broadly, an important set of activities at the OECD concerns governance – enhancing the efficient functioning of government, and the promotion of good governance in both the public and corporate sectors. The principles at the core of this work are respect for the rule of law; transparency and accountability to democratic institutions; fairness and equity in dealings with citizens;



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clear, transparent and applicable laws and regulations; consistency and coherence in policy formulation; and high standards of ethical behaviour.

Keeping with this tradition of addressing issues of the future which governments must begin to think about today, this conference focuses on the future of money.

The potential for new forms of payment, particularly online and offline e-money, to make major inroads into traditional payment systems in the future is vast, and stems primarily from the application of new technologies.

I know we have experts here and good background papers. I will not dwell on issues with respect to which, in any event, I have no expertise to offer.

However, I would be interested in adding to your deliberations an issue raised by Mervyn King (Deputy Governor of the Bank of England) at the Jackson Hole Symposium in 1999 – namely, the impact of technological innovations on the role of central banks. He suggests, "*There is no reason, in principle, why final settlements could not be carried out by the private sector without the need for clearing through the central bank. The practical implementation of such a system would require much greater computing power than is at present available. But there is no conceptual obstacle to the idea that two individuals engaged in a transaction could settle by a transfer of wealth from one electronic account to another in real time. Pre-agreed algorithms would determine which financial assets were sold by the purchaser of the good or service according to the value of the transaction.*" And he goes on to explore this possibility in some depth, concluding that "*Without such a role in settlements, central banks, in their present form, will no longer exist, nor would money. The need to limit excessive money creation would be replaced by concern to ensure the integrity of the computer systems used for settlement purposes*".

So I would conclude that from the point of view of governments and regulators, the challenges are many and varied, and you have much scope here for exchange of ideas and debate. What can and what should be done to stimulate innovation and facilitate the spread of new forms of money? Will special measures be taken to deal with criminal activity, tax avoidance or infringement of privacy, which did not exist in the past? Finally, there are the questions about monetary policy, such as the role, if any, of central banks in the future and perhaps what tasks and responsibilities the regulatory authorities should take on, should the scenario described by Mervyn King actually emerge.

Unfortunately, I must leave the Conference at the end of today's session, but I very much look forward to the results of your deliberations.

Let me take this opportunity to thank the Government of Luxembourg, the Association des Banques et Banquiers de Luxembourg, and many other sponsors who have made this conference possible.

Thank you.



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# Address by Luc Frieden, Minister of Treasury and Budget and of Justice, Luxembourg

When I first saw the topic of this conference, I saw that this is a rather worrying topic for a Minister of Treasury and Budget because I was wondering whether this topic could imply that some wonder whether there *is* any future for money, and I asked myself what a Minister of Budget and Treasury would do if there is no money anymore. But taking a closer look at the description of this conference, I saw that you were not putting into doubt the *existence* of money as such, but merely discussing what new technological form money may take in the future due to technological changes.

While reflecting on the subject, one should think of how extraordinary the concept of money in our society is and how easy it has made our daily lives over the past centuries. Barter trade still exists in many places in the world for many transactions, but we can no longer imagine barter trade in our daily lives. Nowadays it has become customary to use fiduciary money and scriptural money, to use cyber money and credit and debit cards; we have not even noticed the changes from the old-fashioned style of money to the new one. But this still exists, and the OECD could hardly have chosen a better moment to organise this conference in Luxembourg than the time in which we, together with eleven other countries in the European Union, are going from one currency into another. Or better, in which we for the first time are receiving euros in the form of coins in the traditional way, whereas many people already thought this traditional way of talking about money, of using money, would disappear. So even if we have to think about the technological changes that affect money, we should not forget that the old-fashioned style of money still exists and plays an important role in our life, indeed making it much easier.

I will certainly leave it to the experts attending this conference to examine the consequences of technological changes on money. We as ministers in charge of finance, however, have to follow this debate closely and take into account the conclusions of conferences such as yours, because we have to put into place a legal framework under which financial transactions are carried out, whatever form those



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financial transactions take. Ministers of finance must decide on the most important issues regarding currencies, without which there can be no transactions. It therefore naturally follows that I would like here to touch upon the consequences of the introduction of the euro. Because for many people in Europe, the future of money these days means also the future of their money in whatever form it may come: the future of the euro. Even if intellectually we are perfectly aware that the euro became our common currency two years ago; that there are no exchange rates anymore; that there is but one single policy with one set of interest rates; that cash accounts for no more than a minimal percentage of financial transactions performed in another currency, we are nonetheless deeply conscious that for many of our citizens, the new age will start only once we have the euro in tangible form in our hands.

I think that the passage to actual notes and coins will be one of the biggest and most complex peacetime logistical operations in European history, and carry enormous consequences. These days, armoured trucks all over Europe are bringing these freshly printed notes and coins to our central banks or other places of storage, with a view to distribution to each and every resident at the beginning of the next year or to banks and shops later this year. This is an extraordinary event. It will give new legitimacy and power to the single currency; it will bring people in Europe closer together.

Yes, exchange rates have already disappeared, and we often forget this substantial advantage of having a common currency. Indeed, on the other hand there are also potential minus sides with the European currency, and some only see these. For instance, consumers and workers will note the differences in wages and prices in the coming years much more than they did in the past. Some see that as an advantage, others as a problem. This also means that at the end of the day our markets in all aspects will move closer together, which was what those who decided on the introduction of the common currency a few years ago wanted.

It is of paramount importance, of course, that this changeover is accomplished smoothly. The introduction of the euro in 1999 on a theoretical basis was very well prepared and was done without major problems, although much work went into that operation. We now have to continue the work in view of next year. We must establish the appropriate legal framework. When you visited the Luxembourg Parliament this afternoon, Mr. Secretary-General, we were about to discuss the law on the introduction of the euro, or at least some technical aspects of the introduction, the rounding of some amounts in legislative texts. There is quite a lot of work to be done there by the public authorities; at the same time, with less than six months to go, we now have to put a lot of work into the practical aspects that remain, especially with small businesses that need to be prepared so that they do not face a major problem at the beginning of next year.



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At this conference you are asking questions about the future of money. I would like, on the sidelines of that topic, to ask about the future of our new money, the euro. Ladies and gentlemen, there is no money without trust. Public order and the public good thus require that the management of money lie first and foremost with the state. It is our duty, as politicians who stand responsible for state money, to ensure that the public trusts its money, and that this confidence is and remains justified. Of course, nowadays – and this is very clear for the European currency – that responsibility has been delegated to an independent central bank. They have the task of providing the right quantity of money. But this approach cannot absolve the political authorities from caring about the stability of the currency, both internally and externally. The setting up of an independent central bank vested with the single instrument for setting interest rates to achieve its objective of upholding the purchasing power of money makes it doubly necessary to engage in a close and permanent dialogue between that central bank and the governments. Otherwise, the right policy mix cannot be found.

Therefore, in the euro zone, we must constantly put a lot of stress on that permanent dialogue, on that exchange of views that is necessary between the European central bank and the ministers of finance. We must exchange our views not before microphones at the beginning or at the end of Ecofin Councils, but rather in the conference room, between the president of the European central bank and the ministers of finance. Both must listen to each other and both must, in full respect of their rights and duties under the European treaty, take into account what has been said – especially in the Eurogroup meetings, when they take decisions. We are at the beginning of that exercise, which works much better than some think when they comment on the work of the Eurogroup; that is quite normal because they do not attend these meetings. But we can certainly improve the dialogue. The euro is only at its beginning; I think that in a few years' time we will see good co-ordination between those views, and the policy mix will be accurate.

When the single currency was launched in 1999, an important aspect was the co-ordination of economic policies within the European Union. The broad lines of the euro area economic policies are defined in the Ecofin Council and discussed in the Eurogroup; that as well must become an more important element in *national* politics. Too often I have the impression that we discuss the broad economic guidelines at the European level, but then when national budgets are drawn up or when national political decisions are being taken, those broad economic guidelines are sometimes forgotten. Therefore it is extremely important that mutual evaluation of national budgetary policies are undertaken. This is a sometimes unpleasant exercise for the ministers of budgets who have to go through that exercise, but it keeps everybody on track. That is most important if macroeconomic co-ordination is to remain an important tool in the euro zone.



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Public budgets have a very important role to play. Structure problems, such as implications of ageing populations for the stance of public finance or the need for public investment in education and mobility – topics touched upon by the Secretary-General a few minutes ago – must be analysed in depth within the Eurogroup. We must continue that – and again, we must not forget it when we come home. That also is true for the Grand Duchy of Luxembourg. Some of the debates in the past few weeks should not distract us from what we have undertaken when we submitted stability programmes in Brussels that were approved by national parliaments. I'm not saying that we are diverting from that. The government will strictly adhere to the stability programmes that were submitted to the European Ecofin Council some time ago, which have to be annually adapted. But we have to take into account what is discussed at the European level, because it has a major impact on the strength of our new common currency and of public finance discipline within the euro zone. That is an essential factor not only when countries come into the European Monetary Union – when we had the Maastricht criteria. These stability criteria are extremely important now that the European Monetary Union exists.

That approach toward public budgets is important to achieve mainly two aspects: a stable macroeconomic framework and making tax and benefit systems more employment-friendly. The Luxembourg Government, again, tries to do that through a major tax reform that has started this year and will continue next year.

All that is not only necessary for our euro zone, for our national economies. It is also important if we want to see an increased international use of the euro, which requires certain elements to be in place. Otherwise we cannot one day be in a stronger position *vis-à-vis* the other major international currencies. We do not want to replace them – that has never been the goal of Europe – but we want to have a strong currency *equal* to the other important international currencies. The euro is a strong political symbol of European integration. It must become an internationally used, strong currency. That will take time, but as we are discussing the future of money I'm talking many years ahead. Nevertheless I hope one day to see the euro used as an international reserve currency, as a currency used in international transactions. I also hope one day to see the euro used to pay the bills for the petrol that we import in the European Union. That would put us in a much less uncomfortable situation than we were in the past months.

The idea of introducing a single currency has both political and economic aspects – we should always keep that in mind. If we want to see the full benefits of the European currency, we need to do more than to just look at the currency. I talked about macroeconomic policies and the need to supervise the national policies that are led in that area. The same is true for other aspects. I'm thinking for instance of the increased competition, the increased price transparency to which the euro will lead and, in that context, of the need to have a harmonised financial



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services market in the European Union. Too often I notice that a lot of people want to see the financial services action plan of the European Commission put in place, but when it comes to discussion of the various draft directives that are put forward by the Commission when they are discussed at the Ecofin Council, I think that the political will is sometimes missing. The euro needs a big market in which it can be used; we need a fully integrated financial services sector; and we must always be, in Europe and even further than Europe, leading that ambition to have a fully integrated financial services market in the European Union and in the world. Otherwise financial markets cannot become as competitive as we want them to be.

We must therefore sometimes change some of our national habits. We must be ready to give up some practices to which we have become accustomed. We must, in some areas, give up deferring tax regimes. I'm thinking for instance of the absence of a common tax system for international pension funds. If everybody wants to cook his own soup in his corner, we will not have strong pension funds in Europe. There are many other areas where we need to open up our borders, where we need more Europe, where we need a stronger harmonised financial services sector. That goes for many OECD countries.

Today the money market can, for many practical purposes, already be considered to be fully integrated across the euro area. In the area of bond markets we are progressing a bit more slowly, but I think that will increase in speed over the next few years.

Competition among national capital markets is certainly leading to increased market pressures toward harmonisation, co-operation and consolidation. Again, Luxembourg will be on the side of those who will work for this close co-operation and for the abolition of borders of whatever nature they are if they are hampering the putting into place of a strong financial services sector in Europe.

The future of this currency is of course not only a question for us in the euro zone. The structural implications of the euro are also important for the neighbouring countries, whose economies and financial markets are generally closely linked to those of the euro area. Non-participating countries must assess whether they find that the benefits of maintaining a national monetary policy and autonomy in that area – if one can speak of such autonomy in an integrated and globalised market situation – outweigh the possible drawbacks of remaining outside the monetary union. Experience has shown to many countries, including mine, that those countries that have taken initiative and worked constructively towards European integration have generally been more successful in gaining influence in this process than those seemingly less committed to a common European vision.

The euro will have to perform its monetary role in a competitive environment. Money is whatever is held to be money by fulfilling its basic functions. Legal tender money is more and more in competition with other kinds of money, even if



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eventually many of those different kinds are ultimately linked to state money or based upon it. Money in the future, in whatever guise it will appear – and that is true also for the euro – shall require the attributes and the framework that will permit it to go on fulfilling its standard basic functions in a much more sophisticated and competitive economic environment on the global scale.

Your organisation, Mr. Secretary-General, can usefully contribute to that framework on the basis of its founding Convention. It will have to take as its lodestars the freedom of capital movements, fair competition, assistance to economically weaker countries. While steering along these lines it shall continue its efforts to implement rules of good governance, and to avoid the abuse of those liberties. The commendable efforts of the financial action task force against money laundering, which are strongly supported by the Luxembourg Government, can serve as an example here, and we will support all the efforts to improve the instruments in that area.

The experts that are gathered for this conference will have the possibility tomorrow to discuss the new forms of money, and the implications and uses to which they can be put. I hope that the conclusions of the conference will help us in shaping policies in Europe, in the OECD, in Luxembourg. I'm fully aware that the euro is not the only currency that will have a future; many will. We wonder in what form; I think there will be many different forms. Again, it is our task to put that into a framework so that financial transactions can be done on a basis that is, from a legal point of view, clear – because only clear rules make financial transactions safe and allow the economy to develop at a pace that is fast and secure. That is true for Europe and for many other places in the world, and I think the OECD has a very important role to play in establishing the framework for such transactions.

I wish your conference much success, and hope that when you leave Luxembourg we will know more how our different monies will look a century from now.

Thank you very much.



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*Annex*

# List of Participants

**CHAIRMEN**

Donald J. JOHNSTON
OECD Secretary-General

and

Wolfgang MICHALSKI
Director, OECD International Futures Programme

**PARTICIPANTS**

Peter ACHLEITNER
Director
Oesterreichische Nationalbank
Austria

Michel AGLIETTA
Professeur de sciences économiques
Université de Paris X – Nanterre
France

Pierre BECK
Chef du Département
Systèmes de paiement
Banque centrale du Luxembourg
Luxembourg

Serge BERTHOLOME
Coordinateur de la circulation fiduciaire
Banque Nationale de Belgique
Belgium

Ian DAVEY
Vice President, Research and International
University of South Australia and
Bob Hawke Prime Ministerial Centre
Australia

Juan-Carlos DELRIEU ALCARAZ
Director and Chief Economist
Cemex
Mexico

Frederic DUMONT-ST-PRIEST
Président Directeur Général
Mitsubishi France SA
France

Robert GOEBBELS
Député, Membre de la Commission
économique et monétaire
Parlement européen
Ancien Ministre de l'Économie,
des Travaux publics et des Transports
Luxembourg

Charles GOLDFINGER
Managing Director
Global Electronic Finance Management SA
Belgium

Duck-Soo HAN
Ambassador
Permanent Representative
Delegation of Korea to the OECD



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Jean-Marc HOSCHEIT
Ambassadeur
Représentant permanent
Délégation du Luxembourg
auprès de l'OCDE

Richard L. HUDSON
Managing Editor
The Wall Street Journal Europe
Belgium

Geoffrey INGHAM
Professor of Social and Political Sciences
Cambridge University
United Kingdom

Kazuhiko ISHIDA
Chief Manager
Global Economic Research Division
Bank of Japan
Japan

Yoshio KAMATA
General Manager
Finance Department
Mitsui & Co. Europe Plc
United Kingdom

Riszard KOKOSZCZYNSKI
Vice Governor
National Bank of Poland
Poland

Malte KRUEGER
Visiting Research Fellow
Institute for Prospective Technological Studies (IPTS)
Spain

Mark LAWRENCE
Group General Manager, Risk Management
Australia and New Zealand Banking Corporation (ANZ)
Australia

Mervyn K. LEWIS
National Australia Bank Professor
School of International Business
University of South Australia
Australia

LOW Siang Kok
Director
Board of Commissioners of Currency
Singapore

Seiichi MASUYAMA
Chief Researcher
Center for Policy Research
Nomura Research Institute
Japan

Yves MERSCH
Président
Banque Centrale du Luxembourg
Luxembourg

François MOES
Président de l'Association des banques et banquiers
Luxembourg

Ewald NOWOTNY
Vice President
European Investment Bank

Nikolaus PIPER
Chief Editor, Economics
Süddeutsche Zeitung
Germany

Nobusuke TAMAKI
Senior Research Fellow
National Institute for Research Advancement (NIRA)
Japan

Heiko THIEME
Chairman
American Heritage Management Corp.
United States

Zachary TUMIN
Director of Research
Financial Services Technology Consortium
United States

Giacomo VACIAGO
Professor of Economics
Catholic University of Milan
Italy

Leo VAN HOVE
Professor of Economics
Vrije Universiteit Brussels
Belgium

Norbert VON KUNITZKI
Président
Centre universitaire de Luxembourg
Luxembourg



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Jahn WENNERHOLM
Director
Corporate Marketing and Strategic Business Development
LM Ericsson
Sweden

Sylvain WICKHAM
Président
Groupe Vision de Prospective Industrielle
France

Jan WORONIECKI
Ambassador
Permanent Representative
Delegation of Poland to the OECD

**OECD SECRETARIAT**
**Advisory Unit to the Secretary-General**

Barrie STEVENS
Deputy to the Director

Riel MILLER
Principal Administrator

Pierre-Alain SCHIEB
Counsellor

Norbert SCHUH
Administrator



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