FROM A FREE BANKING PAST TO AN E-CASH FUTURE:

AN ANALYSIS OF PAYMENTS SYSTEM RISKS

AND RESULTING REGULATIONS

by

STEPHEN JAMES TACHOUET

A THESIS

Presented to the Department of Economics
and the Honors College of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Bachelor of Science

June 2001

APPROVED: Jo Anna Gray
Dr. Jo Anna Gray

An Abstract of the Thesis of

Stephen James Tachouet for the degree of Bachelor of Science

in the Department of Economics to be taken June 2001

Title: FROM A FREE BANKING PAST TO AN E-CASH FUTURE: AN ANALYSIS OF PAYMENTS SYSTEM RISKS AND RESULTING REGULATIONS

Approved: Jo Anna Gray
Dr. Jo Anna Gray

Today's electronic cash payments system and that of the Free Banking Era in the United States share many of the same risks. By assessing the similar risks associated with each payments system, a strong argument for the regulation of e-cash can be made. Additionally, an analysis of banking system regulation over the past 150 years can provide insight into how e-cash will be regulated in the future. Although parallels can be drawn between e-cash and free banking, the introduction of the Internet as the new forum for the exchange of e-cash raises concerns regarding the risk of fraud and operational failure. In order to maintain the integrity of the new e-cash payments system, cooperation between the Federal Reserve and Internet Regulatory bodies must produce innovative solutions.

ACKNOWLEDGMENTS

I would like to first and foremost thank Dr. Jo Anna Gray for her support and guidance of this project. Without her open mind and great attention to detail, this project would never have succeeded. I would like to thank Dr. Henry Alley of the Honors College for his ongoing guidance, not only during the lifetime of this project, but throughout my college career and beyond. Additionally, thanks go to Dr. Van Kolpin for his enthusiastic support of this thesis, and for taking me on as an advisee without any knowledge of where I wanted to take this project. Finally, I would like to thank my parents, John and Mary Tachouet. Only with their love and full-hearted support have I achieved anything.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I: INTRODUCTION

The term "fast money" is beginning to take on a whole new meaning. The Internet is destined to dominate the landscape of twenty-first century media, and it is helping to transform the way players in our economy view money. Both businesses and individuals alike are turning to the Internet to manage their money. Online bill paying has become easier than ever as banks today are beginning to leverage the power and convenience of the Internet in managing their operations. While banks have sought to go online and offer customers easier access to their accounts, some private firms have sought to replace the online presence of banks and credit card companies with digital currency. The developers of Internet money for online consumer purchases, or e-cash, are seeking to create digital money for the information superhighway.

Although e-cash sounds like a futuristic version of money's current role in the payments system, its development has in many ways taken currency back 150 years. Whoever said that history repeats itself must have seen this one coming, because e-cash revives images of the private currencies issued during the mid nineteenth century. The Free Banking Era (1837-1863) in the United States was a time when banks were allowed to issue their own private notes of currency, and in many ways the issuers of e-cash are doing exactly the same thing. The Free Banking Era is historically considered a failure on a number of levels, not the least of which was a risky payments system. E-cash poses many of the same risks to the payments system as privately issued bank notes of the Free Banking Era posed, with some interesting additions of risks attributable to the Internet.

Very little in the way of economic literature has been written about the development of e-cash. E-cash has been discussed primarily in such popular magazines as Forbes and Internet World. Some banking journals, including that of the American Banker's Association (ABA Banking Journal), have touched on the future effect of e-cash in the banking industry. James McAndrews, an economist at the Federal Reserve Bank of New York, has addressed payments system risks imposed by e-cash. McAndrews and his colleagues have not, however, focused on the similarities between today's e-cash payments system and that of the Free Banking Era.

Both e-cash and privately issued currency of the Free Banking Era present numerous risks to the payments system. These risks are measured and discussed, using the risks of the Free Banking Era as benchmarks in assessing the threats e-cash may pose to a smoothly running payments system. E-cash and the bank notes of the Free Banking Era share a few serious forms of payments system risk, including solvency, liquidity, and fraud risk. E-cash, however, presents some interesting new operational and systemic risks not found during the Free Banking Era. By looking closely at the similarities and differences of the free banking and e-cash payments systems, we can gather insight into the structure and regulation of the future United States financial system.

CHAPTER II: THE STORY OF E-CASH

Money and Payments Systems

In order for one to gain an understanding of how e-cash is actually a new version of money, it is important to understand how money is defined at its most basic level. Money has three distinct properties (Mishkin, 49). Firstly, money is defined as a medium of exchange, meaning that it is exchanged for goods and services. Barter was the first form of exchange, but was extremely inefficient. In a bartering system, people exchange goods and services for other goods and services directly. Thus, if you possess some good A that you wish to exchange for good B, you must find someone who possesses good B and also wishes to exchange it for good A. This trade requires a "double coincidence of wants". Money's job is to replace the extremely large amount of time and energy needed to form such matches.

Secondly, money is defined as a unit of account. A unit of account is used to measure value in the economy. Goods and services are valued in terms of dollars in the United States. By using money as a measure of value, we have one way of evaluating whether goods and services are expensive or cheap. In a barter economy, every good and service must be valued by measuring it compared to every other good and service available, since they are exchanged directly for one another. The benefits of using money grow as the number of goods and services grow. Money thus reduces transactions costs,

which means that money makes it cheaper for a person to purchases goods and services because they use less time and brain power.

Lastly, money is defined as a store of value. Money is a repository of purchasing power over time. As we receive income in the form of money, we can put it away and purchase goods and services sometime in the future. Money is not the only store of value in the economy. Any asset that a person holds, such as a house, corporate stock, or bonds, also maintains value over time. Money is unique, however, in that it is the most liquid of assets. Money can be converted into a medium of exchange far easier than any other asset. In fact, unlike other assets, money *is* a medium of exchange.

Now that money has been given a clear definition, we turn our attention to the role that money plays in the payments system. The payments system is the method of conducting transactions in the economy (Mishkin, 52). Payments were originally made several hundred years ago using precious metals such as gold or silver. Since precious metals were of some value to nearly everyone, they were a good form of money. When used in large quantities, however, precious metals are burdensome to lug around, thus making payments for "big ticket" items inconvenient.

Paper currency was developed because of the difficulty of transporting precious metals. Today, paper currency in most countries has evolved into fiat money. Fiat money is paper currency which has been decreed by a government to be legal tender. Fiat money must therefore be accepted by everyone for payment of any good or service (Mishkin, 53). The dollar serves as the United States' form of fiat money. Merchants are obligated by the United States government to accept dollar bills as payment for goods and

services. The bank notes of the Free Banking Era and present-day e-cash are similar in that neither carries the legal weight and credibility of government. Although both means of payments can be classified as money, neither can be classified as fiat money since neither are, or were, convertible by law to other items that behave as a store of value.

E-Cash and E-Commerce

As the use of the Internet has increased exponentially in the past decade, consumer e-commerce has been slow to grow. Many Internet users are quite wary of making online purchases. By far, most online purchases are made by transferring the consumer's personal information across unsecured networks, often credit card numbers. According to TheStandard.com, 95% of online purchases are made using credit cards, and 60% of those individuals making purchases worry about having their credit card numbers stolen (Lawrence, 1). Although the wariness of consumers remains strong, e-commerce is catching up with general Internet usage very quickly. Consumer e-commerce in 2000 reached $45 billion and is expected to reach $269 billion by the year 2005 ("TheStandard.com: 100 numbers you need to know").

E-cash is becoming a growing part of the expanding e-commerce industry as consumers look for safer and more secure ways to make purchases and transfer currency over the ungoverned Internet. E-cash quite simply acts as digital currency for purchases made by consumers at online merchants. The purpose of e-cash purchases online is to replace the use of credit cards and their associated transfer of delicate personal information each time a purchase is made. Its purpose is additionally to facilitate the ease

with which consumer e-commerce is conducted. E-cash replaces the need to transfer credit card information and is settled at the time of transaction completion. The merchant receives e-cash from a consumer just as if the consumer had handed them hard currency.

E-cash is not only being used increasingly in online purchases of consumer goods, but also in the settlement of debts between private individuals. Some private non-bank institutions are using email as a way to facilitate the transfer of e-cash between individuals. Companies are not only providing consumers with the technology behind the service, but are also acting as institutions of settlement as well. The fact that e-cash is being used as an immediate form of settlement between two people is essential in classifying e-cash as digital money, a digital medium of exchange.

E-Cash Founders

E-cash online made its first appearance sometime in 1995. DigiCash was one of the first companies to develop e-cash. Through the DigiCash system, users sent money via a credit card or ATM machine to a bank that issued DigiCash's e-cash. Banks tied to DigiCash's system "created" e-cash tokens, each worth a certain amount in U.S. dollars. The newly created e-cash tokens were then sent to the user via email. DigiCash's detailed method of encryption (encoding the data) insured that the e-cash tokens were unique, and that merchants receiving DigiCash tokens could be assured of their validity. Settlement ran through the traditional banking system, providing an established mechanism for merchants to convert DigiCash tokens into U.S. dollars. Although

DigiCash made a splash as the first issuer of digital currency, the company filed for bankruptcy in 1998 after its partner Mark Twain Bank pulled out of their test pilot.

Another of the early entrants into the e-cash market was First Virtual Holdings, Inc. First Virtual customers opened accounts with the company and transferred funds by either credit or debit cards, similar to customers of DigiCash's system. Consumers subscribing to the system provided merchants with a VirtualPIN. A merchant subscribing to the First Virtual system used this VirtualPIN to reclaim the funds from First Virtual directly. The merchants received an electronic invoice with a consumer's VirtualPIN on it, attached their own merchant ID to the invoice, and then returned the invoice to First Virtual for routing through the established banking system. Settlement in the First Virtual system was thus conducted just as settlement of payments in the non-Internet world. Like DigiCash, the First Virtual system was slow to catch on and the firm burned over $35 million in venture funding before finally selling their system to rival CyberCash, Inc.

CyberCash, the third of the three most well-known early providers of e-cash, initially provided e-cash for download onto consumers' computers. The e-cash was appropriately called CyberCoin. CyberCoin, like DigiCash's e-cash, was intended for use by consumers in paying merchants. Like the others, CyberCoin never caught on with consumers. Today, CyberCash has taken First Virtual's system and modified it to provide business-to-business (B2B) solutions rather than retail payments services. CyberCash's current system involves encrypting credit card numbers on electronic invoices and sending them to merchants. Merchants attach their merchant ID number to

invoices and send them back to CyberCash, who routes the invoices through the banking system for settlement of payments.

E-Cash of the Future: Micropayments and P2P Transfers

Although these pioneers made valiant attempts to create widely held digital currencies, consumers found their systems both difficult and cumbersome to employ. Without a critical mass of consumers wishing to use these systems, merchants were reluctant to accept the currencies. In the last few years, however, a new crop of e-cash providers have focused on making their systems easier to set up and more efficient in settling payments. In addition, the focus of their business is no longer on providing Internet payments solutions for the purchase of mainstream retail goods, but for the purchasing of online content such as news articles and music downloads.

Traditionally, online content providers have relied on advertising fees as a primary source of revenue. In the last few years, however, revenues from advertising have been decreasing drastically. One of the new sources of revenue for online content providers is charging for content on a per-use basis, called micropayments. Micropayments are payments made online in amounts less than $10. Where pioneer companies such as DigiCash and CyberCash provided e-cash that could be used for micropayments, the timing of their offerings were too early. Advertising revenues in the mid to late 1990's flourished, making it unnecessary to charge for online content. In the new millennium, many Internet content providers and users expect micropayments to be the dominant source of revenue in the world of online consumer e-commerce.

New firms such as eCharge and Qpass are focusing on the idea of micropayments, while firms such as Western Union's MoneyZap and PayPal focus on person-to-person (P2P) digital currency transfers. As mentioned earlier, consumers are looking to not only purchase items online, but to make payments to other individuals as well. The failure of such e-cash issuers as DigiCash and First Virtual Holdings has forced new entrants to look in new directions. The future of e-cash at this point appears to be a combination of micropayments and transfer of digital currency between individuals.

Firms vary somewhat in the way they issue e-cash. The eCharge corporation allows users to open up what they call a Net Account, intended to fund micropayments over the Internet. Consumers' accounts are financed in a prepay manner, where funds are transferred from a bank account and balances drawn down as online purchases are made. Additionally, eCharge will charge a consumer's credit card each time, using the information provided to eCharge by the consumer. Two of eCharge's online merchant partners include McAfee and MP3.com. Qpass provides a similar service to that provided by eCharge. Each time a micropayment purchase is made, a Qpass ID is transferred to the merchant's computer and the correct consumer's account is charged. Qpass verifies the ID and the merchant's request, and then charges the purchase to the consumer's credit card. Qpass does not currently offer a pre-paid account.

MoneyZap, a division of Western Union, provides e-cash for P2P transactions. Users open MoneyZap (what Western Union calls the e-cash it issues) accounts and link them with an FDIC insured bank account or a valid credit card. MoneyZap funds can be created by requesting a charge on a consumer's credit card or a transfer from the

identified checking account. Funds are sent to other individuals who hold MoneyZap funds via email. Funds can also be requested from a single person or a group, collecting e-cash for such purposes as group gifts or ski trips. Account holders can transfer their MoneyZap funds back into their checking accounts at any time. Transfers of MoneyZap funds between individuals are instantaneously realized in both accounts, while the transfer of funds into or out of checking accounts takes 2-3 business days.

Commonalities and Concerns

Whether these firms are focusing on micropayments, P2P payments, or both, they share several commonalities. Firstly, balances of e-cash held in the accounts of these companies are not insured by the Federal Deposit Insurance Corporation (FDIC). Unlike demand deposits issued by chartered banks which are insured up to a value of $100,000 by the FDIC, accounts held at these non-banks have no government insurance covering them. If for some reason the firm goes bankrupt or loses a consumer's money, their e-cash accounts may be unrecoverable. One company, PayPal by Citibank, offers fraud insurance of up to $100,000 provided by the Travelers Group ("Terms of Use"). These accounts are not, however, insured against improper investment of a consumer's balances.

Secondly, none of the prepaid accounts held at these non-bank institutions earns interest on the their balances. Like banks, these firms earn interest from investing consumer's account balances in either stocks or bonds, or possibly even short-term loans. Because consumers do not receive any of the interest that firms earn by investing

consumers' deposits, firms are receiving interest-free loans from consumers. When consumers demand that their e-cash balances be converted into dollars, firms may need to sell investments in order to pay their customers. Although acting like banks, private non-banks issuing e-cash do not fall under any regulation requiring that they invest consumer deposits like banks do, or that they keep an amount of e-cash balances as reserves to meet customer's demand for repayment.

Not only are these firms behaving like banks in that they invest the balances of their depositors to make profit, but they are involved in payment settlement as well. Traditionally banks have been the "owners" of the payments system, but the providers of e-cash are seeking to create a new online payments system. The U.S. payments system has been run smoothly under the regulatory supervision of the Federal Reserve for most of the past century. The entry of non-bank firms into the business of payments settlement is of much concern to the Federal Reserve. Specifically, the recent emergence of an online payments system congers up images of an unregulated and unstable period in U.S. banking history known as the Free Banking Era.

CHAPTER III: PRIVATELY ISSUED BANK NOTES OF THE FREE BANKING ERA (1837 – 1863)

When discussing banking in the middle of the nineteenth century, economists have typically focused on two arguments. The first argument relates to the idea of whether or not this country's free banking system could be considered truly "free" banking, since the system did impose a variety of restrictions on banks. Secondly, conservative economists often argue that we should instate a system of true free banking and allow market forces to promote efficiency. Although these issues are both interesting and worthwhile topics for discussion, free banking was eventually abolished in favor of the more nationalist banking system we see today. Our main concern here is exactly why free banking was considered a failure and how parallels can be drawn between free banking of the past and this new concept of e-cash today.

Stylized Facts of True Free Banking

Economists typically recognize three factors in determining whether a banking system is considered true free banking (Sechrest, 3). The first of these is the absence of a central monetary authority. Almost all industrialized nations rely on central banks to oversee and discipline their banking systems. In the United States, the Federal Reserve acts to protect the integrity of the payments system and provide banks with a lender of last resort. If a bank today has problems meeting the demands of depositors for liquidity, it can turn to the Federal Reserve for a loan. In the ideal world of the free banking

advocate, there is no need for a central bank when there are independent banks behaving in a competitive market environment.

A second characteristic of true free banking, or laissez-faire banking, is free entry and exit. Firms should be able to enter the banking industry at will, without being required to qualify for a charter or meet capital requirements. Free entry means that when investors choose to establish a bank, there exist no artificial barriers due to government regulation. Free exit is similar in that banks should be able to liquefy their portfolios and close down when they become insolvent. In order for true free banking to exist, banks would not only be allowed free entry and exit, but would be allowed to have free reign in determining appropriate investment strategies. Free banking would not prohibit banks from investing in certain types of assets, and would place no restrictions on the interest rates paid to depositors.

Lastly, true free banking involves the issue of private bank notes; each bank creates its own currency. Currency issued by banks would be "backed" in whatever form the bank thought most appropriate. Given competitive forces in the banking industry, banks would make responsible loans and investments, appropriately balancing risk and return. Banks that became insolvent, in that their assets become worth less than their liabilities to note holders, would be forced out of business with consequent losses to stockholders and/or depositors.

United States Free Banking (1837 – 1863)

The experiment with free banking in the United States cannot be considered true free banking. Free banking during the period 1837 to 1863 meant state-regulated free banking. Because Andrew Jackson and his followers were opposed to the presence of the federal government in banking, the second effort to introduce a nation bank failed in 1836 when the Second Bank of the United States' charter was not renewed (Capie, 75). Following these events, states were left entirely in control of determining who could become a bank for sometime.

In the Free Banking Era, states were left to decide who qualified for a charter as well as the requirements that must be met in order to qualify. Some states required that investors commit a certain minimum capital amount before they were awarded a bank charter. For instance, a state might have required that investors possess a starting amount of $50,000 in order to back the currency it issued. The minimum amount of capital necessary in New York was $100,000, while it was $25,000 in both Wisconsin and Minnesota (Sechrest, 96).

Of course, free banking statutes did not exist in all states. Some states required that banks obtain charters before issuing currency, making loans, and engaging in other investment opportunities. As of 1860, a number of states including Massachusetts, New York, Pennsylvania, and Ohio, had established free banking statutes (Rockoff, 3). Many

states did not, however, follow suit. A few states that never permitted free banking during the period included Virginia, North Carolina, California, and Oregon.

Another common practice among states that permitted free banking was requiring banks to back their notes with state bonds. Each state borrowed money by selling bonds to the public, and the value of these bonds varied from state to state. If a group of investors wished to become a bank and issue bank notes, they were required to back their notes with state bonds. For instance, a bank could have $50,000 in initial capital with which they could purchase $50,000 worth of state bonds. The bank could then issue up to $50,000 in bank notes to its depositors. The state bonds that were purchased would be stored with the office of the state note depositor, who would maintain information regarding the value of each bank's bond purchases, as well as the value of a each bank's issued notes.

As with many bank deposits today, banks were required to redeem their notes for specie on demand. This requirement meant that if a depositor came into the bank with a handful of bank notes, the bank was required to give that person an equal amount of specie in return. When bank customers made deposits at their banks, depositors would use specie such as gold or silver as the deposit. The bank would then give the customer bank notes equal in value to the gold or silver they deposited. Banks were required to give customers their specie deposits back if they demanded them. This requirement was established to ensure that banks could not run off with a customer's specie.

A final basic fact consistent among all states permitting free banking was what happened to a bank if it could not redeem its notes with specie. In the event that a

customer came into a bank demanding specie for notes and the bank could not oblige, the bank was shut down. When a bank lacked the amount of specie to pay back its customers, its assets were sold off in yard sale fashion in order to pay back the note holders. One reason banks found themselves unable to pay depositors was that the value of their assets depreciated. Another reason was that banks failed to hold enough of their assets in relatively liquid form. Banks were required to redeem notes with specie in an attempt to protect depositors from such problems.

Bank Failures and Depositor Losses

The fact that free banking does not exist today serves to point out the failures of the Free Banking Era. Nevertheless, in the past twenty years some conservative economists have argued that free banking was not a failure but in fact a success. These economists claim that the number of failed banks can be misleading, and that the market-run system of banking was both smooth and efficient. There is much evidence to suggest, however, that the free banking experiment was a rough operation at best. Common occurrences in the era included fraud, wildcat banking, bank failures, and note holder losses. The market-run banking industry has been characterized as unstable, and thus a hindrance to economic development.

One of the well-known problems of the Free Banking Era was fraud associated with the over-issuance of bank notes. Noted previously, banks were required to purchase state bonds and deposit the bonds with the state note director. The banker could then issue notes equal to the "face" value of the bonds. Due to the fluctuating price of bonds,

and often the unwise behavior of states, bond market prices frequently fell below face values. As a result, for example, a banker might be able to buy bonds with a face value of $100 for only $90. The banker could then take $100 worth of specie from depositors and issue $100 worth of bank notes. The banker then would have $10 in profit, and could use this profit to buy more bonds, issue a larger value in notes, and repeat the process. A large bank with many depositors could make an extremely large profit in this manner.

Hugh Rockoff argues that bankers would happily redeem bank notes for a while, but once enough profit had been made, would close up shop and disappear (Rockoff, 94–129). This type of fraud was commonly known as "wildcat" banking. Wildcat bankers often relocated their branches to the middle of nowhere, where only a wildcat would find them. As long as note holders were unable to locate the bank, depositors were unable to demand specie and the bank could stay in business. The gain that a wildcat banker made was equal to the value he received in specie minus the market price of the bonds he purchased. In order to make money, the banker would need to be able to buy state bonds with a market price below that of the face value. In cases where state bonds traded above face value, which was seldom, fraud of this sort was not possible.

Wildcat banking was only one small source of bank failure. The primary source of bank failure during the Free Banking Era was, in fact, the fluctuating prices of state bonds used to back bank notes. As the value of the state bonds dropped, banks were often left without enough capital to buy specie and meet depositors' demand for repayment. For example, a bank might have issued $100 worth of notes from the purchase of a $100 bond. If the price of the bond dropped to $50, the bank would only

receive $50 in specie from selling the bond, while the depositor demanded the full $100 in specie. Rolnick and Weber believe that falling bond prices during recessions were the main cause of bank failures during the Free Banking Era (Rolnick and Weber 1979, 17).

Whether bank failure resulted from wildcat fraud or falling bond prices, banks collapsed with regularity. The lifespan of the average bank varied from state to state, much of which had to do with both bond prices and the repetition of wildcat banking. In New York, Indiana, Minnesota, and Wisconsin, fifty percent of free banks eventually failed (Rolnick and Weber 1980, 11). In fact, many economists believe that it was common for a free bank to be in business for only a month or two (Rockoff, 8). While only sixteen percent of free banks were in business for less than a year, banks today have a failure rate near zero (Rolnick and Weber, 1980, 13).

Although many banks failed during the Free Banking Era, losses were more frequently incurred by note holders than bank shareholders. Limited liability meant that equity shareholders of free banks in the U.S. were required to pay back only specie in the amount of the initial capital investment (Gorton, 269). If a bank failed, shareholders of the bank would only be liable for the first $50,000 or so that was payable to note holders. Any amount in specie deposited above this amount was a loss to the depositors. As mentioned previously, upon failure a bank would be closed and its assets sold off to pay back note holders. More often than not, bank assets would not cover the amount owed to note holders.

Macroeconomic Effect of Free Bank Failures

Additionally, free bank failures had destabilizing macroeconomic effects. Estimates of the real money supply per capita, or the amount of money in the economy per person adjusted for inflation, seem to have varied considerably. The growth rate of money plays an important role in determining whether the economy heads towards a boom or a bust. From 1835 to 1860, the real money supply per capita ranged from a low of $9.21 to a high of $23.13 (See Table 1). There were distinct population changes during this period, which likely had some effect on the data. Overall, however, the money supply seems to have been incredibly unstable during the Free Banking Era.

Table 1. Measured Real Money Supply per Capita (1835 – 1860)

Year	Nominal	Real	Year	Nominal	Real
1835	$14.52	$13.50	**1848**	$14.55	$16.49
1836	14.55	11.86	**1849**	17.04	19.32
1837	13.93	11.26	**1850**	15.49	17.16
1838	14.81	12.52	**1851**	16.96	19.01
1839	12.32	10.23	**1852**	18.12	19.15
1840	10.65	10.42	**1853**	19.62	18.81
1841	9.89	10.00	**1854**	19.15	16.50
1842	8.12	9.21	**1855**	19.52	16.50
1843	9.58	11.89	**1856**	20.36	18.04
1844	10.36	12.51	**1857**	16.43	13.76
1845	11.24	12.60	**1858**	23.13	23.13
1846	12.14	13.61	**1859**	21.23	20.78
1847	12.49	12.90	**1860**	17.61	17.61

The coefficient of variation (CV) of the real money supply per capita was a scant 0.1990 between 1835 – 1849, and an even smaller 0.1280 between 1850 – 1860 (Sechrest, 112). The CV measures the standard deviation of the real money supply per

capita divided by its mean. The CV, although small, does not accurately portray the peaks and valleys in the data. The MAPC, or mean absolute percentage change, is much higher. The MAPC for the period 1835 – 1849 was 10.981 percent, and 14.847 percent for the period 1850 – 1860. Although the money supply appears stable over the long run, period to period changes were quite drastic. This data demonstrates that free banking caused larger and more frequent business cycles in the U.S. economy during that time.

Economic efficiency was retarded because of inability of the free banking system to promote growth. U.S. citizens frequently complained about the lack of a common currency and its inhibitive nature on the efficiency of monetary exchange (Capie, 93). The lack of a common currency was a problem for both merchants and consumers. Merchants were forced to tediously verify bank notes against the note detector, a book printed by the state note depositor's office that included updated pictures and values of all the different bank notes. Often the values of the notes changed frequently, which left the detector out of date. As a result, merchants often were forced to accept only well-known or local notes.

The Free Banking Era closed much as it had begun, with the federal government in control of the banking industry. Banking in the era was unstable, inefficient, and inconvenient. As a result, congress passed the National Banking Act of 1864 (West, 18). The act superceded the National Currency Act, but its main purpose was to establish a stable national currency. The instabilities, inefficiencies, and inconveniences of the era were caused by, as we'll soon see, the many payments system risks associated with free banking.

CHAPTER IV: PAYMENTS SYSTEM RISK: FREE BANKING ERA VS. E-CASH

Payments systems are intended to run smoothly, but there are inherent risks associated with any payments system. James McAndrews outlines the six well-known forms of payments system risk: credit (solvency), liquidity, herstatt (time-gap), fraud, operational, and systemic risks (McAndrews 1997, 7). Free banking and e-cash share many of the same risks, including solvency and liquidity risk, and for strikingly similar reasons. The two systems are not, however, clearly linked by similar operational or systemic risks. Although the individual risks will be defined separately, they are not mutually exclusive, and an increase in one could result in increased risk overall.

Solvency Risk

The first risk associated with a payments system is solvency risk. When a bank becomes insolvent, the value of the bank's assets have dropped below the value of its liabilities. Assets represent a bank's loans, investments, and cash, while its liabilities represent what it owes other parties. Solvency risk means that there exists a possibility that settlement of a payment will not be realized at full value. The insolvency of one of the parties involved in settlement could be the problem. Ways in which the assets of a bank could become worth less than its liabilities are that the bank's loans could be defaulted on, or its investments could lose value, either of which could cause insolvency.

Insolvency was a major problem during the Free Banking Era. As mentioned previously, banks backed their notes with state bonds. If the value of a bank's state bonds dropped below the value of the notes that it had issued, the bank could easily become insolvent. Insolvency was a huge reason for high bank failure rates during the Free Banking Era (Rolnick and Weber 1979, 15). The requirement that banks back notes with risky state bonds resulted in banks possessing unnecessarily risky portfolios of investments. Secondly, banks were not allowed to pass losses on to note holders because they were required to redeem notes on demand with specie. Although the reason for these requirements by the state was to protect note holders from bank failure, banks frequently became insolvent anyway and note holders realized losses as a result.

Today's e-cash payments system demonstrates solvency risk as well. Currently, public information regarding private non-bank firms' portfolios is virtually non-existent. Firms are not required by law to reveal the types of investments they are engaged in, while the nature of non-bank firm portfolios can have a direct impact on their level of solvency. Firms that take customer account balances and invest in risky assets, run the risk of becoming insolvent because assets can quickly lose value. Insolvency will rear its ugly head if the value of a firm's portfolio drops below the value of e-cash which they have made available to customers.

As the use of e-cash becomes geared more towards micropayments, as well as payments between individuals, e-cash accounts are more typically established with balances less than $3000. Although individually small, account balances can provide firms with a large amount of investment capital when pooled. Investing in corporate

stock is one activity involving a high degree of moral hazard, or the possibility that a business's management may not behave in a manner thought to be in an investor's best interests. Corporate stock also involves a high potential for adverse selection, where the firm investing does not have enough appropriate information to choose the best investment. The volatility of the stock market is well documented, and although the market provides an opportunity to realize high returns, it also provides an opportunity for non-bank e-cash issuers to become insolvent.

Currently, non-banks issuing e-cash do not pay interest on account balances. If an individual holds $100 in e-cash balances, the firm will not pay interest on that $100, even though the firm earns interest from investing that $100. Additionally, account balances are not FDIC insured. If a firm becomes insolvent, the firm is not liable for an e-cash depositor's loss of funds. Higher risk associated with seeking higher returns, such as investing in corporate stock or other risky assets, rather than buying bonds or making loans, has been transferred to the e-cash depositors. Because of this transfer of risk from the non-bank to the depositor, e-cash issuers can maximize their returns by investing in risky assets with less stable returns.

Liquidity Risk

Liquidity risk refers to the possibility in which settlement is delayed because one party is illiquid at the time of settlement. Economists and bankers refer to liquidity as the relative ease and speed with which an asset can be converted to cash. An asset is very liquid if it can be sold easily in exchange for cash. Examples of liquid assets include

corporate stock and treasury bonds, both of which are traded in efficient markets. Non-liquid assets include long-term loans, which exhibit payments and maturity dates that are extremely difficult to fast-forward. If one party holds a claim for $100 against another, and the indebted party cannot sell an asset in order to receive cash and make the payment, the indebted party is considered illiquid.

Liquidity risk during the Free Banking Era was a considerable problem. If a free bank could not redeem its notes on demand because they didn't have enough specie, or could not sell any state bonds, the bank was considered illiquid. Today the Federal Reserve mandates that banks maintain a level of reserves either in deposit at the Fed, or as cash in a bank's vault in order to promote liquidity. Although some states required that banks maintain a certain specie to note ratio, this was not a uniform practice among all free banking states. In 1860, free banks reserve ratios averaged 14.9%, with a standard deviation of 9.45% (Sechrest, 107). By comparison, chartered banks of the same time period held reserves of 17.2% on average, with a standard deviation of 8.78%.

Liquidity risk also poses a threat to today's e-cash payments system. Since firms issuing e-cash are not considered banks, they are not required by the Federal Reserve to hold a percentage of e-cash deposits on reserve to meet demands for liquidity. Additionally, non-banks are allowed to invest all e-cash balances in non-liquid assets. If firms have balances tied up in non-liquid assets, they may not be able to convert assets to cash in order to meet depositor demands for hard currency. Although most e-cash firms state that they will redeem their customers' funds on demand, there are no laws requiring non-bank redemption of funds.

Having a large financial backer like eCharge Bank, an industrial loan institution based in Utah, may decrease the liquidity risk a firm like eCharge Corporation presents to the e-cash payments system. Although eCharge's account balances are not FDIC insured, being a bank subsidiary could mean assistance from the bank in meeting liquidity demands, as well as solving problems of insolvency. Banks that are issuing e-cash today are doing so through the establishment of subsidiaries, which are not banks. Because of these relationships, parent banks are not legally *obligated* to meet the liquidity demands of their subsidiaries. This relationship allows a bank to enter the e-cash market and attain higher returns, without becoming liable for decreasing asset values or liquidity difficulties.

Herstatt Risk

On June 26, 1974, German banking regulators withdrew the license of Bankhaus Herstatt, a small Cologne bank active in the foreign exchange markets. Prior to the announcement of the bank closure, the bank had received all of its Deutsche Mark payments. The bank had not, however, made any of its U.S. dollar payments, and those parties due to receive payments incurred large losses. Herstatt risk thus refers to the consequences of a time delay in the delivery and settlement of a payment. Herstatt risk in today's banking system is actually greater than the risk in either the Free Banking Era, or today's e-cash payments system.

Most payments today are made using paper checks. In fact, paper checks account for 80% of all payments made in the United States, with 63 billion checks being written

annually ("PaymentNet Hopes the Check is in the Web Site"). Checks are cleared via clearinghouses, which are institutions where banks meet to exchange checks drawn on each other. The process of clearing checks takes some time, resulting in a time-gap between payment and settlement. This time-gap provides an opportunity for payment to be made and the indebted party to go bankrupt, before the check is settled. Although this risk exists in today's banking-based payments system, it remains quite small.

Payments made during the Free Banking Era were settled immediately, whether payments were made to a merchant or another individual. When a bank note holder used notes to pay for a good or service, the acceptor would look up the value of the notes in the note reporter, which would display the most current value of the notes being presented. Once the two parties had exchanged notes, payment was final and settlement had occurred. With almost no time-gap, herstatt risk in this type of payments system is extremely small.

E-cash payments also exhibit little if any herstatt risk compared to a check-based system. The Internet has sped up the payments system tremendously. When a depositor uses e-cash to purchase goods or services online, payment is settled in a matter of seconds. Computers and software automatically validate purchases and depositors' accounts are debited instantaneously. The same is true regarding person-to-person payments. Account balances of e-cash are simultaneously credited and debited. This method of payment should all but eliminate herstatt risk associated with today's system of clearinghouse interaction.

Fraud Risk

Perhaps the largest risk associated with both the free banking and e-cash payments systems is the risk of fraud. Fraud risk refers to the chance that counter-parties, customers, employees, or any other third parties, might misrepresent themselves in ways that would increase the liabilities of the payer, or to subvert the workings of the payments system to their own benefit (McAndrews 1997, 8). The risk exists if a some party has an incentive to cheat the system in one form or fashion. Today the Federal Reserve spends time monitoring issues of fraud and attempting to prevent its proliferation. Both free banking and e-cash present interesting fraud risk issues.

One form of fraud associated with the Free Banking Era is wildcat banking. Bankers who could purchase discounted state bonds often had an incentive to issue more notes than were safely backed, because they could keep the difference between the face value and the market price of the bond. The over-issuance of bonds was also a costly form of fraud. When bankers relocated their banks in remote locations, fraud was furthered and over-issuance became profitable by eluding depositor claims. Wildcat banking proved to be a major source of fraud in the free banking payments system.

Another form of fraud risk associated with free banking was the counterfeiting of bank notes. Individuals frequently attempted to create paper duplicates of bank notes that were already in circulation. Counterfeited notes could decrease the value of real notes and result in note holder losses if the fake notes were placed into circulation. The proliferation of false notes and the decrease of note values as a result (inflation), also

increased the solvency risk associated with the payments system, increasing the liability of banks. Merchants were often forced to consult a counterfeit reporter, much like a note reporter, when dealing with unfamiliar or non-local notes (Capie, 93).

Fraud risk is also a major concern in today's e-cash payments system. One type of e-cash fraud involves the ability of non-banks to issue e-cash. Non-bank firms could have an incentive to mislead customers in some manner. Firms might lie about their level of security in transactions in order to gain market share, or use account balances for inappropriate or illegal activity. Private firms left unregulated could be loaning money to unfavorable foreign governments. Because of imperfect information on e-cash firms, depositors may not be able to decipher reputable firms from non-reputable ones.

E-cash fraud risk also involves the inappropriate handling of delicate personal information. Many e-cash firms require that depositors fund their e-cash accounts via credit cards or bank accounts. In order to fund an account, depositors are required to provide e-cash firms with credit card or checking account numbers and sign contracts giving firms access to these accounts. Firms have the ability to withdraw balances from checking accounts or make unscrupulous charges to credit cards without the depositor's knowledge. The fact that in most "terms of use" details associated with e-cash contracts, firms claim that they will not make unauthorized charges or withdrawals without the consumer's knowledge, does not eliminate this risk.

The biggest risk of fraud associated with e-cash is the transfer of information over open-networks. Unlike Electronic Funds Transfers (EFTs) between banks and the Federal Reserve, e-cash payments do not use dedicated lines of communication to make

transfers. Fedwire, the Fed's method of transferring funds electronically, is a closed network that can only be accessed by banks who are members of the Federal Reserve. E-cash payments are made by electronically transferring funds over the Internet, which is an open-network. An open-network allows information passed along its lines of communication to be shared between different networks.

As information is shared over an open network, the risk exists that third parties might intercept critical information as it is being passed back and forth over the Internet. Account numbers and passwords could be stolen and used to delete funds or transfer funds to criminal accounts. If the servers of e-cash issuing parties are not protected sufficiently, accounts could be altered or permanently deleted from the system by way of an outside source. E-cash could be intercepted and duplicated. Much like counterfeiting of the Free Banking Era, the creation of excess e-cash could decrease its value and create solvency problems for e-cash issuing firms.

Fraud risk is of the utmost concern for both issuing firms and policy makers. Conventional passwords will not be security enough to prevent hackers from disrupting the e-cash payments system. E-cash developers, including hardware and software firms, are working relentlessly to produce new forms of high security to protect the transfer of payments made over the Internet. A firewall prevents certain outside sources from infiltrating company servers and viewing or altering information. Firewalls have been a major improvement of Internet security in the past decade.

There are two primary Internet security features being developed today. One method that has been around for quite some time is cryptography. Cryptography is the

encoding and decoding of digital information. One form of cryptography commonly used in the Internet domain is public-key cryptography. In order to decode information, a user must have a "key" that allows them to convert the information into something useful. Digital signatures are a very new technique being used by many e-cash issuing firms. A digital signature uniquely identifies a party, and can be attached to information and treated as a real signature. Legislation was passed in 1998 that legally allows the use of digital signatures as replacements for actual ink and paper signatures in e-commerce transactions ("Congress OKs Digital Signatures").

Operational Risk

Operational risk is one type of payments system risk that is not similarly shared between the Free Banking Era and today's e-cash payments system. McAndrews notes that operational risk, even if very small, exists in any payments system. Operational risk states that the possibility of breakdowns in the planning or execution of payments, such as a breakdown in the operation of a central computer, can expose the participants in the system to unexpected liquidity shortfalls (McAndrews 1997, 8). Players in the system, because of an operational failure, may not be able to finalize payment because they cannot transform their assets into currency. Firms may become illiquid because of operational disruptions. Jack Meckler defines operational risk in slightly more general terms. He states that operational risk is "the risk that a payment medium will not function properly or that the payment instruction will either not be carried out or will be carried out improperly" (Meckler, 32).

Operational risk in the Free Banking Era was undoubtedly small. The was no check clearing, and since the banking industry was so decentralized, banks seldom held claims against each other. The only parties involved in transactions were individuals, merchants, and the bank that issued the notes used for payment. Payments were settled upon physical exchange of bank notes. Once the notes effectively transferred hands, payment was complete. Of course, the possibility that paper bank notes could rip as they were being passed from one hand to another would represent an operational risk of the system. Additionally, the value of notes could be miscalculated resulting in an inappropriate transfer of money. Occurrences of such a variety represented the operational risks of the free banking system, and these were likely of little significance to system-wide reliability.

In contrast to the relatively low operational risk found in the completion of Free Banking Era payments, e-cash payments give rise to many operational risks. From an end-user standpoint (an end-user being either the consumer or the firm), computer software and hardware combine to cause major operational risks. Either a consumer or firm computer could fail mid-transaction, resulting in lost information and failure to complete the transaction. Depositor accounts could be debited, while the funds may never be credited in some other account, thus resulting in lost e-cash. Data loss during transfer is a huge concern for both consumers and issuing firms alike. In order to get around this risk, software systems attempt to keep track of an ongoing transaction by buffering the information and only finalize the transaction upon successful completion. This buffering allows systems to recapture data in the event of a transaction failure.

Like fraud risk, operational risk is increased when dealing with an open network such as the Internet. The backbone of the Internet consists of several hardware components, including data lines, routers, and switches. Routers redirect data to new locations and act as points along the path of information. If routers fail to correctly transfer information, crucial information could be passed to the wrong people and data could be lost. The hardware and software of the Internet also require compatibility. In order for the Internet to function correctly, standards must be abided by when developing methods of transferring information.

Unlike free banking payments, e-cash payments involve an unprecedented number of parties. Developers of software and hardware for the Internet, firms issuing e-cash, individuals holding e-cash, and Internet service providers, all have an impact on the magnitude of operational risk facing an e-cash payments system. Standards of compatibility, usage, and security all become tremendously important in managing a smoothly running payments system. Without standards, the system is unlikely to achieve a state of acceptable reliability.

Systemic risk

In simple terms, the systemic risk of a payments system reflects the overall risk of the entire system failing as a result of a small number of individual participants failing. In economics terms, it is defined as the risk that a serious liquidity shortfall on the part of one or several participants cascades throughout the system and threatens the stability of all or a large number of the system's participants (McAndrews 1997, 8). The systemic

risk of a system is high if the failure of one free bank or e-cash issuer could result in the failure of the system as a whole. Obviously, systemic risk is a major concern to all those involved in the system, as well as government policy makers.

Systemic risk was large during the Free Banking Era. Hugh Rockoff argues that "contagion" effects existed in free banking, meaning that failure of a few banks would cause note holders of other banks to worry and make runs on their own banks (Rockoff 1985, 886-889). A bank run occurs when many of the bank's depositors attempt to claim their balances and the bank fails because of a liquidity shortfall. Rockoff claims then, that during the Free Banking Era, systemic risk was very large and that people's beliefs and distrust of banks would cause local failures to spread across the system. Again, because imperfect information did not allow depositors to tell the difference between risky and safe banks, bank runs persisted.

Rolnick and Weber attribute high systemic risk to the banking system of the Free Banking Era, but argue that it was not due to the "contagion" effect, but to the falling value of state bonds (Rolnick and Weber 1986, 885). Since banking systems were organized by states and notes were backed by state bonds, banks in other states would not suffer the same losses as those banks in states with falling bond prices. Note holders could easily determine the differences in value between the bonds of their state and those of another, giving them an indication of how solvent their bank should be. Rolnick and Weber found that interstate spillovers were quite minor, and that falling bond prices in one state usually did not trigger falling prices in another. A state could have benefited from the failure of a bordering state's system, thus receiving new out-of-state depositors

and their specie. Although systemic risk may not have been a critical risk at a national level, systemic risk was certainly high in any state with falling state bond prices.

The level of systemic risk associated with new forms of e-cash payment will likely hinge on the consumer's ability to distinguish between the differing behavioral traits of firms. At this moment it is very difficult to determine either the liquidity or the solvency of e-cash issuing firms. We have no indication of what types of assets they are investing in other than what they refer to as "liquid" assets. Without being able to distinguish between differing firm investment strategies, contagion is likely to be a significant threat. Consumers today are likely to believe that the failure of one firm signals the probable failure of others.

Part of the reason for the lack of consumer information regarding e-cash issuers is related to the fact that e-cash issuers are very different in their system implementations. Although micropayments and person-to-person payments are at the forefront as the motivating purpose of e-cash, companies are employing a variety of techniques to attract users. Firms are partnering with different online providers for content, and using email, credit cards, and checking account information to settle payments. The contagion may be reduced to the extent that consumers know that firms differ in their e-cash implementations. As standards are developed that force issuers of e-cash to conform to a certain implementation, however, systemic risk is likely to increase as long as information regarding firm investment behavior is not relatively available.

The aforementioned payments systems risks only add to the basic systemic risks involved in running an e-cash payments system. System-wide viruses could also cause

increases in both the contagion effect and systemic risk. Even if a virus only reached a few non-bank firms, consumers could believe that it would spread to all firms and proceed to make a "run" on their respective e-cash issuers. Although a virus would typically be categorized as either a fraud or operational risk depending on what it does, a widespread virus could cause systemic failure of the payments system.

One aspect of the e-cash payments system that is likely to decrease its systemic risk is its Internet backbone. We've discussed how the Internet is operated as an open network, unlike a closed network such as the Federal Reserve's Fedwire. The Internet in effect has no central computer. Information is routed around network failures, so that if one part of the Internet fails there are alternative pathways for the exchange of information. The Internet has been designed to be decentralized, thus reducing systemic risk. This non-failing characteristic of the Internet may help reduce the possibility of system-wide failure in settling e-cash payments.

The payments system risks exhibited during the Free Banking Era led to a change in the structure of the banking industry and ultimately the rebirth of national banking. The banking industry and the payments system today continue to reflect the effects of those risks in the form of regulation implemented to guard against them. Today, e-cash payments systems and e-cash issuers are not directly subject to the rules and regulations that govern the operation of national banking systems. As e-cash becomes more important in facilitating e-commerce we can expect policy and regulations to play a larger role in addressing the payments system risks discussed here.

CHAPTER V: THE FUTURE OF E-CASH REGULATION

The banking industry is one of the most heavily regulated sectors in the United States. Asymmetric information in the banking industry has traditionally led to problems of adverse selection and moral hazard. Depositors do not have enough information to determine the quality of bank loans, leading to the problem of adverse selection. In addition, banks are not regulated by uninformed depositors. Because depositors do not withdraw funds from a bank investing in risky assets, moral hazard exists as banks have an incentive to take risks. Banking regulation, like all economic regulation, has been intended to correct market failures. Although banking regulation creates some market imperfections, regulation has proven necessary over the past 150 years.

Major regulatory initiatives began with the establishment of national banking in 1864 and have included landmark legislation such as that establishing the Federal Deposit Insurance Corporation (FDIC) in 1934. The evolution of the system to its current state has been influenced heavily by the events of the Free Banking Era and by more recent concerns over payments system risk and instability in the banking industry. Given the similarity of the risks associated with the Free Banking Era and the currently evolving e-cash system, it would not be surprising if efforts were made to bring the system under the same regulatory umbrella as the banking industry. In addition, given unique fraud, operational, and systemic risks of an e-cash payments system, we may also see some innovative cooperation between the Federal Reserve and Internet regulatory bodies.

Banking System Regulation: 1864 – 1913

Free banking ended, as mentioned previously, with the passing of the National Currency Act in 1863 and the National Banking Act in 1864. The biggest change from a state-controlled system was that bank notes were thereafter backed by federal bonds rather than state bonds. The new system of national banking also meant that all national banks issued the same currency backed by federal bonds. State banking was not, however, eliminated by the National Banking Act. In fact, state banking remained strong for many years, and a combination of state and national banking would remain the norm until 1913 (West, 25).

The National Banking Act, by eliminating reliance on state bonds to back currency, essentially extended free banking to the entire country (West, 21). States that previously did not allow free banking now found themselves with national banks that issued a single currency backed with federal rather than state bonds. Although free banking had not really been eliminated, the new national banks fell under much tighter restrictions than the state banks of the Free Banking Era. National banks, the predecessors of modern commercial banks, were all required to meet initial capital requirements and to demonstrate an economic need for a new bank in their region. Only then were they allowed to begin banking operations.

In addition to requiring sufficient bank capital, the act also standardized the reserves that banks were required to maintain (West, 23). Banks were required to keep a percentage of issued notes as specie in order to meet depositor demands for liquidity.

The banks of the Free Banking Era were required to hold little or no reserves, making it often difficult for banks to redeem notes. Reserve requirements were established in an attempt to reduce the liquidity risk so prevalent among free banks. The act also attempted to reduce solvency risk by placing a limit on the total amount in bank notes that banks could issue. National banks were limited to issuing notes totaling in value no more than 90% of the market value of the federal bonds purchased to back bank notes (West, 22). Placing a limit of 90% on the amount of notes a bank could issue was intended to give banks a solvency buffer in order to weather bond price fluctuations.

Not long after the passing of the National Banking Act in 1864, banks began to practice mutual cooperation in order to reduce the risk of bank failure. Private clearinghouses began to appear, with the most prominent being the New York Clearing House. The clearinghouse organizations operated as places for banks to meet and clear checks and drafts, as well as conduct other business related to inter-bank payments settlement. Clearinghouse members kept reserves at the house, which could then be used to assist any individual member bank in the event of a liquidity shortfall. Robert West writes,

> Because of the development of clearinghouses, things were not quite as bad as they might have been. In both 1873 and 1907, it is probable that the crises would have been worse had not New York banks come to one another's aid. In other cities the situation was less admirable. Nevertheless, the clearinghouses allowed some cooperation during panics. They also convinced many people that more cooperation would improve the operation of the financial sector (West, 31).

Clearinghouses, as a first method of central organization, provided banks with some protection against liquidity shortfalls when bank panics took place.

Banking System Regulation: 1913 – Present

Although clearinghouses provided some protection for banks, bank panics would continue for years to come because many banks continued to exhibit a reluctance to cooperate. West writes, "Also, the reluctance with which banks engaged in such operations demonstrated the need for outside regulation of bank activities" (West, 32). This outside regulation would come in 1913, when congress passed legislation to establish the Federal Reserve. The Federal Reserve was created to act as the central bank of the United States, modeled after European central banks such as the Bank of England.

The creation of the Federal Reserve was intended to reduce the payments system risk so prominent in both the free banking and national banking eras. The Federal Reserve was established with four main objectives: To be the banker's bank, to provide banks with a lender-of-last-resort, to regulate commercial banks (monitor and administer), and to conduct monetary policy. First and foremost, the role of the Federal Reserve was to reduce banking panics. Lawrence White writes about the establishment of the Federal Reserve System, "its principal rationale was to prevent the recurrent banking panics that were being fostered by the existing regulatory regime" (White 1999, 84).

As a banker's bank, the Federal Reserve requires that its member banks keep a fraction of total reserves on deposit at one of its 12 regional banks. Much like the reserve requirement of national banking, Fed reserves are held in order to reduce liquidity risk and insure that banks have adequate currency to meet depositor demand. As a lender-of-

last-resort, the Fed has the ability to loan money to member banks in the event that reserves are not enough to cover depositor demand for liquidity. Member banks have access to what is known as the discount window, where banks can borrow funds from the Fed at an interest rate determined by the Fed. Previously, no lender-of-last-resort had existed in the banking system.

In addition to acting as the lender-of-last-resort for banks, the Federal Reserve has the ability to create "high-powered" money. White defines high-powered money to be "money that currently or potentially serves as reserves" (White, 74). High-powered money is also known as the monetary base (MB), or the amount of currency in circulation (C) plus any bank reserves held at the Fed or in banks' vaults (R), so that $MB = C + R$ (Mishkin, 417). In the event that depositors' preferences for currency increases, which could bring about the complete depletion of bank reserves, the Federal Reserve can print more currency to offset the depletion. Printing money increases the stock of high-powered money in the economy.

Even with the existence of the Fed, with its ability to act as a lender-of-last-resort and adjust the level high-powered money in the economy, bank panics reached epidemic proportions during the Great Depression, due primarily to contagion effects. In 1934 the Federal Deposit Insurance Corporation (FDIC) was established with the purpose of insuring depositor accounts in the event of a bank failure. Previous to the FDIC's establishment, depositors often had to wait until a failed bank's assets were liquidated before they could recover their deposits (Mishkin, 297). In addition, depositors might not receive the full value of their deposits upon collection. Because of the problem of

asymmetric information, meaning depositors could often not tell the difference between good and bad banks, depositors had an incentive to be first in line for retrieval of their funds.

The establishment of the FDIC meant a government safety net for depositors, with account balances now being insured by the federal government up to $100,000 per account. Because of asymmetric information, depositors were unable to tell which banks were safe and which were insolvent. Between 1930 and 1933, the number of bank failures per year averaged over 2000 (Mishkin, 297). Following the establishment of the FDIC, that number decreased to only 15 per year. The FDIC reduced contagion by convincing depositors to keep their funds in the banking system.

The Fed and the FDIC have not, however, been able to entirely eliminate the risks found in today's banking system. Although the FDIC has been successful in preventing bank panics, a serious moral hazard problem comes with the insurance. Banks have an incentive to increase their risk taking activities because they know they will be bailed out by the FDIC. Additionally, depositors whose balances are insured lose the incentive to monitor bank activity and make sure that banks are not taking on too much risk. The savings and loan scandal during the 1970's was an example of greater risk being taken by financial institutions because of depositor insurance. Following the S&L scandal, the FDIC was left at the brink of bankruptcy and searching for answers.

In order to reduce the amount of risk banks undertake, restrictions on bank asset holdings and capital requirements have been established on top of the initial Federal Reserve System and FDIC regulations. Restrictions on bank asset holdings include

preventing banks from holding common stock, promoting diversification of assets, and limiting the number of categorical loans that banks can make. Banks are also required to hold larger amounts of equity capital, thus imposing a greater loss on the bank if it fails. Bank failures and bailouts in the past half century have proven that without asset holding and capital requirement restrictions, Federal Reserve System supervision and FDIC insurance are insufficient in preventing insolvency.

Future E-Cash Regulation

There are no current regulations regarding the issuing of e-cash by non-depository institutions for a couple of reasons. First, both policy makers and members of the developing e-cash community are concerned that regulation at this stage would discourage the development of potentially valuable innovations in the payments system. A report from the Federal Reserve Bank of Chicago states,

> The shift to electronic payments offers clear benefits to society. Processing checks is a labor-intensive, relatively inefficient process. Americans write about 63 billion checks every year. The costs of processing these checks is equal to 1 percent of the U.S. gross domestic product. A shift to electronics would allow this money to be used in more productive ways ("Electronic Money").

Given that the Federal Reserve views e-cash as a beneficial development to society, they are reluctant to take actions that might inhibit its development.

Second, the market for e-cash today is fairly small. In this regard, e-cash does not pose an immediate threat to the payments system simply because so few people are using it. The Congressional Budget Office estimates the near-term market for e-cash to be fairly small, probably about equal to $20 billion annually (Emerging Electronic Methods for Making Retail Payments). This market is comparable to that of travelers' checks

today, representing only 0.2 percent of the United States' $9 trillion real GDP. The CBO also recognizes that the growth of the industry will depend very much on future decisions made by millions of individuals and businesses. If estimates of the growth in the use of Internet are any indicator -- domain names have increased one hundred fold over the past decade -- we can expect e-cash to grow rapidly as well.

Accounts held with e-cash issuing firms, as mentioned, are not insured by the FDIC. As the existence of information asymmetries undoubtedly proliferates in the e-cash world at this time, users are likely to run on their e-cash firms if a small number of firms, or even a single firm, fail. The systemic risk in this regard is fairly high. Insuring e-cash accounts through the FDIC may provide the government with a way of spurring development in that industry. Many Internet savvy individuals who might like to open e-cash accounts may be discouraged from doing so because their prospective accounts are not insured. Insurance by the FDIC could help to reduce the contagion effect, as well as help to draw depositors to e-cash.

If private firms issuing e-cash are treated as depository institutions in the future, we will see an e-cash payments system under the regulation of the Federal Reserve System and the Office of the Comptroller of the Currency. The banking industry went through many growing pains before stability was reached, but today the payments system is remarkably reliable. The Fed has been able to reduce the solvency and liquidity risk of its members by setting reserve requirements, playing the role of lender-of-last-resort, setting capital requirements, restricting asset choice, and controlling high-powered money. Because e-cash firms face similar solvency and liquidity risks, it would be

logical and very beneficial to place e-cash issuing firms under the regulation of the Federal Reserve once the development of e-cash reaches a certain stage of maturity.

Internet-Related Regulation

An e-cash payments system operating over an open and unrestricted network such as the Internet is likely to instigate revolutionary regulation as the industry grows. Specific legislation addressing the counterfeiting and fraudulent use of e-cash is likely to come about once instances of such abuses come to the attention of the public. E-cash firms, like eCharge, may need to provide private insurance against fraud if government and Internet security experts and regulators are unable to prevent it. Without insurance against fraud, consumers are unlikely to hold accounts with e-cash issuing firms. In addition, if fraud conducted over the open-network Internet is not prevented sufficiently, contagion is likely to increase.

Operational risks associated with the open network nature of the Internet will require the cooperation of the Fed with established Internet standards groups. The reliability of e-cash transactions will be a primary determinant of the efficiency and use of such a payments system. The IETF, or Internet Engineering Task Force, is an organization that establishes Internet standards and insures the interoperability of hardware and software. Standards for reliable and efficient payment of e-cash transactions would be most useful if designed cooperatively by the Fed and the IETF. As e-cash continues to develop, organizing bodies like the IETF could provide expertise to assist the Fed in reducing the operational risks involved in an e-cash payments system.

Systemic risk in an e-cash payments system is just as important as systemic risk in the banking industry today. E-cash issuer access to the Federal Reserve system and regulation of investment choice is likely to reduce systemic risk to some extent, but not as completely as it is reduced in today's payments system. Systemic failure could easily result from fraudulent and operational risks associated with the Internet as a payments pipeline. For this reason, cooperation between the government, the Federal Reserve, and Internet standards bodies such as the IETF will be crucial in promoting a sound and robust e-cash payments system.

CHAPTER VI: CONCLUSION AND POSSIBILITIES FOR GROWTH

Passing e-cash over and around the Internet presents a brand new mechanism of monetary exchange; indeed, because of its Internet backbone, e-cash is in many ways considered revolutionary. Nevertheless, analysis of state banking and privately-issued bank notes of the Free Banking Era suggest similarities to the evolving e-cash payments system. The ability to issue private currency and the relatively unregulated state of the Free Banking Era and e-cash today point to high payments system risk in each case. As shown, liquidity, solvency, and fraud risks were very high during the Free Banking Era and can be expected to be high in an e-cash system if left unregulated. As much as the Internet has done for increasing accessibility to information, consumers' inability to discriminate between low and high-risk e-cash firms increases the risk of a payments system collapse.

As tempting as it may be to claim that the developing e-cash payments system is a replica of the free banking experiment, there are several important differences that limit the usefulness of the analogy. E-cash transactions "clear" in a different manner than the free bank note transactions of the past. The Internet also increases the operational and fraud risks associated with the payments system. Unlike free banking of the past, e-cash requires the cooperation of a large number of parties. Coordination is not likely to be easy, even if the Fed works closely with the IETF. The ability to maintain the integrity of

a payments system involving continually changing technology provides regulators with a very unique challenge.

There are inherent concerns associated with regulating e-cash, besides decreasing firms' incentives to develop and maintain e-cash accounts. Internet users have voiced their desire for security, reliability, and privacy. If e-cash is regulated in an attempt to insure security and reliability, the privacy of its users could be compromised. The idea of the Internet as a freely-accessible public domain, where information is exchanged easily and the anonymity of its users is retained, could be jeopardized by over-regulation. Increased monitoring of transactions, combined with a need for the verification of parties, could threaten the ability of e-cash users to anonymously transfer money. Likewise, the anonymity of e-cash transactions could cause difficulties for the government in tracking money laundering and other forms of financial criminality.

Although there are many obstacles to overcome in its development, e-cash does appear to have a very bright future. Thomas Melzer, President of the Federal Reserve Bank of St. Louis, expressed the Fed's belief in e-cash's possible benefits in a 1996 address in San Francisco. He stated,

> The payments system in the 21st century should, as it does now, offer access to a wide variety of participants and users. It must also continue to operate efficiently, reliably, and with integrity. If the payments system of the future achieves these goals – integrity, efficiency and accessibility – it will support economic growth and continue to be worthy of the public's confidence (Melzer 29 Sep. 2000).

Although free banking ended in 1864, cooperation of parties and regulation of the industry has been shown to reduce payments system risk and stabilize the economy. Unprecedented growth in the U.S. has been possible in the twentieth century in large part

because of reduced payments system risk. If e-cash, like today's banking industry, can overcome the payments system risks it currently imposes, phenomenal growth might continue in the twenty-first century as well.

BIBLIOGRAPHY

Adao, Bernardino, and Temzelides, Theodosios. Beliefs, Competition, and Bank Runs. Federal Reserve Bank of Philadelphia: October 1995, Working Paper 95-26.

Benston, George J, and Kaufman, George G. Issues in Financial Regulation: Is the Banking and Payments System Fragile?. Federal Reserve Bank of Chicago: December 1994, Working Paper 94-28.

"Congress OKs Digital Signatures". <http://www.thestandard.com/article/display/0,1151,16108,00.html>. 6 Mar 2001.

"Could E-cash Threaten Payment Integrity?". ABA Banking Journal 89.11 (1997): 58-68.

Dorn, James A., Ed. The Future of Money in the Information Age. Washington D.C.: The Cato Institute, 1997.

Dowd, Kevin. The State And The Monetary System. New York: Philip Allan, 1989.

"Electronic Money". United States. The Federal Reserve Bank of Chicago. 9 Oct. 2000 <http://www.frbchi.org/pubs-speech/publications/BOOKLETS/electronic_money/electronic_money.html>.

Emerging Electronic Methods For Making Retail Payments. United States. Congressional Budget Office. 9 Oct. 2000 <http://www.cbo.gov/showdoc.cfm?index=14&sequence=0&from=1>.

Freeman, Eva. "How to Move E-cash Around the Internet". Datamation 42.16 (1996): 58-62.

Furger, Robert. "Digital Cash Gets Real: Good-bye to Free Web Content?". PCWorld 16.1 (1998) 68-70.

Good, Barbara Ann. The Changing Face of Money: Will Electronic Money Be Adopted in the United States? New York: Garland, 2000.

Goodhart, Charles. The Evolution of Central Banks. Cambridge, Massachusetts: MIT Press, 1988.

Gorton, Gary. "Banking Theory and Free Banking History: A Review Essay". Journal of Monetary Economics 16.2 (1985) 267-276.

Herringshaw, Chris. "E-cash gets to Work". Internet World 8.5 (1997): 84-86.

Hildreth, R. Banks, Banking, and Paper Currencies: In Three Parts. New York: Greenwood Press, 1968.

Hoenig, Thomas M. "The Evolution of the Payments System: A U.S. Perspective." Economic Review 80.3 (1995): 5-9.

"Internet Payments". The Economist 356.8182 (2000): 70.

Kettell, Brian. What Drives Financial Markets. London: Prentice Hall, 1999

Lawrence, Stacy. "E-Commerce Spotlight: Who's Cheating Whom?". <http://www.thestandard.com/research/metrics/display/0,2799,10096,00.html>. 6 Feb 2001.

Lundquist, Leslie, and Daniel C. Lynch. Digital Money: The New Era of Internet Commerce. New York: John Wiley & Sons, 1996.

Lunt, Penny. "E-cash Becomes Reality, via Mark Twain and DigiCash". ABA Banking Journal 88.1 (1996): 62-66.

McAndrews, James J. Banking and Payment System Stability in an Electronic Money World. Federal Reserve Bank of Philadelphia: July 1997, Working Paper 97-9.

McAndrews, James J., and Roberts, William. Banks, Payments, and Coordination. Federal Reserve Bank of Atlanta: November 1994, Working Paper 94-14.

McAndrews, James J., and Wasilyew, George. Simulations of Failure in a Payment System. Federal Reserve Bank of Philadelphia: June 1995, Working Paper 95-19.

Melzer, Thomas C. "Electronic Money, Inflation and the Role of the Fed in the Payments System". The Federal Reserve Bank of St. Louis. 9 Oct 2000 <http://www.stls.frb.org/general/speeches/970425.html>.

Melzer, Thomas C. "The Federal Reserve's View Of The Payments System In The 21st Century". The Federal Reserve Bank of St. Louis. 29 Sep. 2000 <http://www.stls.frb.org/general/speeches/0416.html>.

Mishkin, Federic S. The Economics of Money, Banking, and Financial Markets, 5th Edition. Menlo Park: Addison-Wesley, 1998.

"PaymentNet Hopes the Check is in the Web Site". <http://www.thestandard.com/article/display/0,1151,1222,00.html>. 6 Mar 2001.

Radigan, Joseph. "Locking Up The Money Monopoly." U.S. Banker 107.1 (1997): 26-34, 57.

Rockoff, Hugh. "New Evidence on Free Banking in the United States". The American Economic Review 75.4 (1985) 886-889.

Rolnick, Arthur J, and Weber, Warren E. "A Theory of Free Bank Failures: Tests and Implications". Federal Reserve Bank of Minneapolis Staff Report (April 1979): 1-36.

Rolnick, Arthur J, and Weber, Warren E. "The Free Banking Era: New Evidence on "Laissez-Faire Banking". Federal Reserve Bank of Minneapolis Staff Report (May 1980): 1-46.

Rolnick, Arthur J, and Weber, Warren E. "Banking Instability and Regulation in the U.S. Free Banking Era". Federal Reserve Bank of Minneapolis Quarterly Review 6.3 (1985): 2-9.

Rolnick, Arthur J. and Weber, Warren E. "Inherent Instability in Banking: The Free Banking Experience". The Cato Journal 5.3 (1986) 877-890.

Sechrest, Larry J. Free Banking: Theory, History, and a Laissez-Faire Model. Westport, CT: Quorum Books, 1993.

Sifers, Randall W. "Regulating Electronic Money in Small-Value Payment Systems: Telecommunications Law as a Regulatory Model". Indiana University School of Law – Bloomington. 24 Jan. 2001. <http://www.law.indiana.edu/fclj/v49/no3/sifers.html>

Solomon, Elinor Harris. Virtual Money: Understanding the Power and Risks of Money's High Speed Journey into Electronic Space. New York: Oxford University Press, 1997.

"Terms of Use". <http://www.paypal.com>. 5 Feb 2001.

"TheStandard.com: 100 numbers you need to know". <http://www.thestandard.com/article/display/0,1151,20128,00.html>. 6 Feb

2001.

Warwick, David R. Ending Cash: The Public Benefits of Federal Electronic Currency. Connecticut: Quorum, 1998.

West, Robert Craig. Banking Reform and the Federal Reserve 1863 – 1923. Ithaca: Cornell University Press, 1977.

White, Lawrence H. Competition And Currency: Essays on Free Banking and Money. New York: New York University Press, 1989.

White, Lawrence H. The Theory of Monetary Institutions. Malden, Massachusetts: Blackwell Publishers, 1999.