RETAIL PAYMENTS RESEARCH PROJECT

A Snapshot of the U.S. Payments Landscape

Depository Financial Institution Check Study

Check Sample Study

Electronic Payment Instruments Study

Research Sponsored by the Federal Reserve System.

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Table of Contents

Table of Exhibits

Table of Tables

1   Executive Summary

1.1   Introduction

In 2001, the Federal Reserve System made its first attempt to directly estimate the volume and value of checks and other retail payments in more than 20 years. As the country's central bank, the Federal Reserve undertook this research a) to document the size of the U.S. retail payments system and b) to quantify the opportunity for future substitution of paper check payments by electronic payments. Based on interactions with industry stakeholders before, during and since the study, this effort has been welcomed by the industry.

Three studies – two examining the check payments market and one measuring electronic payments – measure the size of the non-cash payments market and offer unique insights into the dynamics of the U.S. retail payments system.

The results are used to provide a snapshot of the current U.S. retail payments market. The 2001 effort lays an essential foundation for continued research and trend analysis by the industry and the Federal Reserve System.

The Federal Reserve's 2001 *Retail Payments Research Project* consisted of the following:

▸ ***The Depository Financial Institution Check Study*** estimated the total annual volume and value of check payments in the United States. Conducted with the help of Global Concepts and Westat, *The Depository Financial Institution (DFI) Check Study* collected data from a sample of depository financial institutions about paid checks and returned checks during March-April, 2001. Using the two-month sample, estimates for the entire industry were produced and are reported on an annual basis.

▸ ***The Check Sample Study*** complemented *The DFI Check Study* by characterizing check payments according to type of payer, payee and purpose. Specifically, *The Check Sample Study (CSS)* estimates who (consumer, business or government) writes checks to whom (consumer, business or government) and why (remittance, point-of-sale, income or casual payments). This study, also conducted with Global Concepts and Westat, surveyed depository financial institutions to estimate national check usage.

▸ ***The Electronic Payment Instruments Study*** estimated the total volume and dollar value of payments across each of six established electronic payment mechanisms.[1] *The Electronic Payment Instruments Study (EPIS)*, conducted with the help of Dove Consulting, estimates the transaction volume and value of credit cards (general purpose and private label), debit cards (online and offline), ACH (automated clearing house) payments and EBT (electronic benefits transfer) payments by surveying clearing houses and payment processors through which these payment volumes are cleared. The study estimates national transaction volumes for the year 2000.

This report describes the results of each study, beginning with *The DFI Check Study* and ending with *The Electronic Payment Instruments Study*.

The three studies paint a unique picture of the size and characteristics of the non-cash payments market. They will serve as a benchmark against which the industry can measure its evolution and its success in converting paper payments to electronic transactions.

1.2   Significant Results: The Depository Financial Institution Check Study

The DFI Check Study estimates that 42.5 billion checks are written annually in the U.S. accounting for $39.3 trillion in payments.[2]

The DFI Check Study, which gathered paid check volume data for the months of March and April 2001 from 1,256 U.S. financial institutions, is the first comprehensive check volume study since the 1979 Federal Reserve Check Collection Study. That study estimated a national volume of 32.8 billion checks. A comparison of the 1979 and 2001 studies shows that the number of check payments has risen 30% from the 1979 estimate. This translates into an average compound annual growth rate (CAGR) of 1.2% for check payments between 1979 and 2001.[3]

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[1] The Study also describes the usage levels of several emerging payment mechanisms (e.g., stored value cards, Internet currencies, etc.).
[2] Including 95% confidence intervals, the estimates are 42.5 billion checks +/- 1.59 billion checks and $39.3 trillion +/- $2.46 trillion respectively. These estimates include 492 million Federal government checks and Postal Money Orders for a total value of $313 billion that were not estimated by the survey but added to the final survey results.
[3] This study provides no information about how growth rates may have varied from year to year.

Exhibit 1: Comparison of Check Volume Survey Results (1979 vs. 2001)
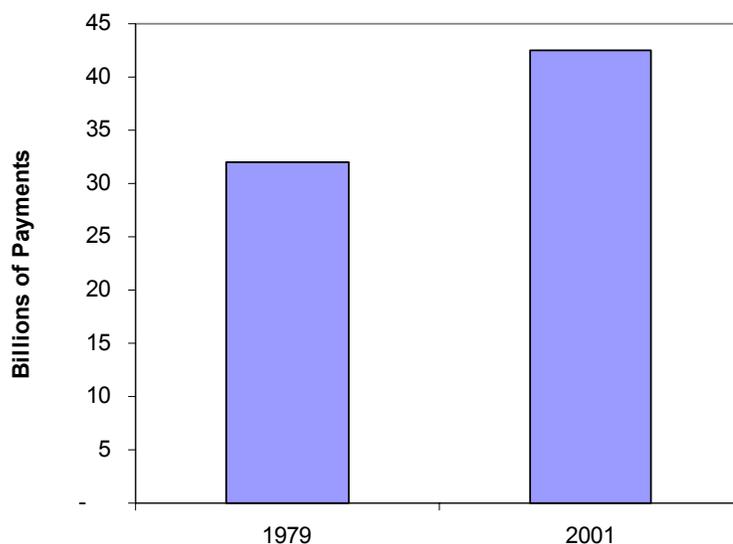
The average value per check has increased 22%, from $757 in 1979 to $925 in 2001. This increase in average value, however, can be attributed to inflation. The average value of an inflation-adjusted check has actually dropped since 1979. In 2001 real dollars the 1979 estimate would be approximately $1,584 compared to $925 today.

The drop in average dollar value per check payment likely reflects substitution by wire and ACH payments for high dollar value checks.

1.2.1   Check Volume and Value by Clearing Methods

In addition to estimating national check payments volume and value, *The DFI Check Study* gathered data on the methods used to clear and settle checks. Twenty-nine percent of all checks are "on-us," meaning the bank of first deposit for these items is also the institution on which the checks are drawn. These 12.4 billion on-us checks ($14.3 trillion in value) are not cleared and settled between financial institutions.

"On-us" checks represent a greater portion of check value than of check volume: 36% of total U.S. check value, equivalent to $14.3 trillion, are "on-us" checks. In contrast, clearing houses, same-day settlement and the Federal Reserve all represent smaller shares of check value than of check volume.

Exhibit 2: Distribution of Check Volume and Dollar Value by Clearing Method

Total Check Volume: 42.5 billion

Total Check Value: $39.3 trillion
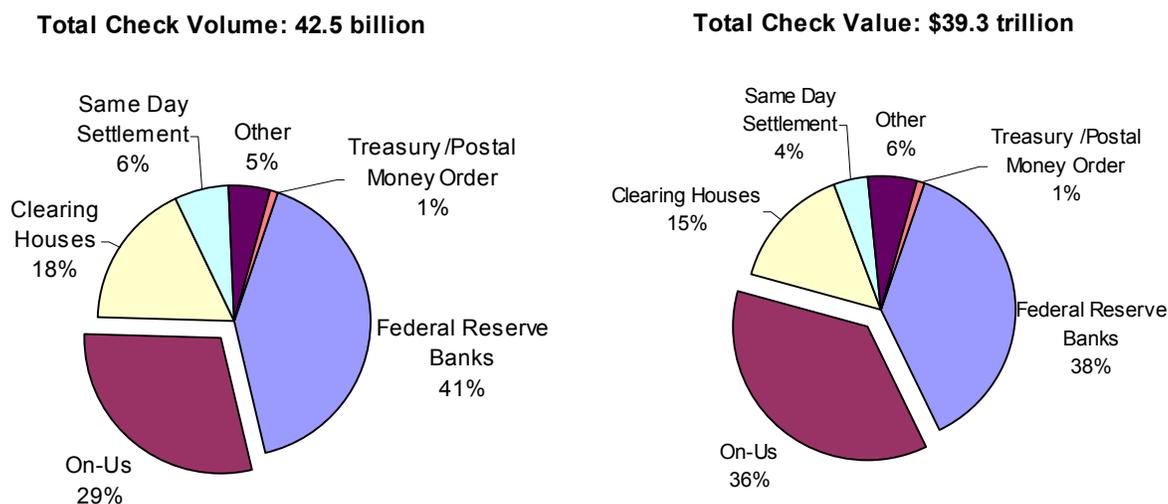
1.2.2 Returned Check Volume and Value

Another objective of *The DFI Check Study* was to collect volume and value estimates for returned checks.[4] The study found that 251 million of the 42.5 billion checks written annually are returned. This equates to 0.6% of total check volume. The average value per returned check is $701, which is $224 less than the average value across all check payments.[5]

Table 1: Estimated Returned Check Volume & Value Compared to Paid Check Volume & Value

	Volume	*Value*	*Average Value*
Returned Checks	251 million	$176 billion	$701
Total Checks	42,508 million	$39,309 billion	$925

1.3 Significant Results: The Check Sample Study

Conducted as a complementary study to *The DFI Check Study, The Check Sample Study* examined 28,877 randomly selected checks deposited at 149 depository financial institutions in the U.S. The study categorized these checks by type of payer, payee and purpose. In terms of

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[4] The study did not attempt to quantify the volume or value of returns re-presented. Re-presentment of returns will have a very slight inflationary effect on the aggregate volume/value of paid checks.

[5] The $701 average value per return is also considerably lower than the $1,100 noted in a 1995 report to the Congress.

volume, results indicate that consumers are the predominant check writers, but businesses receive the majority of checks.

The table that follows lists the estimated distribution of check payments across various combinations of payer (the party making the payment) and payee (the party being paid). The payer and payee together constitute the counterparty. The table illustrates that consumers write over half of all checks, while businesses receive about half of all checks.

Table 2: Estimated Distribution of Check Volume by Counterparty

Check Volume by Counterparty with 95% confidence interval (for totals only)							
	Payee						
				Business or			
Payer	Consumer	Business	Government	Government	Unknown	*Total*	
Consumer	11.2%	33.8%	1.7%	2.7%	1.6%	*50.9%*	*+/- 2.2%*
Business	14.6%	15.0%	0.8%	1.0%	0.9%	*32.3%*	*+/- 2.1%*
Government	2.5%	0.7%	0.2%	0.0%	0.1%	*3.5%*	*+/- 0.7%*
Business or Govt[6]	0.6%	0.4%	0.0%	0.1%	0.1%	*1.3%*	*+/- 0.1%*
Unknown[7]	0.1%	0.2%	0.0%	0.0%	11.6%	*12.0%*	*+/- 2.6%*
Total	*29.1%*	*50.1%*	*2.7%*	*3.8%*	*14.3%*	100.0%	
	+/- 4.4%	*+/- 3.2%*	*+/- 0.5%*	*+/- 0.6%*	*+/- 2.5%*		

In contrast to the check volume analysis, consumer-written checks account for only 19% of the total value of check payments, while businesses write checks for 62% of total check value. In terms of value, businesses are both the heaviest writers and receivers of check payments. Taken alone, business-to-business checks account for over 40% of the total value of check payments.

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[6] The Business or Government (BG) category includes checks for which the payer or payee is clearly not a consumer but cannot be distinctly categorized as a business or government. Business and governments are often grouped together in the study because their payment behavior is very similar and because governments represent a small portion of check volume compared to businesses.

[7] The "unknown" category in Table 2 and Table 3 includes both those items for which the survey was filled out with inconsistent data (approximately 2%) and those items for which no payer, payee and/or purpose (approximately 10%) was identified. The "unknown" category may include specific segments of check payments that are difficult to categorize; for example, a number of checks written by sole proprietors or very small businesses (i.e., checks that have many characteristics of consumer payers and business payers) may have been categorized as "unknown" for payer. Checks for which it is unclear whether the payee is a consumer or small business are likely to be categorized as "unknown" for payee and for purpose.

Table 3: Estimated Distribution of Check Value by Counterparty

	Check Value by Counterparty with 95% confidence interval (for totals only)						
			Payee				
Payer	Consumer	Business	Government	Business or Government	Unknown	**Total**	
Consumer	6.7%	10.2%	0.6%	0.7%	0.9%	*19.2%*	*+/- 2.1%*
Business	14.5%	42.7%	0.5%	2.9%	0.9%	*61.6%*	*+/- 3.5%*
Government	1.5%	1.9%	0.3%	0.0%	0.0%	*3.8%*	*+/- 1.1%*
Business or Govt	0.4%	0.5%	0.0%	0.1%	0.5%	*1.5%*	*+/- 0.5%*
Unknown	0.1%	0.2%	0.0%	0.0%	13.6%	*13.9%*	*+/- 2.9%*
Total	*23.3%*	*55.5%*	*1.5%*	*3.8%*	*15.9%*	*100.0%*	
	+/- 4.0%	*+/- 4.3%*	*+/- 0.6%*	*+/- 1.9%*	*+/- 2.9%*		

1.3.1 Categorization of Check Payments by Purpose

The study categorized check payments into six purpose categories: Casual, Income, Remittance, Point of Sale (POS), Remit/POS, and Unknown. These categories are defined as follows:

- **Casual**: Payment from one individual to another. By definition, all consumer-to-consumer payments, therefore, are categorized as *Casual*. This category is likely to include some payments to and from individuals acting as small businesses, such as rent payments written to individuals.
- **Income** – Payment to an individual from either a business or government entity. By definition all business-to-consumer or government-to-consumer payments, therefore, are categorized as *Income*. This category includes – for example – payroll, pension, rebates, expense reimbursement and investment disbursement checks.
- **Remittance** –Payments from any type of payer to either a business or government payee that does not occur at the point of sale. The types of remittance payments include: regular recurring remittance payments such as bill payments, non-recurring bill payments such as payments to doctors, plumbers, etc., and commercial remittance payments between businesses and/or government organizations.
- **Point of Sale (POS)** – Payments from any type of payer to either a business or government payee that occurs in any of the following environments: storefront, over-the-counter retail remittance, such as a telecom bill paid at the local office, MOTO (mail order/telephone order, e.g., catalog retailers), Internet, mobile POS (such as check payments occurring at home to repairmen), C.O.D., and vending.[8]
- **Remit/POS** – Payments made to business or government payees that *The Check Sample Study* was unable to categorize as either distinctly remittance or POS.
- **Unknown** – Payments for which *The Check Sample Study* could not determine a purpose or for which the survey respondent may have completed the questionnaire incorrectly.

As shown in the exhibit below, remittance and POS check payments combined represent over half of all check payments volume (57%). Income and casual check payments (those payments

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[8] Internet, MOTO (mail/telephone order), and vending transactions fall into the POS category, but they do not apply to check payments. The categorization was designed to describe all potential payment mechanisms – not just check – for the POS purpose category.

received by consumers) represent about 30% of all check payments by volume, while Unknown checks account for the remainder.

The distribution of check payments by dollar value demonstrates that POS checks, while a significant portion of total volume (19%) make up only 9% in terms of the total value of checks. Conversely, the Remittance/POS category accounts for a significantly greater portion (25%) of check payments value than of volume (12%). This is due to a relatively small number of high-value checks between business or government payers and payees for which the purpose (either Remittance or POS) could not be clearly determined.

Exhibit 3: Estimated Distribution of Check Volume and Dollar Value by Payment Purpose

Check Payments Volume by Purpose
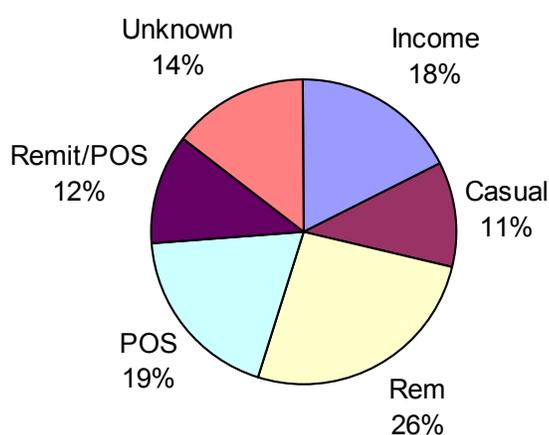
Check Payments Value by Purpose
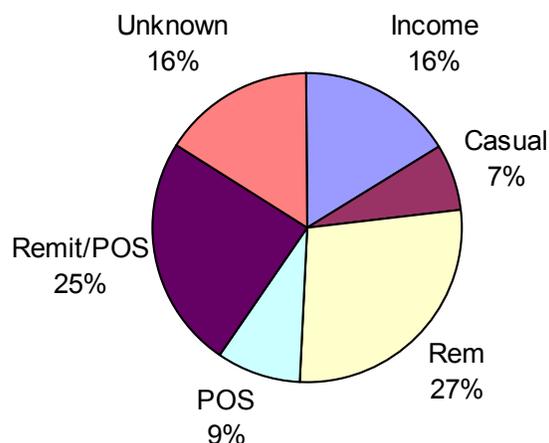
Check payments can be categorized into eight Payer-Payee-Purpose subcategories (excluding Unknown) that describe the distribution of check payments.[9] As shown in the chart below, the largest segments of check payments are business and/or government income payments to consumers (17.8%) and consumer remittance payments to business and/or governments (17.7%).

Table 4 illustrates that payments categorized as Remit/POS are roughly split between those written by consumers (6.4%) and those written by businesses or government organizations (5.5%). Remit/POS payments written by businesses or government organizations are more likely to be remittances. Those written by consumers are more difficult to surmise. This segment likely includes POS payments from the home to contractors and remittance payments to small businesses that endorse checks in a similar way to small retail merchants or consumers.

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[9] The intersection of Payer, Payee and Purpose actually allows for 20 cells (excluding "unknown"), but only 8 cells are by definition appropriate for analysis. For example, consumers do not receive POS payments.

Table 4: Estimated Distribution of Check Volume by Counterparty and Purpose

Distribution Includes 95% confidence interval (% All Check Payments)										
	Counterparty									
Purpose	C2C	(+/-)	C2BG	(+/-)	BG2C	(+/-)	BG2BG	(+/-)	Unknown[10]	(+/-)	*Total*
Income					17.8%	2.5%					*17.8%*
Casual	11.2%	1.9%									*11.2%*
Remittance			17.7%	1.9%			7.9%	0.7%	0.1%	0.1%	*25.7%*
POS			14.1%	2.0%			4.9%	0.8%	0.1%	0.0%	*19.0%*
Remit/POS			6.4%	0.9%			5.5%	0.9%	0.1%	0.0%	*11.9%*
Unknown									14.5%	2.5%	*14.5%*
Total	*11.2%*		*38.1%*		*17.8%*		*18.3%*		*14.7%*		*100.0%*

Of the estimated 21.6 billion checks written by consumers, 22% are for casual payments.

Exhibit 4: Purpose of Check Payments by Consumers (Volume)

21.6 Billion Consumer Checks
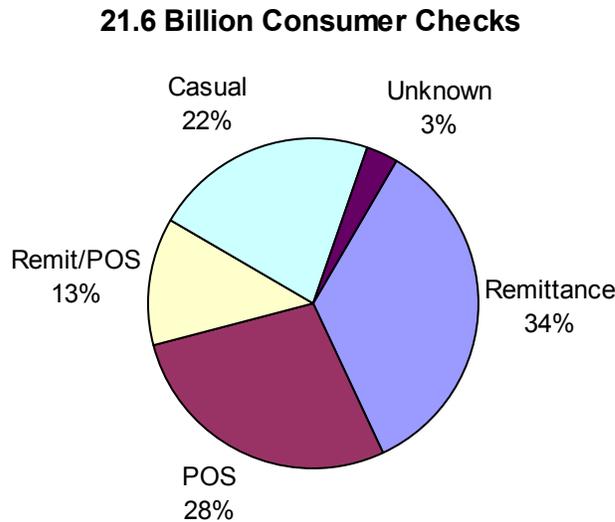
About half (48%) of the estimated 15.8 billion checks written by businesses or government organizations are income payments to consumers. Remittance and POS payments make up the other half.

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[10] Checks for which the counterparty relationship is unknown are any checks for which either payer or payee cannot be determined. Therefore, some checks for which the payer is known (e.g., consumer) have been categorized as "unknown" for the purpose of this table, because the payee type could not be determined. The sum of all C2C and C2BG checks, therefore, does not equal the sum of all consumer checks. Nor do BG2C and BG2BG account for all checks written by business or government payers.

Exhibit 5: Purpose of Check Payments by Business/Government Entities (Volume)

15.8 Billion Bus/Gov Checks
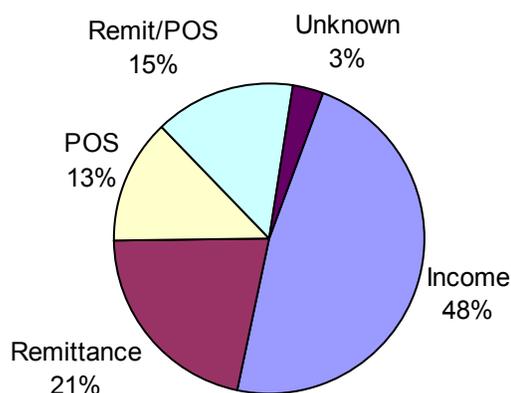
Nearly half (49%) of the value of check payments is concentrated into a single counterparty relationship – BG2BG payments (payments from business or government payers to business or government payees), with 21% going toward remittance payments, 21% to remittance or POS payments and 7% for POS payments. The only other segment with more than 7% of the total value of check payments is business/government income payments to consumers.

Table 5: Estimated Distribution of Check Value by Counterparty and Purpose

Distribution Includes 95% confidence interval (% All Check Payments Value)										
					Counterparty					
Purpose	C2C	(+/-)	C2BG	(+/-)	BG2C	(+/-)	BG2BG	(+/-)	Unknown	(+/-)	*Total*
Income					16.5%	3.6%					*16.5%*
Casual	6.7%	1.2%									*6.7%*
Remittance			6.2%	1.5%			21.1%	4.9%	0.1%	0.1%	*27.4%*
POS			1.7%	0.4%			7.1%	2.2%	0.0%	0.0%	*8.8%*
Remit/POS			3.7%	0.9%			20.8%	4.6%	0.1%	0.1%	*24.6%*
Unknown									16.1%	2.9%	*16.1%*
Total	*6.7%*		*11.5%*		*16.5%*		*49.0%*		*16.2%*		*100.0%*

1.4   Significant Findings: Electronic Payment Instruments Study

Conducted independently of the two check studies above, *The Electronic Payment Instruments Study (EPIS)* estimated the volume and dollar value of electronic payments. The study estimates that during calendar year 2000, 29.5 billion electronic payments were originated in the United States with a value of $7.3 trillion.

The study counted electronic payment transactions from consumers, businesses and government entities in three primary areas: those used by buyers of goods or services; those used on the 'back-end' to effect final settlement for purchase transactions; and those used by employers, state agencies and others for disbursements of income payments. The Study excluded non-purchase transactions such as ATM and settlement transactions, which are not considered to be direct substitutes for paper checks. Fedwire, CHIPS, and automated clearing house (ACH) transactions for Cash Concentration or Disbursements (i.e. CCD) were all excluded from the study.

The Study was conducted by surveying the leading electronic payment processors. The research team identified and surveyed 118 organizations that could collectively provide data on all electronic payment transactions in the United States. Organizations representing 94% of all estimated payment value participated in the survey. Data for the remaining organizations were estimated.

Table 6: Total Estimated Volume and Dollar Value of Electronic Payments

Electronic Payment Instrument	Transaction Volume (Millions)	Dollar Volume ($Millions)	Average Payment Value
General purpose credit cards[11]	12,300.2	$1,072,555	$87.20
Private label credit cards[12]	2,748.6	$162,819	$59.24
Offline debit (signature-based)[13]	5,268.6	$209,980	$39.85
Online debit (PIN-based)[14]	3,010.4	$138,151	$45.89
Automated Clearing House (ACH)[15]	5,622.0	$5,674,851	$1,009.40
Electronic Benefits Transfer (EBT)[16]	537.7	$13,744	$25.56
Total	**29,487.5**	**$7,272,100**	**$246.62**

[11] General-purpose credit cards include co-branded credit cards, charge cards, co-branded charge cards secured credit cards, T&E cards, commercial cards (including business, corporate, and purchasing), and new payment technologies that route transactions through the card associations' networks.

[12] Private-label credit card programs include those run by individual retailers or gas companies, third-party fleet-card issuers and third-party receivable owners.

[13] Offline debit refers to debit card transactions that require the customer's signature (rather PIN) as a means of authentication. Visa and MasterCard have the only two networks for offline debit transactions. Visa's offline debit statistics also include the new hybrid online/offline debit card offered by Visa, the Visa Check Card II.

[14] Online debit card transactions require the customer to enter a four-digit PIN (personal identification number) as a means of authentication (as opposed to signing a sales receipt). Online debit card transactions are originated, cleared and settled over EFT networks (the same networks that process ATM transactions) as opposed to Visa or MasterCard's networks.

[15] The ACH is an electronic payments network that allows credits and debits to be processed between financial institutions. ACH transactions between financial institutions are processed by one of four ACH operators, who were surveyed. ACH transactions that are On-Us (a DFI is both the originator and receiver of a transaction) have been estimated using data from NACHA (National Automated Clearing House Association).

[16] EBT is an electronic system that allows a recipient to authorize transfer of his/her government benefits from a Federal account to a retailer account to pay for products received. EBT is currently being used in many states to issue food stamps and other benefits.

As shown in the exhibit below, the majority (51%) of electronic payment transactions were made using credit cards, but 78% of payment dollars were handled through the ACH.

Exhibit 6: Comparative Distribution: Electronic Payments Volume vs. Dollar Value

Electronic Payments Volume by Payment Instrument
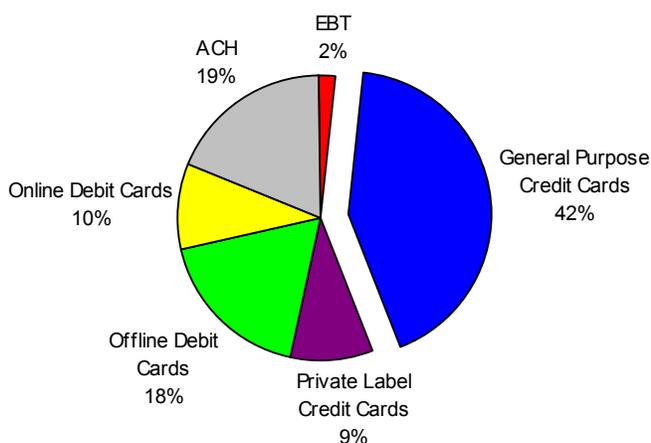
Electronic Payments Value by Payment Instrument
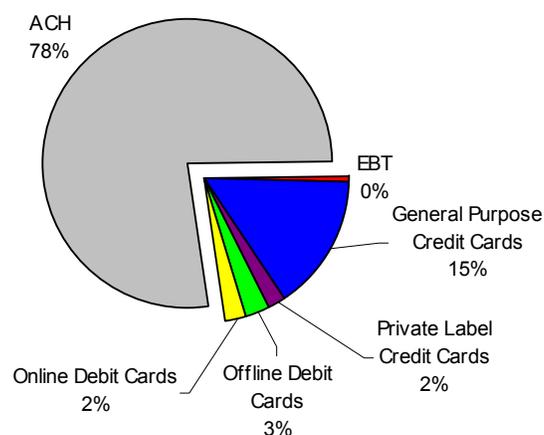
1.4.1 General Purpose and Private Label Credit Card

On a transaction volume basis, general purpose and private label credit cards were the most common electronic payment instrument used in the U.S. during the Year 2000: 15.0 billion transactions were originated with a value of $1,235 billion. The average transaction size for general purpose credit cards was much larger than that of private label cards: $87.20 vs. $59.24. Credit cards accounted for 51% of all electronic payment transactions and 17% of the dollar value. Eighty-two percent of credit card transactions and 87% of transaction value came from general purpose credit cards.

1.4.2 Online and Offline Debit Cards

Following credit cards, debit cards represented the second most common form of electronic payment, accounting for 8.3 billion transactions and a dollar value of $348 billion in 2000. On average, each debit transaction was $42, compared with $87 for the average general purpose credit card transaction. In 2000, 64% of transactions and 60% of the value was contributed by offline debit (i.e., signature-based); 36% of transactions and 40% of value was from online debit (i.e., PIN-based).

1.4.3 ACH

Although ACH was the third most commonly used electronic payment instrument with 5.6 billion transactions, it dominates on a dollar value basis accounting for 78% of the monetary value. The average transaction volume was more than 11 times larger than that of general purpose credit card transactions ($1,009 vs. $87).

1.4.4   EBT

EBT volume has increased dramatically due to initiatives at the federal level and significant efforts by state governments to electronify both food stamps and cash assistance payments during the 1990s. Nevertheless, EBT was the smallest volume payment instrument with 500 million transactions and $13.7 billion in value. Note that the "EBT" category in this study refers to consumer payments using EBT. Government disbursements to financial institutions that hold EBT funds and those institutions' reimbursements to merchants for EBT sales are included in the ACH category.

1.4.5   Emerging Payments

The survey of emerging payments involved companies that provide services in such markets as electronic bill payment, person-to-person payments, stored value, Internet currencies and other emerging technologies. In general, emerging payment volumes for the payment instruments studied were quite small in 2000. Organizations participating in the survey reported 76.2 million transactions involving $12.7 billion. However, these numbers represent only a small portion of the total emerging payments. Many organizations did not respond to the survey because they were very new or they were in a very competitive market and did not want to reveal their data. The Study did not attempt to estimate the volumes for non-respondents. Several categories within the emerging payments group will be important to watch in the coming years, especially person-to-person payments.[17]

1.5   Non-Cash Payments Market Then vs. Now

The Federal Reserve's 1979 check collections study was the last authoritative study of the U.S. check payments market. The study did not estimate electronic payments volumes comparable to the 2001 effort, but review of available data suggests a 1979 market of approximately 5-6 billion electronic payments.[18]

Since 1979, the total number of non-cash retail payments has nearly doubled from approximately 38 billion to 72 billion. This translates into an average compound annual growth rate (CAGR) of 2.9% for non-cash retail payments from 1979 to 2001.[19] ACH, credit card, debit card, and EBT payments have led this growth: taken together these four electronic retail payment types have grown at an average CAGR of approximately 8%, increasing from an estimated 5-6 billion in 1979 to 29.5 billion, according to the results of the *Electronic Payment Instruments Study*.

Check volume on the whole has increased by 30% since the 1979 estimate of 32.8 billion checks. Although checks remain the dominant form of non-cash payment, over the last 20 years, their proportion of the total payments market has declined considerably. Despite overall growth in

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[17] Emerging payments settle via existing payment systems for which this study estimates annual volumes.

[18] The retail electronic payments volume in 1979 was attributable entirely to credit card and ACH transactions. The estimated volume of 5-6 billion payments is based on extrapolation from a study by the Federal Reserve Bank of Cleveland for its 1977 annual report. That report estimated 5 billion credit card transactions and 12 million ACH transactions in 1976-77. Available data from general purpose credit/charge card companies and secondary sources support a conservative estimate of 5-6 billion electronic payments in 1979.

[19] The 2001 research effort marks the first time since 1979 that the Federal Reserve System conducted research to estimate national check volume. The characteristics of the growth curve between 1979 and 2001 for paper or electronic payments are unknown; the CAGR represents the average growth between the 1979 and 2001 data.

volume, checks have declined from approximately 85% of non-cash payments in 1979 to 59% today.

Exhibit 7: Comparison of Non-Cash Payments Volumes (1979 vs. 2000)

Growth of Non-Cash Retail Payments: Check Vs. Other
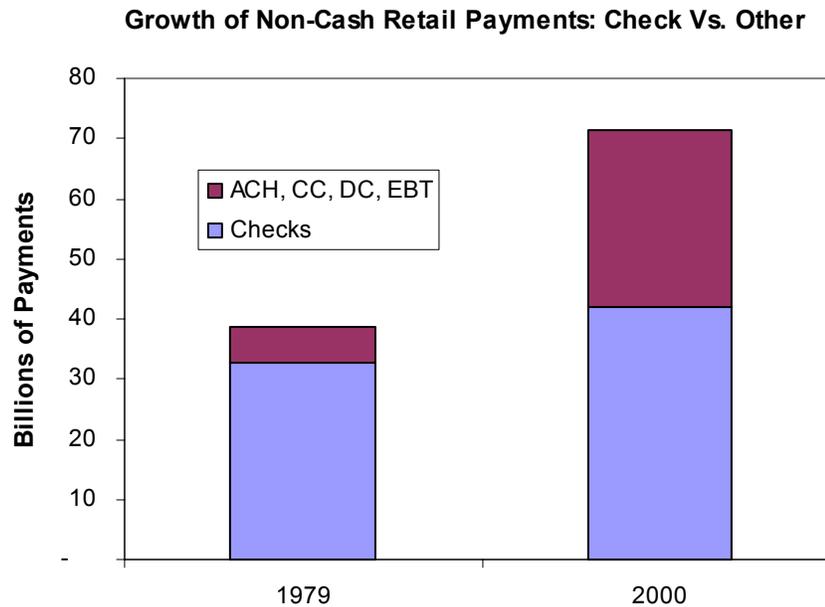
1.6   Implications and Observations

As the Federal Reserve, like many other payment processors, looks for ways to make the payments system more efficient, it is vital to understand where opportunities exist for migrating check payments to electronics.

The data from this research show that remittance and point-of-sale payments written by consumers offer the most significant opportunities for substitution, as these are the largest categories of checks written today. This implies that the ACH and credit and debit cards are poised for meaningful growth in the near term.

Given the large number of checks still being written in the United States and the increased usage of electronic forms of payment, businesses and financial institutions are going to have to maintain multiple channels for the foreseeable future. While checks, we believe, will account for a decreasing portion of total payments, they will continue to be around for some time to come.

Despite an annual volume of 42.5 billion checks, it appears that Americans are changing their historical, conservative use of payments. The fact that 30 billion electronic payments were initiated in 2000 indicates clear acceptance by consumers and businesses. And given that debit and credit card payments and ACH transactions collectively have grown exponentially in the last 20 years – some 500 percent since 1979 – these electronic forms of payment will become more prevalent and increasingly a requirement of doing business for U.S. companies and financial institutions.

The data from the study are important because they offer factual evidence to financial institutions, the financial services industry and the Federal Reserve System on the volume and value of payments. From this, industry stakeholders may make inferences about the migration of the payments system and where prudent opportunities for investments in payments system technology exist. Going forward, the Federal Reserve plans to repeat this research and establish a trend line that will enable both industry stakeholders and the Fed to measure the progression of the payments system and the migration of paper payments to electronics. This study is just a picture – a snapshot – of the continuing evolution of the payments system.

2 Introduction

This report details the methodologies and findings of each of three research efforts performed as part of *The Retail Payments Research Project*:

    ▶ *The Depository Financial Institution Check Study*   **Chapter 3**

    ▶ *The Check Sample Study*   **Chapter 4**

    ▶ *The Electronic Payment Instruments Study*   **Chapter 5**

2.1 Survey Methodologies

Each of the three studies used a discrete methodology, but a distinction should also be made between the two studies of check payments and the study of electronic payments:

- Both *The Depository Financial Institution (DFI) Check Study* and *The Check Sample Study* were sample surveys. They relied on standard statistical techniques in order to estimate the size and characteristics of the check payments market by surveying a representative sample of the whole. For *The DFI Check Study* – which estimated the national annual volume and dollar value of check payments – this meant surveying a representative random sample of insured depository financial institutions with regard to their paid check volume. *The Check Sample Study* – which characterizes the types of check payments being made – required that a representative random sample of checks be surveyed.

  As sample surveys *The DFI Check Study* and *The Check Sample Study* are subject to sampling error. For this reason tables in this report include error estimates alongside many of the point estimates. The error estimate, or margin of error, reflects an interval within which there is a 95% level of confidence about the estimate. The 95% confidence intervals are based on sampling error alone.[20]

- *The Electronic Payment Instruments Study* did not rely on a statistical sampling methodology. Rather, the study took a census of clearinghouses and payment processors who clear and settle the vast majority of electronic payments. While not all processors

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[20] There are non-sampling error factors not accounted for in these error estimates. Non-sampling errors include biases due to inaccurate reporting, processing and measurement, as well as error due to nonresponse and incomplete reporting. These types of errors cannot be measured readily. However, to the extent possible each error has been minimized through the procedures used for data collection, editing, quality control and nonresponse adjustment.

chose to respond to the study, estimation of uncounted volume was minimized by strong participation and thorough validation. We believe the results to be highly accurate estimates of the total annual volume and dollar value of electronic payments in the United States.

Combined the three studies allow the first authoritative account of both the size and characteristics of non-cash retail payments in the United States in more than 20 years.

The Federal Reserve wishes to recognize the efforts of its contractors – Global Concepts, Dove Consulting and Westat. We appreciate the quality of their execution of these studies.

We also extend our deepest gratitude to the many financial institutions and payment processors that contributed data for the studies. Despite the considerable effort required of some institutions, participation in the three studies was outstanding. The industry's commitment signifies clearly the importance of understanding the dynamics of the market in which we operate. The Federal Reserve System is truly grateful for the time and effort committed by all participants in *The Retail Payments Research Project*.

3   The Depository Financial Institution Check Study

The survey research team of the Federal Reserve, Global Concepts and Westat conducted a stratified random sample survey of depository financial institutions (DFIs) to estimate the total volume of check payments in the U.S. over a 12-month period.[21] Sample data were collected for the months of March and April 2001. Results were extrapolated to the sample universe and annualized. Participant DFIs were asked to provide the total volume and dollar value of paid checks (i.e., On-Us checks) and (outgoing) returned check processed during each of the two months.

The main objective of the study was to estimate the annual volume and value of check payments in the U.S. The estimate includes data about the volume of checks paid by commercial banks, thrifts and credit unions as well as the annual aggregate volume and dollar value for all institutions.

3.1   Methodology

The DFI Check Study received check volume and value data from 1,256 financial institutions during March and April 2001. The methodology discussion below reviews the study's methodology at a relatively high level. For a more detailed description, see section 6.1 *Statistical Methodology for The DFI Check Study*.

3.1.1   Sample Design

The study of paid check volume was conducted as a sample survey of DFIs. DFIs were stratified before sampling, first by type of institutions and then by size. The three primary strata (by type of institution) were commercial banks (CMB), credit unions (CUS) and thrifts (THR).[22] The next level of stratification was carried out on the basis of size where the measure of size was public checkable deposits (PCD). The size stratification was based on the PCD value at the highest institutional level (i.e., holding company if applicable). The sampling unit, therefore, was the DFI at its highest institutional level (e.g., holding company) and the data were collected for all the institutions owned by the sampled DFI.

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[21] A design variable called Public Checkable Deposits (PCD) was used to stratify the sample. These are all checkable deposits held by a DFI that are not the deposits of other DFIs or the federal government. Checkable deposits were believed to be a better indicator of check volume than total assets or total deposits. The sample was also stratified according to type of institution – Commercial Bank, Thrift or Credit Union. See section 3.1.1 or section 6.1.1 for more detail.

[22] Thrifts include savings banks and savings and loan associations.

3.1.1.1 Sampling Frame of the Financial Institutions

The sampling frame was constructed from files supplied by the Federal Reserve Board of Governors. The frame represented the population of insured depository financial institutions in the United States, which includes U.S. branches of foreign owned institutions. Only institutions with checkable deposits above $100,000 were included in the frame. It is possible that a bank holding company could have no checkable deposits, in which case it was eliminated from the frame.

More specifically, the frame consisted of:

- 6,846 commercial banks and bank holding companies, plus 6 "anomalous banks"
- 6,551 credit unions,
- 1,293 thrifts.

The six anomalous banks were identified and surveyed as a certainty stratum, because their paid check volume was known to be poorly correlated to PCD. Relatively speaking, these were small banks (low PCD value) that process a high volume of low dollar value rebate checks. These institutions were surveyed as a certainty stratum to avoid the risk of selecting them as part of a random sample. They are not representative of most other institutions their size. Their data would skew the results of a national estimate if it were extrapolated to estimate volumes processed by non-sampled banks.

3.1.1.2 Certainty Strata

The study was designed to account for as much volume/value as possible and to estimate the rest by surveying a representative random sample of DFIs. Because the largest institutions were assumed to account for the majority of total paid check volume and dollar value, they were sampled with certainty – i.e., all of them were included in the sample. Random sampling was conducted to select institutions from the other strata.

3.1.1.3 Sample Size and Sample Allocation

The sample size of 2,339 DFIs was based on the following assumptions for each of the primary strata (CMB, CUS and THR), and the aggregates of these strata:

- Expected response rate of 65 percent.
- Target of +/- 5% margin of error with a 95% level of confidence.

The total sample of 2,339 institutions was allocated across 14 design strata defined by type of institution and size (plus one stratum of anomalous banks).

The table below gives the number of institutions in the sample frame and the number sampled within each sampling stratum.

Table 7: Number of Institutions Sampled by Size Stratum (Original Design)[23]

Primary Stratum	Size Stratum	Number of Institutions	Number Sampled
Commercial Banks	1	204	204
	2	329	329
	3	845	336
	4	1,408	300
	5	2,036	242
	6	2,008	156
	All	6,830	1,567
Credit Unions	1	104	104
	2	344	181
	3	723	134
	4	1,742	112
	5	3,199	69
	All	6,112	600
Thrifts	1	40	40
	2	347	114
	3	850	44
	All	1,237	198
TOTAL		14,179	2,365

3.1.2 Sample Weighting

Survey responses from the respondents were inflated to obtain estimates for the entire population using a ratio estimation technique. In short, the ratio (i.e., sample weight) for each institution was computed as the total PCD for its stratum divided by the PCD for the respondent institution. The estimates for each stratum were then summed to produce a national estimate.

3.1.3 Estimation

The sampling and weighting methods above, combined with common imputation techniques, allow the study's results to estimate the total annual volume and dollar value of the following:

- Paid checks in the U.S.
- Paid checks in the U.S. by type of institution.
- Paid checks in the U.S. according to their clearing method.
- Returned checks (i.e., outgoing returns).

3.1.4 Designing the Survey Instrument

Instrument development was an iterative process between Global Concepts and the Federal Reserve. The final survey requested data from three major categories: paid checks, outgoing returns, and routing transit numbers.

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[23] This table represents the original design of the sample. During the survey period a number of DFIs merged with other institutions or were re-stratified for various reasons. The final sample size was 2,339 DFIs allocated as follows: 1,547 commercial banks, 599 credit unions, 187 thrifts and 6 anomalous banks. See table 8 for a summary or table 46 for details of the final stratification.

3.1.4.1 Paid Checks

In designing the survey methodology, Global Concepts and the Federal Reserve decided to survey paid checks. Check volume is prone to double counting, because multiple parties may handle a single item in the check clearing process (e.g., bank of first deposit, payor bank, correspondents). Because a check ultimately can be paid by only one DFI, however – the payor bank – a survey of paid checks was deemed most likely to produce an accurate estimate of national check volume.

Some DFIs do not process checks in-house. For example, many DFIs outsource check processing either to other DFIs or to third-party check processors. For this reason, the questionnaire stressed that the surveyed DFI was to report all checks paid by their institution, even if the checks were processed by a third party.[24] Conversely, DFIs that perform correspondent processing were asked not to count checks they process on behalf of other DFIs.

3.1.4.2 Outgoing Returns

The survey instrument requested the volume and dollar value of all outgoing returns during the survey period. These are checks presented to but returned unpaid by the respondent institution. By surveying outgoing, as opposed to incoming, returns, the study avoided double-counting returns handled by multiple institutions in much the same way as the survey of paid checks avoids double counting presented check volume/value.

The survey did not attempt to distinguish the volume of re-presented returns. These are checks returned once by the payor bank and presented a second time by the bank of first deposit for payment. This volume has a small inflationary impact on the overall estimate of total paid check volume.

3.1.4.3 Routing Transit Numbers (RTs)

In addition to surveying check volume and dollar value, the survey instrument requested that each respondent report the RTs that correspond to all volume/value reported. The RT survey provided a means to validate the identities of respondent DFIs and to gauge the reasonableness of DFI-reported data. The RTs were used to compare respondent data to Federal Reserve data about presentment volumes to those RTs.

3.1.4.4 Pretesting the Survey Instrument

The survey instrument was pretested with the help of both large and small financial institutions. These institutions provided high quality feedback on the clarity of the survey instrument and the relative difficulty in providing the survey data.

3.1.5 The Survey Instrument

Financial institution respondents reported value and volume data for the reference period (March and April 2001) either via the paper survey that was mailed to them or on a secure Web site using a user I.D. and a password provided to each institution. In addition to aggregate paid check volume and value data, the survey also requested the responding companies to report

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[24] When necessary, the outsourcer was also included in the survey.

components of the aggregate volume and value data for each month, breaking their total volume and value down into five possible categories:

- Inclearings from the Federal Reserve,
- Inclearings from all Clearing Houses or local exchanges,
- Inclearings via Same-day Settlement,
- Inclearings from Other channels, and
- On-Us deposits (i.e., those deposits for which the paying institution was the bank of first deposit).

Responding institutions were also asked to report the volume and value of outgoing returns for each month. Finally, each responding institution was requested to report active Routing Transit numbers. A copy of *The Depository Financial Institution Check Study* survey instrument can be found in Appendix C.

3.1.6 Reporting Period: March 1, 2001 - April 30, 2001

The survey research team chose a two-month survey period to mitigate any effect of an aberration in check volume or value for any given month. March and April, 2001 were chosen, because they were sufficiently representative without an unusual number of processing days. The research plan called for adjusting the two-month data to an annual estimate of check volume and value. The research team decided on a multiplication factor of 6 to annualize the two-month data.[25]

While April is the end of the annual filing period for most personal income tax returns, this does not have a significant effect on the overall estimates. Even without a seasonal adjustment, the research team does not believe April's tax payment and refund volume would have a significant impact on the overall estimate. Federal refund checks are paid by the U.S. Treasury and were, therefore, not counted by the survey of depository financial institutions. Estimated annual federal check volume and value (based on recent historical data) have been added to the national estimate after survey results were extrapolated to the industry and annualized (see Table 9 and Table 10). State refund checks, however, were counted through the survey of DFIs.

3.1.7 Data Collection

The data collection strategy was based on the Dillman Total Design Method (1978), which uses a combination of respondent notifications, survey distribution and reminders to achieve the desired response rate. This study used a modified form of the methodology that included multimode contacts, that is, letter and phone calls, a different strategy for the top commercial banks certainty stratum, and a choice of response modes, that is, letter, fax or website.

Extensive data scrubbing and follow-up were performed to verify data and to correct errors.

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[25] Historical processing volume data from the Federal Reserve implies that an annualization factor of 6 for the combined volume of March and April is reasonable. (This reflects the conclusion that the reference period does not exhibit either unusually high or low volume.) This factor assumes that there are no seasonal fluctuations in Federal Reserve share of total industry volume.

3.2   Results and Analysis

3.2.1   Survey Response

Fifty-four percent of sampled institutions (including 6 of 6 "anomalous banks") responded to the survey. Credit Unions responded at the highest rate (57%).

Table 8: Survey Response by Type of Institution

SAMPLE	Sample Frame Size	Sample Size	Institutions Responding	Response Rate
Commercial Banks	6,846	1,547	810	52%
Credit Unions	6,551	599	343	57%
Thrifts	1,293	187	97	52%
Anomalous Banks	6	6	6	100%
All Institutions	14,696	2,339	1,256	54%

3.2.2   Aggregate Paid Check Volume and Value

The table that follows documents the survey's primary output – a 12-month estimate of the total volume and value of check payments in the U.S. The 95% confidence interval is included for the total and the breakdown of the total by the primary stratification (type of institution). The aggregate total includes two additional data points that were not collected through the survey: U.S. treasury checks and postal money orders (PMO). This volume (492 million items) and value ($313 billion) have been added to the estimated volume of checks paid by DFIs. Because treasury checks and PMO volume are processed by the Federal Reserve, the volume and value figures are known and include no error estimate.

Treasury checks and PMO volume and dollar value from the year 2000 were assumed to provide the most reliable recent estimate of checks paid by the Federal Reserve, because Treasury check volume in 2001 (or March-April 2001) was expected to produce an extraordinarily high estimate – millions of tax refund checks were mailed to U.S. households in 2001.

Table 9: Estimated Annual Check Payments Volume

	Total Check Payments		95% Confidence Interval	
U.S. Market	42.508	billion	**(+/-)** 1.593	billion
Commercial Banks	33.006	billion	(+/-) 1.495	billion
Credit Unions	4.745	billion	(+/-) 0.269	billion
Thrifts	3.991	billion	(+/-) 0.480	billion
Anomalous Banks	0.275	billion	N/A	
U.S. Treasury Checks	0.262	billion	N/A	
Postal Money Orders	0.230	billion	N/A	

The estimated annual dollar value of check payments is summarized in the table below. The aggregate estimate and the estimated breakdown by type of institution include a corresponding 95% confidence interval for each estimate.

Table 10: Estimated Annual Check Payments Value

	Value of Check Payments		95% Confidence Interval	
U.S. Market	$ 39.309	**trillion**	**(+/-)** **$2.456**	**trillion**
Commercial Banks	$ 36.549	trillion	(+/-) $2.449	trillion
Credit Unions	$ 0.883	trillion	(+/-) $0.041	trillion
Thrifts	$ 1.552	trillion	(+/-) $0.178	trillion
Anomalous Banks	$ 0.011	trillion	N/A	
U.S. Treasury Checks	$ 0.283	trillion	N/A	
Postal Money Orders	$ 0.030	trillion	N/A	

3.2.3   Check Volume and Value by Clearing Method

Financial institutions were asked to report not only their total paid check volume and dollar value, but also the distribution of that volume/value by presentment method. Specifically, DFIs were asked to report volume/value received from the Federal Reserve, clearing houses (CH), same-day settlement (SDS) and other clearing methods; as well as any "on-us" volume.[26] The results of the survey's clearing methods data are provided in the tables below. Each estimate includes its corresponding 95% confidence interval. The figures exclude 492 million Treasury checks and postal money orders for a value of $313 billion.

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[26] The category Other was used to allow DFIs to allocate volume they could not accurately label as either presented by the Federal Reserve, a clearinghouse, via same-day settlement or deposited on-us.

Table 11: Estimated Annual Check Volume Distributed by Clearing Method

Cleared via	Total Check Payments	95% Confidence Interval	
FRB	17.223billion	(+/-)	N/A
ON-US	12.393billion	(+/-)	1.415billion
CH	7.618billion	(+/-)	1.174billion
SDS	2.657billion	(+/-)	0.308billion
OTHER	2.125billion	(+/-)	0.522billion

(+ 0.492 billion Treasury checks and PMO)

Table 12: Estimated Annual Check Value Distributed by Clearing Method

Cleared via	Value of Check Payments	95% Confidence Interval	
FRB	$ 14.639 trillion	(+/-)	N/A
ON-US	$ 14.286 trillion	(+/-)	$ 1.611 trillion
CH	$ 6.056 trillion	(+/-)	$ 1.203 trillion
SDS	$ 1.637 trillion	(+/-)	$ 0.277 trillion
OTHER	$ 2.377 trillion	(+/-)	$ 0.827 trillion

(+ $ 0.313 trillion in Treasury checks and PMO)

3.2.4 Outgoing Returns Volume and Value Data

The following table illustrates the estimated annual volume and dollar value of returned checks and the respective 95% confidence interval for each estimate.

Table 13: Estimated Annual Aggregate Outgoing Returns (Volume and Value)

Category	Estimate	95% Confidence Interval		% Total Checks
Returns Volume	251million	(+/-)	20.6million	0.59%
Returns Value	176billion	(+/-)	15.9billion	0.45%

4   The Check Sample Study (CSS)

In an effort to characterize the check payments market, the survey research team conducted a two-stage stratified random sample survey of bank-of-first-deposit (BFD) checks.[27] The characteristics of each check were recorded on the survey form and each check then categorized in terms of payer, payee and purpose of the transaction.

Privacy was a great priority of *The Check Sample Study* (CSS). No sensitive information or characteristics of the check that could identify the payer, payer account, payee or payee account were collected. To further ensure the privacy of the parties to each check, access to the sampled checks was limited strictly to the participant financial institutions (or their processors), who collected all data themselves. Neither Global Concepts, Westat nor the Federal Reserve collected any data directly from the sampled checks. The survey instrument allowed respondents to identify, for example, whether particular phrases or suffixes, such as "Inc., LLC, PLC, Corp, LTD or .com" were present on a sampled check without having to record the actual name of the payer or payee.

Data were collected retrospectively for the reference period May, 2000 to April, 2001. By overlapping the reference period with that of *The DFI Check Study* – March and April 2001 – the methodology ensures maximum compatibility of the two studies' results.

4.1   Methodology

4.1.1   CSS Sample Design

The Check Sample Study required a two-stage sample design in order to survey a representative random sample of checks:

- For the first stage of the sampling for this study, an approach similar to *The DFI Check Study* was used, with the same three institution type strata constructed, followed by size-based (i.e., PCD-based) strata within each. For commercial banks, a certainty stratum was established that contained many of the same banks in the first certainty stratum of *The DFI Check Study*.

- The second stage of the sampling addressed the allocation of checks. Since the goal of the CSS was to describe the universe of checks, the sample for the CSS was designed to

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[27] Because *The Check Sample Study* sampled BFD items, it includes all check volume, including Treasury checks, postal money orders and travelers checks.

ensure the same probability of selection for each check in the U.S. that was deposited during the reference period.

Although this was a study of checks, minimizing the number of institutions to be recruited to provide checks made the data collection effort more efficient and cost effective. Additional reasons for using this approach for this stage were that it was similar to *The DFI Check Study* approach, enabling comparison to *The DFI Check Study* findings, and it ensured representation of the largest institutions, especially the top 100 commercial banks.

4.1.1.1 Sample Size and Sample Allocation

The number of sampled institutions and strata for each type are reported in the table below.

Table 14: Stage One Sample Allocation – DFIs Sampled per Stratum

	Type of Institution			
Stratum	Commercial Banks	Credit Unions	Thrifts	TOTAL
Top '100'	87			87
1	31	41	17	89
2	42	31	43	116
3	31	23	44	98
4	59	40		99
5	62			62
TOTAL	312	135	104	551

Once the stage one sample was selected, the second stage of the sample design was implemented to allocate a required number of checks to each institution in the sample. The target number of checks was set at 36,000 to achieve the desired precision across the types of institutions in the study. The required number of checks was set proportionally to the size (i.e., PCD values) of the institution.

Table 15: Stage Two Sample Allocation – Checks Desired per Stratum (Design)

	Type of Institution			
Stratum	Commercial Banks	Credit Unions	Thrifts	TOTAL
Top '100'	12,451	-	-	12,451
1	1,523	2,080	2,146	5,749
2	1,952	1,475	2,046	5,473
3	1,475	1,095	2,094	4,664
4	2,808	1,904	-	4,712
5	2,951	-	-	2,951
TOTAL	23,160	6,554	6,286	36,000

The overall approach of the design was to achieve nearly the same probability of selection for each check in the sample universe. Selected institutions were asked to report their overall deposit volume as part of the preliminary information for the CSS. Institutions could then have

their responses weighted by deposit volume adjusted for the number of sampled checks and PCD value.

4.1.2 CSS Sample Weighting

Data collected from *The Check Sample Study* (CSS) were inflated to the universe level using weights designed to (1) compensate for unequal selection probabilities; and (2) adjust for non-responding depository financial institutions (DFIs). As discussed above, the CSS employed a two-stage sample design to select the sample of checks. The DFIs were selected at the first stage of sampling, and the checks were sampled in the field at the second stage from the sampled DFIs. The DFIs in the certainty strata were all selected for the study. The sample of DFIs from the non-certainty strata was selected with probability proportional to size (PPS) sampling from within strata. The sample of checks was selected independently from each sampled (respondent) DFI using systematic sampling procedure. Two weights were constructed corresponding to the two stages of sampling, i.e., a DFI weight to represent the non-sampled and non-respondent DFIs and a check weight to represent the non-sampled checks within the respondent DFIs. The final CSS weight was obtained by multiplying the two weights, i.e., the DFI and check weights.

The base weight for a sampled DFI was defined to be the reciprocal of selection probability of the DFI. The base weights were adjusted to account for the non-responding DFIs. The nonresponse adjustment factor was applied within each stratum. The nonresponse adjustment factor was defined as the ratio of the number of DFIs sampled from the stratum and the number responding from that stratum.

This weight adjustment was applied to increase the weights of the sampled DFIs for which data were collected. As discussed above, the nonresponse weight adjustment was applied at the stratum level. The weighted adjusted for nonresponse were simply the product of the base weights and the nonresponse adjustment factor for the stratum.

4.1.3 Estimation

Based on the sampling and weighting methods described above, the study's results allowed us to estimate the proportion of checks that satisfied each of a series of classification criteria as discussed in section 4.1.8.

4.1.4 Random Sampling in the Field

The objective to achieve randomness of the sample within each DFI presented a unique challenge for the survey research team. It was important that checks not all be sampled from the same date, obviously, but also not from the same processing facility, sorter device, time of day, roll of microfilm, etc. A bank with a large corporate customer, who always deposits a large volume of checks early in the morning, for example, could seriously bias that bank's sample if all checks were sampled from the first roll of microfilm for each of the randomly selected days. The sampling process required that many variables be randomized to ensure the most representative random sample.

4.1.4.1 The Sampling Parameters Request Form

In an effort to maintain as much methodological control as possible over the sampling process, while at the same time sampling in the most appropriate and efficient way for each institution,

the survey research team developed the Sampling Parameters Request Form (Appendix E). The form was a pre-survey instrument or screener that allowed each DFI to describe the environment in which checks would be sampled. An institution could indicate, for example, its number of processing facilities; the average monthly volume of checks captured at each facility; whether its check archival system assigns a unique trace number or sequence number to each item in archive; and whether checks are archived on microfilm, digital image media or a combination of the two.

This information allowed the survey research team to design a customized set of sampling instructions for each DFI that completed the Sampling Parameters Request Form – instructions that ensured the most random and representative sample of checks. If an institution had multiple processing facilities, for example, the survey research team specified exactly how many checks should be sampled from each of the institution's processing facilities, from what dates and from exactly where in the sequence of each day's check processing volume.[28]

4.1.4.2   Retrieval of Randomly Selected Checks

The survey research team provided each participant institution with a Master List of Random Checks, which accompanied each institution's sampling instructions. The Master List included for each item to be sampled the date on which it was processed and a specific Random Check Number. Dates were chosen at random from the 252 eligible processing days in the May 1, 2000 to April 30, 2001 survey period. The Random Check Number for a given date was chosen at random between 1 and the institution's average daily volume of checks processed.

The average daily volume was calculated using volume data provided via the screener. For institutions that commingle deposited checks with inclearings, the upper bound on this Random Check Number was the average daily prime pass volume – essentially, the combined volume of both inclearings and deposits. This ensured that each deposited check had an equal probability of being selected from the commingled archive, regardless of whether it fell at the end of a batch of inclearings. For institutions that archive deposited checks separately from inclearings, the upper bound on the Random Check Number was simply the average daily deposit volume.

As a practical matter the notion of a Random Check Number worked well for smaller institutions but was overly simplistic for many of the larger institutions in the survey. The primary method of randomizing the sample for many institutions was through the use of Random Sequence Numbers. Global Concepts worked closely with dozens of institutions to customize Master Lists of Random Sequence Numbers to facilitate random selection of sample checks.

4.1.4.3   Photo Retrieval Latitude

There was no guarantee, unfortunately, that a Random Check Number or Random Sequence Number provided by Global Concepts would point to an actual deposited check. In some cases, the Random Number would exceed the total volume processed that day. In other cases, the Master List may have listed an item for which the DFI was not the bank of first deposit, a deposit

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[28] It is common for a financial institution to have a single archive for checks processed at multiple capture facilities. All checks were, of course, sampled from the central archive in these situations, but they were sampled in such a way as to accurately represent the distribution of check volume across multiple capture facilities.

slip or a general ledger (GL) ticket.[29] For that reason each Master List included alternate Random Check Numbers or Sequence Numbers to increase the likelihood of a "hit" on a given date. Even these were no guarantee. Therefore, all institutions were instructed to find the deposited check nearest to the Random Check Number or Sequence Number specified. Generally, this meant rewinding microfilm or advancing to the next item in an optical image archive.

4.1.5   Designing the Survey Instrument

In designing the survey methodology, Global Concepts and the Federal Reserve decided that a survey of deposited checks (i.e., BFD items) was the most appropriate way to survey a representative random sample of check payments.[30]

A primary motivation to survey BFD items rather than paid check volume was that BFD items are simply easier to distinguish from correspondent volume – checks processed (and archived) on behalf of another institution. Bank of first deposit items, unlike other transactions, have only one financial institution endorsement – the survey respondent's. This seemed to the research team like a more practical way of distinguishing a bank's own volume from another institution's than by reviewing both the endorsement on the back of the check and the RT and/or payor bank name on the front of the check.

A survey of BFD items also ensured that checks to or from the federal government would be sampled along with private sector checks.

4.1.5.1   Pretesting the Survey Instrument

The Check Sample Study survey instruments and sampling instructions were pretested concurrently with *The DFI Check Study* survey instruments. Pretest participants' support was invaluable in creating the final survey instrument.

4.1.6   The Survey Instrument

A copy of *The Check Sample Study* survey instrument can be found in Appendix D. In the field, a more lengthy set of instructions accompanied the survey instrument. The instructions included visual aids and helpful hints to assist in the identification and recording of survey data.

4.1.7   Reporting Period: May 1, 2000 - April 30, 2001

The survey research team decided that a 12-month survey period was the best way to account for seasonal variation in the distribution of checks written in the U.S. Unlike *The DFI Check Study*, *The Check Sample Study* could not rely on Federal Reserve seasonality data as an adjustment factor to a 2-month survey. The Federal Reserve data address only aggregate volume variation – not variation in descriptive data, such as the purpose, payer or payee of check payments.

The choice of a 12-month survey tackled the seasonality problem, and it proved uniquely practical from a data collection perspective. A retrospective 12-month survey posed no difficulty for respondent DFIs, which archive check deposits for up to 7 years. Unlike the survey of check

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[29] BFD items are distinguished by the presence of only one DFI endorsement.

[30] No strong evidence existed to suggest that a survey of deposited checks would produce less cluster distortion than a survey of paid checks. We assumed that by surveying either BFD items or paid checks we faced roughly equal risk of cluster distortions based on the homogeneity of customers at individual respondent DFIs.

volume (for most institutions), *The Check Sample Study* required no advance notice in order to collect the data in a timely manner. Check archival practices provide a unique environment in which to conduct retrospective rather than prospective survey research.

As mentioned previously, the reference period of May 1, 2000 to April 30, 2001 also allowed for maximum compatibility of results between this study and *The DFI Check Study*, which surveyed check volume between March 1, 2001 to April 30, 2001.

4.1.8   Check Payments Categorization

In designing the methodology for *The Retail Payments Research Project*, Global Concepts and the Federal Reserve determined that documenting the opportunity for substitution of electronics for paper transactions required additional descriptive characteristics beyond the total volume and dollar value of payments. We determined three factors to be sufficiently measurable and descriptive to document substitutability: the type of payer, type of payee and purpose of the transaction. Each of these factors was in turn subdivided into its respective categorization options below:

Table 16: Payments Classification Factors

Payer	Payee	Purpose
Consumer	Consumer	Remittance
Business	Business	Point of Sale (POS)
Government	Government	Income Payments[31]
		Casual Payments[32]

4.1.8.1   Payer and Payee Categories

During the design phase of *The Retail Payments Research Project*, Global Concepts and the Federal Reserve decided that three categories – Consumer, Business and Government – sufficiently described the potential parties to a payment.

- **Consumer** – an individual, household or small business[33]
- **Business** – a private sector entity
- **Government** – local, state or Federal government entity

These categories are not only commonly accepted in the industry, but they make an appropriate delineation between the types of electronic payment alternatives that may be available to or accepted by the respective parties to any payment.

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[31] Income describes any payment from a business or government entity to a consumer (i.e., individual) or small business indistinguishable from a consumer.

[32] Casual describes any payment from one consumer (i.e., individual) to another. This also includes small businesses that are indistinguishable from consumers.

[33] Some small business owners (e.g., sole proprietorships) use their personal checking accounts for business purposes and cannot be distinguished from consumers based on data from their checks alone.

A consumer, for example, generally does not have the ability to accept credit or debit card payments; whereas a business or government would have no significant impediments to accepting debit or credit as alternatives to paper checks at the point of sale. As a payer, a consumer is likely to have online debit available to him or her; whereas, a business or government entity cannot pay with online debit.

Very small businesses, such as sole proprietorships, may resemble a consumer payer or payee more closely than a business in terms of availability and use of electronic payment alternatives. As a practical matter, *The Check Sample Study* effectively deals with the commonality between consumers and sole proprietorships by assuming that any check written to or from an individual and having no characteristics on the check to indicate a business payer or payee is classified as consumer payer or payee respectively.

The distinction between business and government is largely immaterial for the purpose of evaluating substitution potential. There are no particular impediments to a government entity accepting a payment type that a business might accept and vice versa. Likewise, business or government payers are expected to have comparable access to the same payment mechanisms, such as purchasing cards, financial EDI or ACH initiation capabilities.

4.1.8.2 Purpose Categories

Considering all possible payment types and their various options for substitution of electronic for paper payments, Global Concepts and the Federal Reserve determined that all payments fall into one of four primary purpose categories:

- **Casual** – Payment from one individual to another. By definition, all consumer-to-consumer payments, therefore, are categorized as *Casual*. As a category, these payments are believed to have a relatively low potential for electronic substitution.
- **Income** – Payment to an individual from either a business or government entity. By definition all business-to-consumer or government-to-consumer payments, therefore, are categorized as *Income*. This category includes:
    - Payroll
    - Pension
    - Benefits / Entitlements
    - Rebate / Promotional / Refund
    - Expense Reimbursement
    - Tax Refunds
    - Investment Disbursements
    - Remittances to Small Businesses Indistinguishable from Consumers
- **Remittance** –Payments from any type of payer to either a business or government payee that does not occur at the point of sale. The types of remittance payments include:
    - Recurring Retail Remittance – Regular recurring payments, typically described as "bill payments." Examples: utility bill payments, insurance premiums, telecom charges, credit card bill payments, loan repayments, etc.

- o Non-Recurring Retail Remittance – Irregular remittance payments made for products or services rendered for consumer consumption. Examples: medical bill, plumber, carpenter, pest control, legal fees, accountant fees, etc.
- o Commercial Remittance – Any B2B, B2G, G2B, G2G payments not made at the Point-of-Sale. Examples: raw materials purchase, office supplies, business equipment, finished goods from wholesalers, etc.
- **Point of Sale (POS)** – Payments from any type of payer to either a business or government payee that occurs in any of the following environments:
  - o Storefront – Traditional single or multi-lane retail environment, such as department store, drugstore, clothing store, gas station, dry cleaner, concessions, etc.
  - o Over-The-Counter Retail Remittance – Remittance payments made in person, such as telecom bill paid at the local office, utility bills paid in person, medical expenses paid at the doctor's office, etc.
  - o MOTO – Mail Order/Telephone Order transactions (e.g., catalog orders).
  - o Internet – Purchase of goods or services over the Internet.
  - o Mobile POS / C.O.D. – Payments made for goods or services delivered off-premise by the seller with payment occurring at time of delivery, such as food delivery, home maintenance fees, etc.
  - o Vending.[34]

The intersection of the three payer types, three payee types and four purpose classifications vis-à-vis check payments is described in the matrix that follows. Note that gray shaded cells indicate check payment types that do not exist.[35]

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[34] Internet, MOTO, and Vending transactions fall into the POS category, but they do not apply to check payments. The categorization was designed to describe all potential payment mechanisms – not just Check – for the POS purpose category.

[35] It was decided that dividend payments to corporate shareholders would not qualify as Income payments. From a substitution perspective – i.e., the ability to substitute electronic for paper payments – this category is indistinguishable from business-to-business remittance payments and, therefore, should be categorized as such.

Exhibit 8: Original Check Categorization Matrix

PURPOSE	PAYER	PAYEE			
		C	B	G	T
REMITTANCE	C	▓			
	B	▓			
	G	▓			
	T	▓			
POINT-OF-SALE	C	▓			
	B	▓			
	G	▓			
	T	▓			
INCOME PAYMENTS	C		▓	▓	▓
	B		▓	▓	
	G		▓	▓	
	T		▓	▓	
CASUAL PAYMENTS	C		▓	▓	▓
	B	▓	▓	▓	▓
	G		▓	▓	
	T		▓	▓	
TOTALS (VALUE, VOLUME)	C				
	B				
	G				
	T				

C = Consumer
B = Business
G = Government
T = Total

A primary purpose of *The Check Sample Study* was to document the distribution of a 12-month check payments market across this matrix.

4.1.8.3 Groupings of Categories for Data Analysis

For the purpose of reporting data and performing data analysis, a number of categories were grouped into single cells. This helped to simplify the analysis and also to create more meaningful cell sizes for analysis. The groupings used in our analysis are as follows:

4.1.8.3.1 Payer and Payee Groups

Whether payer or payee, the categories business (B), government (G) and business or government (BG) have been grouped into a single business or government category. From a substitution perspective, business or government entities are indistinguishable. It should be noted that the vast majority of business or government checks (whether payer or payee) are business checks.

The business or consumer (BC) category allows us to measure the extent to which business and consumer names (and checks) are difficult to differentiate. From a substitution perspective, however, the two have little in common. Consumers do not accept POS or remittance payments; nor do businesses use debit cards. Therefore, the BC category (whether payer or payee) was combined with indeterminate and "Error" categorizations into an unknown category for analyses.

Payer / Payee	Grouped as
B, G, or BG	Business or Govt
BC, Indeterminate (X), Error	Unknown

4.1.8.3.2 Purpose Groups

Only checks of indeterminate purpose and those for which the purpose categorization is believed to be in error were combined in the analyses of purpose data.

Purpose	Grouped as
Indeterminate (X), Error	Unknown

4.1.9   The Check Categorization Model

Global Concepts employed a categorization model based on conditional logic to assign a classification to each check. Judging from the characteristics of the check, as described by the DFI respondent, the model assigned a payer, payee and purpose classification to each item. If the model could not definitively categorize the surveyed item, it was categorized as *Unknown*.[36]

The types of factors that went into the categorization of each item are described below.

4.1.9.1   Categorization of the Payer

The determination of the payer of the check was made entirely from information available on the face of the check.

Checks categorized as *Business*, *Government* or *Business or Government* were typically identified by their larger format, the characteristics of the MICR line (e.g., Federal Government checks' MICR line begins with 000, many business checks include unique MICR characters), the method used to frank the check (e.g., typed or machine printed "signature"), and the characteristics of the payer name and address. The payer name/address was particularly useful in identifying the presence of such indicators as Inc., LLC, PLC, LTD, Corp., Department of, City of, Town of, Bureau of, Accounts Payable, etc. It was also extremely useful to individual respondents, who were asked to conclude what type of payer had written the check and to indicate why this classification was selected. The payee line (e.g., following "Pay to the order of…") was also useful in some cases, because business or government payers – unlike consumers – sometimes include the full mailing address of the payee (machine printed) on the face of the check.

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[36] In practice *Unknown* could result from one of three outcomes: *Business or Consumer*, *Indeterminate* or *Error*. The model returned a *Business or Consumer* outcome if no conclusion could be reached about the check other than to eliminate *Government* as a potential classification. Since *Business or Consumer* provides no useful information about the check in terms of its potential likelihood to be substituted by an electronic payment in the future, *Unknown* was the most appropriate conclusion. The model returned an *Indeterminate* outcome if the survey form was correctly completed but the data were still inconclusive. An *Error* outcome resulted if the survey form contained contradictory data.

Checks classified as *Consumer* generally included smaller format checks without characteristics in the MICR line or name/address fields to suggest a business or government classification. Respondents were also asked whether they believed the check to be a consumer check and why. *Note:* It is entirely possible that some small businesses or sole proprietors might use their personal checks for business payments. Without any characteristics to indicate a business use, these checks would be classified as *Consumer*. Considering, however, that a payer of this nature is for all practical purposes (particularly when considering the substitution possibilities) acting as a consumer would act, these potential misclassifications are acceptable and, arguably, appropriate.

4.1.9.2 Categorization of the Payee

The determination of the payee was made from information on both the front and back of the check: the payee line, the endorsement and any other writing/stamp/print on the check.

Just as they used the payer name/address, respondents were asked to determine whether any telltale signs of a business or government payee existed in the payee line, e.g., Inc., LLC, Corp., IRS, Tax Commissioner, Bureau of, Town of, County of, etc. Additionally, respondents recorded the presence of unique printing or stamps on the checks that might indicate a POS transaction, such as the driver's license number, date of birth, such phrases as, store number, terminal number, cash back, etc. The endorsement was a major determinant of payee type. Business or government payees tend to stamp or machine print their endorsements on the back of checks. Lockbox (i.e., remittance) payments in particular tend to be endorsed along the length of the check (i.e., parallel to text on the face of the check) rather than across the end of the check (i.e., perpendicular to text on the face of the check). These indicate business or government payees.

In all cases, the respondent was also asked to indicate his/her determination of the payee of the check based on all the information available (payee line, endorsement, etc.) and to indicate why this determination was made.

The payee classification of *Consumer* was made if a) the check showed no indications of being written to a business or government payee and b) this fact agreed with the respondent's determination and explanation that the payee was a consumer.

4.1.9.3 Categorization of the Purpose

The purpose of the check payment was determined by a combination of information on the check itself and the classification of its counterparty (i.e., payer and payee).

The payer and payee relationship (counterparty) alone was enough to determine the purposes of some checks. For example, all business-to-consumer, government-to-consumer, or business/government-to-consumer checks were classified as *Income*. *Note*: Not all income payments as categorized by this study are payroll checks. Rebate checks, tax refunds, stock dividends are all types of checks that would fall in the *Income* category. Similarly, all checks payments from one individual to another individual were classified as *Casual*. Based on the examples discussed above, this category no doubt includes payments to or from sole proprietorships or small businesses that use what are, or appear to be, personal checks for business transactions. *Casual* might also include payments from an individual to his/her attorney,

and rent payments from tenants to landlords are almost certainly included in *Casual*. While the term "casual" may incorrectly define the intent of many of these transactions, the classification *Casual* is not entirely inappropriate. In many cases these checks have a low probability of substitution by electronic payment. It is appropriate to group these checks with payments between two individuals. We acknowledge the potential for these misclassifications but believe they are acceptable for the purposes of this study.

Any check written to a business or government payee was categorized as either *Remittance* or *POS*. If the distinction could not be made, these checks were categorized as *Remittance/POS*. The distinction was made by using information about the type of organization being paid and by the characteristics of the endorsement. If the payee was clearly a credit card issuer, a utility, etc. this lent evidence toward a *Remittance* classification. Conversely payments made to a convenience store, a restaurant, or a drugstore would suggest the payment was made at the point of sale. This information was evaluated alongside information about the endorsement. If the endorsement included such information as a store number, a terminal number or a customer's driver's license number, this suggested a POS transaction. Lockbox endorsements (typically apparent by their alignment across the length of the check) or the terms "absentee" or "absent endorsed" indicated a remittance payment.

4.1.10 Data Review
Global Concepts performed data review and validation on the survey responses both to evaluate the accuracy and completeness of the survey responses and to test the function of the categorization model. Neither exhibited any systematic problems.

4.2   Results and Analysis

4.2.1   Survey Response
In total 27% of financial institutions completed the Check Sample Study. The table below illustrates the response rate by type of institution and size stratum.

Table 17: CSS Response Rate by Stratum

Stratum	Type of Institution			
	Commercial Banks	Credit Unions	Thrifts	TOTAL
Top '100'	67%			67%
1	16%	27%	35%	25%
2	26%	19%	21%	22%
3	13%	13%	14%	13%
4	20%	20%		20%
5	18%			18%
TOTAL	32%	21%	20%	27%

Respondent DFIs sampled and surveyed 28,877 checks in total. The distribution of those checks across each type of institution and size stratum can be found in the following table.

Table 18: Checks Surveyed for CSS by Stratum (Actual Response)

	Type of Institution			
Stratum	Commercial Banks	Credit Unions	Thrifts	TOTAL
Top '100'	19,145			19,145
1	450	979	2,068	3,497
2	980	499	807	2,286
3	359	270	519	1,148
4	1,117	696		1,813
5	988			988
TOTAL	23,039	2,444	3,394	28,877

The largest banks not only provided the greatest number of checks, but they did so by responding at a higher than expected rate. The table below illustrates the checks received by each stratum as a percentage of checks expected according to the design of the survey. *Note:* Weighting adjustments applied to the sample help to offset bias introduced by the higher than expected response rate among large commercial banks.

Table 19: Response Rate (in Checks) as a Percentage of the Original Design

	Type of Institution			
Stratum	Commercial Banks	Credit Unions	Thrifts	TOTAL
Top '100'	154%			154%
1	30%	47%	96%	61%
2	50%	34%	39%	42%
3	24%	25%	25%	25%
4	40%	37%		38%
5	33%			33%
TOTAL	99%	37%	55%	80%

4.2.2 Survey Results

The Check Sample Study distributes the volume and value of check payments in the U.S. according to payer, payee and purpose. The following tables detail the study's results.

4.2.2.1 Distribution of Check Volume

The tables in this section detail the distribution of check payments volume according to payer, payee, counterparty and purpose by counterparty. Each sub-total data element in the tables below includes a corresponding error estimate.[37] The error is the 95% confidence interval around each estimate. Consumer-to-consumer casual payments, for example, represent 11.2% of all check payments plus or minus 1.9%; or 9.3% to 13.1% of all check payments.

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[37] Error estimates are not provided for point estimates of 0.1% or less.

Table 20: Estimated Distribution of Check Volume by Payer

Check Volume by Payer with 95% confidence interval		
	% total	**(+/-)**
Consumer	50.9 %	2.2 %
Business	32.3 %	2.1 %
Government	3.5 %	0.7 %
Business or Government	1.3 %	0.1 %
Unknown	12.0 %	2.6 %
Total	*100.0 %*	

Table 21: Estimated Distribution of Check Volume by Payee

Check Volume by Payee with 95% confidence interval		
	% total	**(+/-)**
Consumer	29.1%	4.4 %
Business	50.1%	3.2 %
Government	2.7%	0.5 %
Business or Government	3.8%	0.6 %
Unknown	14.3%	2.5 %
Total	*100.0 %*	

Table 22: Estimated Distribution of Check Volume by Counterparty

	Distribution Includes 95% confidence interval										
					Payee						
Payer	Cons	(+/-)	Bus	(+/-)	Govt	(+/-)	Bus/Govt	(+/-)	Unknown	(+/)	*Total*
Consumer	11.2%	1.9%	33.8%	3.0%	1.7%	0.3%	2.7%	0.4%	1.6%	0.3%	*50.9%*
Business	14.6%	1.9%	15.0%	1.6%	0.8%	0.2%	1.0%	0.2%	0.9%	0.2%	*32.3%*
Government	2.5%	0.6%	0.7%	0.2%	0.2%	0.1%	0.0%		0.1%		*3.5%*
Bus or Gov	0.6%	0.1%	0.4%	0.1%	0.0%		0.1%		0.1%		*1.3%*
Unknown	0.1%		0.2%	0.1%	0.0%		0.0%		11.6%	2.6%	*12.0%*
Total	*29.1%*		*50.1%*		*2.7%*		*3.8%*		*14.3%*		*100.0%*

Table 23: Estimated Distribution of Check Volume by Counterparty and Purpose

	Distribution Includes 95% confidence interval										
					Counterparty						
Purpose	C2C	(+/-)	C2BG	(+/-)	BG2C	(+/-)	BG2BG	(+/-)	Unknown	(+/-)	*Total*
Income					17.8%	2.5%					*17.8%*
Casual	11.2%	1.9%									*11.2%*
Remittance			17.7%	1.9%			7.9%	0.7%	0.1%	0.1%	*25.7%*
POS			14.1%	2.0%			4.9%	0.8%	0.1%	0.0%	*19.0%*
Remit/POS			6.4%	0.9%			5.5%	0.9%	0.1%	0.0%	*11.9%*
Unknown									14.5%	2.5%	*14.5%*
Total	*11.2%*		*38.1%*		*17.8%*		*18.3%*		*14.7%*		*100.0%*

4.2.2.2 Distribution of Check Value

The tables in this section follow the same conventions as section 4.2.2.1, but refer to the dollar value rather than the volume of check payments. As in the previous section, error estimates are excluded for point estimates of 0.1% or less.

Table 24: Estimated Distribution of Check Value by Payer

Distribution Includes 95% confidence interval		
	% total	**(+/-)**
Consumer	19.2%	2.1%
Business	61.6%	3.5%
Government	3.8%	1.1%
Business or Government	1.5%	0.5%
Unknown	13.9%	2.9%
Total	*100.0 %*	

Table 25: Estimated Distribution of Check Value by Payee

Distribution Includes 95% confidence interval		
	% total	**(+/-)**
Consumer	23.3%	4.0%
Business	55.5%	4.3%
Government	1.5%	0.6%
Business or Government	3.8%	1.9%
Unknown	15.9%	2.9%
Total	*100.0 %*	

RETAIL PAYMENTS RESEARCH PROJECT Sponsored by the Federal Reserve System

Table 26: Estimated Distribution of Check Value by Counterparty

Payer	Cons	(+/-)	Bus	(+/-)	Govt	(+/-)	Bus/Govt	(+/-)	Unknown	(+/)	Total
Distribution Includes 95% confidence interval											
Payee											
Consumer	6.7%	1.2%	10.2%	1.8%	0.6%	0.4%	0.7%	0.2%	0.9%	0.4%	*19.2%*
Business	14.5%	3.2%	42.7%	4.6%	0.5%	0.3%	2.9%	1.8%	0.9%	0.3%	*61.6%*
Government	1.5%	0.5%	1.9%	1.0%	0.3%	0.2%	0.0%		0.0%		*3.8%*
Bus or Gov	0.4%	0.1%	0.5%	0.3%	0.0%		0.1%		0.5%		*1.5%*
Unknown	0.1%		0.2%	0.1%	0.0%		0.0%		13.6%	2.9%	*13.9%*
Total	*23.3%*		*55.5%*		*1.5%*		*3.8%*		*15.9%*		*100.0%*

Table 27: Estimated Distribution of Check Value by Counterparty and Purpose

Purpose	C2C	(+/-)	C2BG	(+/-)	BG2C	(+/-)	BG2BG	(+/-)	Unknown	(+/-)	Total
Distribution Includes 95% confidence interval											
Counterparty											
Income					16.5%	3.6%					*16.5%*
Casual	6.7%	1.2%									*6.7%*
Remittance			6.2%	1.5%			21.1%	4.9%	0.1%	0.1%	*27.4%*
POS			1.7%	0.4%			7.1%	2.2%	0.0%	0.0%	*8.8%*
Remit/POS			3.7%	0.9%			20.8%	4.6%	0.1%	0.1%	*24.6%*
Unknown									16.1%	2.9%	*16.1%*
Total	*6.7%*		*11.5%*		*16.5%*		*49.0%*		*16.2%*		*100.0%*

4.2.2.3 Average Dollar Value by Payment Purpose and Counterparty

The table below details the average dollar value per check in each of twelve categories. The corresponding 95% confidence interval (in dollars) is provided alongside the average dollar value figure for each category.

Table 28: Estimated Average Value per Check Category (Counterparty by Purpose)

Purpose	C2C	(+/-)	C2BG	(+/-)	BG2C	(+/-)	BG2BG	(+/-)	Unknown	(+/-)
Distribution Includes 95% confidence interval										
Counterparty										
Income					$1,018.65	$126.77				
Casual	$663.47	$134.88								
Remittance			$ 387.52	$ 51.99			$2,914.46	$667.74	$ 763.39	$ 632.97
POS			$ 128.40	$ 21.56			$1,614.68	$484.48	$ 288.38	$ 184.19
Remit/POS			$ 629.91	$158.47			$4,169.19	$814.01	$1,366.46	$1,639.61
Unknown									$1,220.00	$ 286.16

4.2.2.4 Distribution of Checks by Dollar Value Category

Based on industry feedback during the preparation of this report, the Federal Reserve decided to include data about the distribution of check payments across dollar value ranges. Given the late inclusion of these data, no error estimates have been computed. While we have not computed error estimates, the percentage values are comparable to other values reported in this report; we would expect their error estimates to be comparable as well.

The majority of checks appear to be written for relatively low dollar transactions. As illustrated in the table below, nearly a third of all checks (32%) are written for $50 or less. Over 75% of all checks are for transactions of $500 or less.

Table 29: Distribution of Checks by Dollar Amount

Dollar Amount Range	% Check Payments
$0.01-$50	33.3 %
$50.01-$100	14.7 %
$100.01-$500	28.6 %
$500.01-$1,000	10.1 %
$1,000.01-$2,500	6.3 %
$2,500.01-$5,000	3.5 %
$5,000.01 +	3.4 %
Total	*100.0%*

5   Electronic Payment Instruments Study

5.1   Introduction

5.1.1   Objectives

The primary purpose of this research was to determine the volume and value of retail electronic payment transactions originating in the United States for the year ending December 31, 2000. This information - including information on consumer, business and government initiated electronic payments and remittances - will provide valuable input into the policy and longer-term operational decision-making of the Federal Reserve Bank. The survey captured data on the following electronic payment instruments:

- General-purpose and private-label credit cards
- Online and offline debit cards
- Automated Clearing House (ACH) transactions
- Electronic Benefits Transfer (EBT) payments

In addition, information on Emerging Payment Instruments (including open system stored value and Internet payments) was tracked for informational purposes.

Participation in the study was voluntary but was encouraged by the Federal Reserve team through industry wide communications and personalized letters.

5.1.2   Scope

The Electronic Payment Instruments Study (EPIS) collected data on electronic payments made in the U.S. during the year 2000. Transactions from consumers, businesses and government entities have been included in the statistics gathered. Data were gathered in three primary areas:

1. Electronic payment options used by buyers of goods or services, including point-of-sale transactions.

2. Electronic payment products used on the 'back-end' to effect final settlement for purchase transactions, including bill payment.

3. Electronic payment options used by employers, state agencies and others for disbursements of income payments such as payroll and benefit disbursement transactions.

The types of transactions included in the study and organizations surveyed are summarized in the following table:

Table 30: Types of Transactions and Organizations Included in Study

Transaction Type	Organization Type Surveyed
General-purpose credit/charge, offline debit	Credit and charge card associations
Private-label credit/charge	Retailers, oil companies, fleet card issuers, processors, third party receivables owners
Online debit	Regional and national EFT networks
Automated Clearing House (ACH)	NACHA, ACH operators
Electronic Benefits Transfer (EBT)	USDA Food and Nutrition Service, EBT contractors
Emerging Payments	Companies involved in bill payment, P2P, stored value, Internet currencies, and other new payment technologies

Organizations involved in emerging payments were surveyed for informational purposes only. Most of these new payment types are a new front-end payment method to the consumer, but use traditional funding and settlement systems behind the scenes. Adding their volume numbers into the aggregate would result in double-counting.

5.1.2.1 Excluded from Scope

Only unique payment instruments and their final settlement were tracked for this study. This excludes paper-based transactions (i.e., cash, checks) and exchanges within a payment instrument where no value has changed hands.

Additionally, there are variations of payment instruments as well as components of the payments value chain that the Federal Reserve considered to be outside the scope of this study:

- Cash and check transactions
- Electronic bill presentment transactions
- Bill payment transactions which are paid via paper (even if initiated electronically)
- Closed system stored value purchases, including:
    - Gift cards
    - Internet currencies
    - Loyalty-based accounts (e.g., airline frequent flier accounts)
    - Phone cards
    - University and military closed payment systems
- On-us online debit transactions
- On-us ACH transactions outside of the estimates provided by NACHA
- Cash Concentration through ACH
- Consumer and business wire transfers
- Issuer-to-acquirer settlement transactions

5.2 Research Methodology

The study was conducted by surveying the leading electronic payment processors. The primary sources for this information were major card industry associations and processors, Federal Government agencies, EFT networks and other entities that could provide accurate and reliable data. The survey was conducted during the spring of the year 2001 and surveys were sent out to 178 organizations within 157 companies that either originate or monitor payment transactions in the United States.

5.2.1 Participation Rates

Overall response to the study exceeded expectations: 75% of electronic payment companies participated in the survey, providing data on 94% of all estimated electronic payment value in 2000. Transaction and dollar values for organizations not participating in the study were estimated.

By payment instrument, participation rate of debit providers was highest and credit card participants was lowest. However, all payment instruments had very strong participation in the study.

Table 31: Study Participation Rate by Payment Instrument

Payment Instrument	Potential Participants	Participation Rate by		
		Organization	Transaction Volume	Dollar Value
General-purpose Credit Cards	7	71%	76%	73%
Private-Label Credit Card	72	69%	49%	44%
Offline Debit	2	100%	100%	100%
Online Debit	27	85%	95%	88%
ACH	5	100%	100%	100%
EBT	5	80%	88%	87%
Total	**118**	**75%**	**84%**	**94%**
Memo: Emerging Payments	33	30%		

The high level of participation by the largest payment industry companies provides confidence that the study results are representative for all payment instruments. The study results provide a conservative and reliable estimate of electronic payment transactions in 2000.

5.3 Summary of Findings

During calendar year 2000, 29.5 billion electronic payments were originated in the United States with a value of $7.3 trillion.

Table 32: Total Estimated Volume and Dollar Value of Electronic Payments

Electronic Payment Instrument	Transaction Volume (Millions)	Dollar Volume ($Millions)	Average Payment Value
General-purpose credit cards	12,300.2	$1,072,555	$87.20
Private-label credit cards	2,748.6	$162,819	$59.24
Offline debit	5,268.6	$209,980	$39.85
Online debit	3,010.4	$138,151	$45.89
Automated Clearing House (ACH)	5,622.0	$5,674,851	$1,009.40
Electronic Benefits Transfer (EBT)	537.7	$13,744	$25.56
Total	**29,487.5**	**$7,272,100**	$246.62

Please note that these volumes exclude non-purchase transactions such as ATM and settlement transactions, which are outside the scope of this project.

As shown in the charts below, the majority (51%) of electronic payment transactions were made using credit cards, but 78% of payment dollars were handled through the ACH.

Exhibit 9: Mix of Electronic Payment Instruments
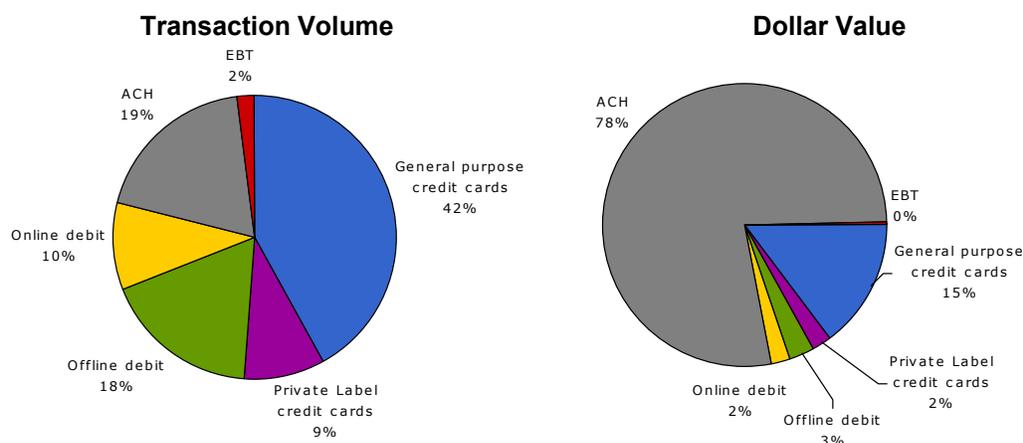
5.3.1 General-Purpose and Private-Label Credit Cards

On a transaction volume basis, credit and charge cards were the most common electronic payment instrument used in the United States during 2000. Fifteen billion transactions were originated with a value of $1,235 billion. Average transaction size for general-purpose credit cards was much larger than that of private-label cards: $87.20 vs. $59.24. Credit cards accounted for 51% of all electronic payment transactions and 17% of the dollar value. Eighty-two percent of credit card transactions and 87% of value came from general-purpose credit cards.

5.3.2 Online and Offline Debit Cards

Following credit cards, debit cards represented the second most common form of electronic payment, accounting for 8.3 billion transactions and a dollar value of $348 billion in 2000. On average, each debit transaction was $42, compared with $87 for the average general-purpose credit card transaction. In 2000, 64% of transactions and 60% of the value was contributed by offline debit; 36% of transactions and 40% of value was from online debit.

5.3.3 ACH

Although ACH was the third most commonly used electronic payment instrument with 5.6 billion transactions, it dominates on a dollar value basis accounting for 78% of the monetary value. The average transaction volume was more than 11 times larger than that of general-purpose credit card transactions ($1,009 vs. $87).

5.3.4 EBT

EBT volume has increased dramatically due to initiatives at the federal level and significant efforts by state governments to electronify both food stamps and cash assistance payments during the 1990s. Nevertheless, EBT was the smallest volume payment instrument with .5 billion transactions and $13.7 billion in value. Note that the "EBT" category in this study refers to consumer payments using EBT. Government disbursements to financial institutions that hold EBT funds and those institutions' reimbursements to merchants for EBT sales are included in the ACH category.

5.3.5 Emerging Payments

In general, emerging payment volumes for the payment instruments studied were quite small in 2000. Organizations participating in the survey reported 76.2 million transactions involving $12.7 billion. However, these numbers represent only a small portion of the total emerging payments market. Many organizations did not respond to the survey because they were very new or they were in a very competitive market and did not want to reveal their data. The Study did not attempt to estimate the volumes for non-respondents. Several categories within the emerging payments group will be important to watch in the coming years, especially person-to-person payments.

5.4 Analysis of Findings and Methodology

5.4.1 General-Purpose Credit Cards

5.4.1.1 Background

Over the past 40 years, credit cards have become an increasingly popular payment method for consumers and businesses at the point of sale. Cardholders like the convenience and deferred payment terms offered by the cards; merchants like the "sales lift" they realize when credit card customers shop in their stores.

There are several types of card products grouped under the credit-card umbrella. All of these products enable a cardholder to purchase goods or services with a promise to pay at a later date. Purchases are "charged" to a line of credit or account established for the cardholder.

Table 33: Types of Card Products

Card Product	Definition/Features	Examples
General-Purpose Credit Card	Minimum payment amount due at the next statement cycle Interest charged on unpaid balance	Visa MasterCard
T&E CARD	Card designed for use in hotels and restaurants	Diners' Club
Charge Card	Full payment required at the next statement cycle	American Express Green card
Private-label Credit Card	Proprietary cards issued by single merchant May or may not allow balances to revolve	Department Store card Gasoline card

This section includes volume information for General-purpose Credit Cards, T&E Cards, and Charge Cards – combined under the heading "General-purpose Credit Card." Private-label credit cards are addressed in the next section.

There are multiple parties involved in each credit card transaction, as shown in the table below:

Table 34: Parties to Typical Credit-Card Transaction

Party	Definition
Cardholder	Consumer or business to whom credit card has been issued
Merchant	Establishment where consumer is shopping
Acquirer	Bank with whom merchant has an account for settlement of credit card transactions
Issuer	Bank with whom cardholder has the credit card account
Association	Organization owning the credit card brand, switching and settling transactions between issuer and acquirer, and establishing routing and sharing rules for the card network
Third-Party Processors	Provide processing services on behalf of acquirers or issuers

This category includes transactions on the following types of cards:

- General-purpose credit cards
- Co-branded credit cards

- Charge cards
- Co-branded charge cards
- Secured credit cards
- T&E cards
- Commercial cards, including business, corporate, and purchasing
- New payment technologies that route transactions through the card associations' networks, such as:
  - Money sent through the credit card networks by person-to-person (P2P) payment systems (e.g., PayPal, Billpoint, or eMoneyMail)
  - Amounts charged to a credit card where the original payment mechanism was a transponder (e.g., Mobil Speedpass)
  - Open system stored value cards that route their transactions through the credit card networks (e.g., Visa Buxx card)

(Information on offline debit transactions routed through the Visa and MasterCard networks is provided in a later section.)

5.4.1.2 Organizations

Since every credit card transaction must be routed through the card association owning the brand, card associations were the survey focus for gathering credit card and charge card transaction and sales volume information. Individual issuers, acquirers and merchants were not surveyed.

5.4.1.3 Survey Data: General-Purpose Credit Cards

General-purpose credit card associations were surveyed for totals of U.S. originated approved and settled transactions for calendar year 2000.

The following information was requested of survey respondents:

- Required data:
  - Number and value of transactions by type of card used and payment mechanism: credit, charge, offline debit, online/offline and stored value
- Optional data:
  - Number and value of transactions by venue: in-store, mail/telephone order, Internet, other card not present purchases, other card present purchases
  - Number and value of transaction by type of retailer
  - Number of cards outstanding by type of card: credit, charge, offline debit, online/offline and stored value
  - Number of financial institutions issuing cards
  - Number of merchants, merchant locations and card terminals accepting card

(Information on offline debit transactions routed through the Visa and MasterCard networks is provided in a later section.)

Transactions are routed through one and only one card association, so there is no risk of double counting among the seven organizations surveyed. Two specific opportunities for overcounting or undercounting were addressed:

- Co-branding

  A **co-branded card** is one that has both the credit card association's brand on it as well as that of a retailer or other marketer. In some cases, retailers are replacing their private-label cards with a co-branded general-purpose card. These cards route their transactions through the credit card association. As a result, co-branded transactions are included in the general-purpose volumes rather than the private-label category.

- Sub-switching

  Sub-switching, also known as private interchange or intra processing, occurs when a processor is both the issuer and acquirer processor for a transaction. The processor is able to settle both "sides" of the transaction within their system rather than routing the transaction through the card organization for settlement. For example, suppose Processor X is the issuer processor for Bank A and the merchant processor for Merchant B. If a Bank A cardholder makes a credit card purchase at Merchant B, Processor X could reconcile that transaction internally since they are linked to both ends of the payment chain.

  Sub-switching does occur, and the largest processors estimate that it accounts for about 9% of their volume. However, per association rules, processors that sub-switch must report sub-switched volume and pay interchange on it. Transaction volumes reported by the card associations include these volumes.

This category is the largest source of electronic purchase transaction volume in this study, accounting for 42% of all transaction volumes in 2000.

Table 35: General-Purpose Credit Card Volumes

	Transactions (Millions)	Sales Volume (Millions)	Average Trans. Size
General-purpose Credit Cards	12,300.2	$1,072,555	$87.20

- Annual transactions per card vary significantly, depending upon the type of card. General-purpose cards are used half as frequently as cards that have been marketed for more specialized purposes such as T&E.
- Consumers also spend significantly more each year on specialized cards.

5.4.2 Private-Label Credit Cards

5.4.2.1 Background

Unlike the general-purpose credit card industry, where there are just a handful of associations that needed to be surveyed to collect all relevant data, private-label credit card programs may be run by individual retailers or gas companies, or by a third party. Generally, larger retailers run their own programs while smaller retailers outsource this task. In this section the data were categorized by the owner of the card's receivables.

- Retailers
- Oil/gas companies
- Third-party fleet-card issuers
- Third-party receivable owners

5.4.2.2 Organizations

Seventy-two major private label credit card receivable owners were surveyed. Smaller receivable owners were not surveyed because their individual transactions and sales volumes were too small to have a significant effect on the aggregate total.

5.4.2.3 Survey Data: Private-Label Credit Cards

Private-label credit card receivable owners were surveyed for totals of U.S. originated approved and settled transactions for calendar year 2000.

The following information was requested of survey respondents:

- Required data:
  - Number and value of transactions processed
- Optional data:
  - Number and value of transactions by venue (in-store, mail/telephone order, Internet, other card not present purchases and other card present purchases)
  - Number and value of transactions by type of retailer
  - Number of active and total private-label credit cards outstanding by type of retailer
  - Number of retailers issuing card by type of retailer

Excluded from the counts provided by survey respondents were:

- Transactions on co-branded cards (accounted for by general-purpose credit card associations)
- Processed transactions for which the respondent does not own the receivables

Private-label credit cards are one-fourth the size of general-purpose credit cards' sales volume in 2000. However, private-label cards still represent a significant source of electronic purchase transactions in this study, accounting for 9% of all electronic payments in 2000.

Table 36: Private-Label Credit Card Volumes

Category	Transaction Volume (Millions)	Sales Volume (Millions)	Average Transaction Size
Retailers	697.1	$52,610	$75.47
Oil Companies	386.7	$9,395	$24.30
Third-Party Fleet Card Issuers	230.3	$17,681	$76.77
Third-Party Receivable Owners	1,434.6	$83,134	$57.95
TOTAL	**2,748.6**	**$162,820**	**$59.24**

- Not surprisingly, third-party receivable owners led the private-label credit card industry, accounting for 52% of private-label credit card transaction volumes.
- Similarly, third-party receivable owners, with their suite of private-label card programs spanning various industries, dominated the sales volume. With higher average ticket prices, retailers had a stronger influence on sales volume, while oil companies had a weaker influence due to lower average ticket prices.

Exhibit 10: Private-Label Credit Card Volume Mix

Composition of Transaction Volume
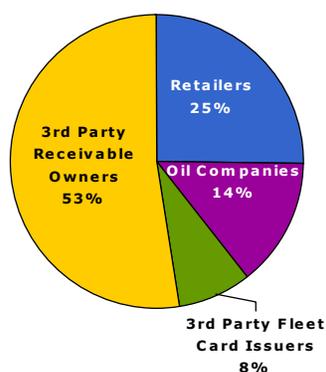
Composition of Sales Volume
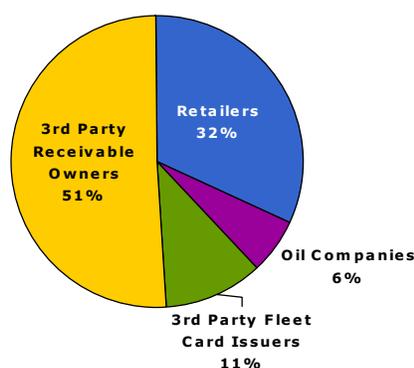
Analyzing average transaction price revealed significant differences among the private-label credit card categories. Retail private-label credit cards carried the highest average transaction price at $75 – over three times as large as oil companies, which had the lowest. This explains retailers' greater share of sales volume as compared to their number of transactions.

Exhibit 11: Private-Label Credit Card: Average Transaction Size by Category

Bar chart showing average transaction size by category:
- Retailers: $75
- Oil Cards Issuers: $24
- 3rd Party Fleet Card Issuers: $77
- 3rd Party Receivable Owners: $58
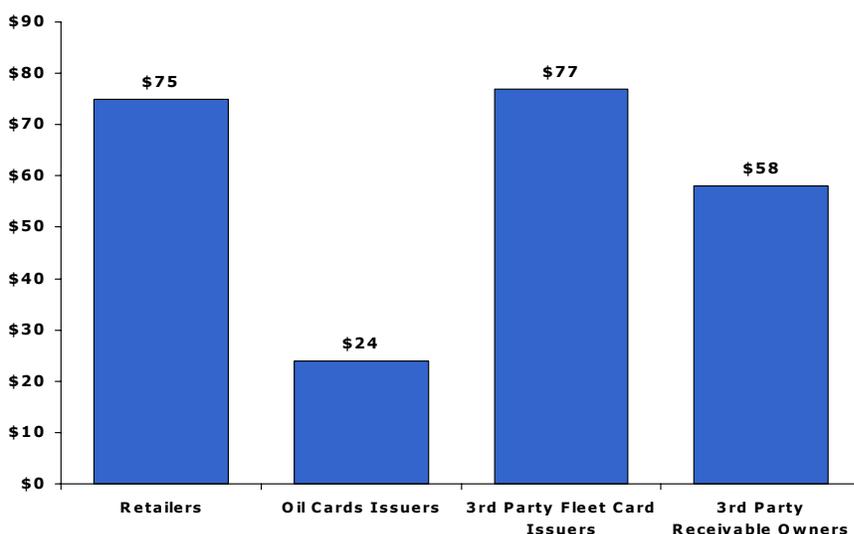
5.4.3 Debit Cards

5.4.3.1 Background

Over the last several years, debit cards have become a more popular method of payment among consumers. Debit cards can also be used to withdraw cash from ATMs, though those transactions are not included in this study. Debit purchase transactions can be either online (PIN-based) or offline (signature-based). While many consumers are unaware of the differences, there are many aspects of how these transactions are processed that are important to the merchant and the card issuer.

Table 37: Online vs. Offline Debit Cards

Online Debit Cards	Offline Debit Cards
Can be used at an ATM	Can be used at an ATM
Can also be used for purchases at checkouts with PIN pads (e.g., a grocery store or gas station) by entering PIN	Can also be used for purchases at checkouts anywhere Visa/MasterCard is accepted by signing receipt
Enables cash-back at point-of-sale	Does not allow cash-back
Routed through regional EFT network	Routed through Visa/MasterCard networks
Real-time settlement	ACH settlement in 1-3 days
Typically fixed fee per transaction paid by merchant to issuer	Fee based on sales amount paid by merchant to issuer

5.4.3.2 Online Debit

5.4.3.2.1 Organizations

The data for the online debit payment statistics were gathered from regional and national EFT networks that provide online debit at the point-of-sale (online POS). All 40 EFT networks were surveyed to ensure the most accurate count, although 13 of these networks do not offer an online POS service under their brand. Some networks support the debit POS service provided by another network; in that case, the transactions was counted by the network that owns the brand.

5.4.3.2.2 Survey Data: Online Debit

EFT networks were surveyed for totals of U.S. originated authorized and settled online POS transactions for calendar year 2000.

The following information was requested of survey respondents:

- Required data:
    - Number and value of purchase transactions at the point of sale that carry the network brand
    - Number and value of purchase transactions at ATMs such as postage stamps
- Optional data:
    - Number and value of transactions by type of retailer
    - Number and value of cash back transactions
    - Number of active and total debit cards outstanding by type of card (online, offline, combined, EBT)
    - Number of financial institutions issuing cards by type of financial institution
    - Number of merchants, merchant locations, and POS terminals accepting cards by type of retailer

Excluded from the counts provided by survey respondents were:

- ATM transactions (other than as noted above)
- Reciprocal or gateway transactions, in order to avoid double counting on the issuer and acquirer sides of transactions
- On-us transactions, where a financial institution is both the issuer and acquirer of a transaction

As noted above, the survey specified that the online POS category should include only transactions that carried the network brand, and that reciprocal and gateway transactions should be excluded. This is because online debit transactions may go through more than one of the regional or national EFT networks. If a cardholder from one network uses his card at a merchant location that is affiliated with a different network, then both networks may count that transaction. Since all transactions carry one and only one network brand, all transactions are counted once and only once under this methodology.

Due to the number of recent mergers among EFT networks, special care was taken with information from networks that had acquired or had been acquired during 2000. In these cases,

full year data were gathered from each organization that was then validated individually with the sources to ensure there was no double counting of volumes.

Table 38: Online Debit Card Volumes

	Transactions (Millions)	Sales Volume (Millions)	Average Trans. Size
Online Debit Cards	3,010.4	$138,151	$45.89

5.4.3.3 Offline Debit

5.4.3.3.1 Organizations

Currently, Visa and MasterCard have the only two networks for offline debit transactions, branded Visa Check and MasterMoney respectively. Visa's offline debit statistics also include the new hybrid online/offline debit card offered by Visa, the Visa Check Card II. Since both Visa and MasterCard provide aggregate data, there was no need to survey card issuers, acquirers, or processors to gather accurate counts. Transactions are routed through one and only one of these organizations, so there is no risk of double counting.

5.4.3.3.2 Survey Data: Offline Debit

Since these data were collected only from Visa and MasterCard, they were collected on the same survey form as the credit card data. The form asked for the number and value of approved and settled offline debit card transactions during the year 2000.

Visa and MasterCard's offline debit cards can be used anywhere their credit cards can be used; therefore, the number of merchants and card terminals that accept their offline debit cards is the same as those for their credit cards.

These numbers are for purchase transactions only, and therefore exclude cash advances.

Table 39: Offline Debit Card Volumes

	Transactions (Millions)	Sales Volume (Millions)	Average Trans. Size
Offline Debit Cards	5,268.6	$209,980	$39.85

- The number of offline debit cards is 135.8 million.
- The average cardholder conducts 39 transactions per year totaling $1,546.

5.4.4   Automated Clearinghouse

5.4.4.1   Background[38]

The ACH Network transfers payments and related data through computer and high-speed communications technology. ACH Network services can be divided into five broad categories:

- **Direct Deposit Services**. Direct Deposit is the automatic deposit of all or part of employees' pay, retirees' pension and annuities, and other business deposits to consumers' checking and/or savings accounts.

- **Direct Payment & Home Banking Services**. With Direct Payment, consumers preauthorize electronic debits to their depository accounts for types of recurring bill payments such as insurance premiums, utility bills, all types of loan payments, mortgages, club memberships, subscriptions and charitable contributions. Home banking/bill payment services allow consumers to initiate their bill payments by telephone, computer, or other mechanisms.

- **Electronic Commerce**. Electronic commerce can incorporate all aspects of the ordering, inventory, and payments processes of businesses. Companies may use electronic data interchange (EDI) to place orders; to update, control, and reorder inventories; to transmit billing statements; and to collect or make payments.

- **Electronic Benefits Transfer (EBT)**. EBT enables governments to replace multiple paper systems with a single, streamlined electronic delivery system that delivers benefits for a wide range of Federal and state programs. Most frequently, EBT is used to provide food stamp and cash assistance benefits. EBT allows recipients to access their benefits with the use of a card through automated teller machines (ATMs) and retail point-of-sale (POS) terminals.

- **Electronic Checks**. An electronic check is the conversion of a paper check to an electronic transaction as early as possible in the check collection process. Another electronic check concept is Electronic Check Presentment (ECP). Financial institutions use ECP to send an electronic file of MICR-line information to the paying bank in advance of the paper check. The paper check continues through the transaction processing and, in due course, is physically received at the paying bank.

5.4.4.2   Organizations

Four ACH network operators handle all ACH transactions (except on-us transactions, described below). The data for ACH statistics were gathered from these four operators. Additionally, the National Automated Clearing House Association (NACHA) collects annual statistics from these networks as well; NACHA's data for 2000 were used to validate and verify respondents' information.

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[38] Condensed from the 2001 NACHA Buyer's Guide

5.4.4.3 Survey Data: Automated Clearing House

The ACH operators and NACHA were surveyed for totals of U.S. originated transactions for calendar year 2000, excluding ODFI/RDFI settlement transactions.

The following information was requested of survey respondents:

- Required data:
    - Number and value of ACH debit and ACH credit transactions and returns for originated inter- and intra-operator transactions by SEC code.
- Optional data:
    - Number and value of ACH debit and ACH credit transactions and returns for originated intra-operator transactions by SEC code.
    - For operators, number of ODFIs that they receive data from, and number of RDFIs that they send items to
    - For NACHA, estimated number of on-us transactions processed by originators

Table 40: Automated Clearing House Volumes

	Transactions (Millions)	Dollar Value (Millions)	Average Trans. Size
Automated Clearing House	5,622.0	$5,674,851	$1,009.40

All ACH transactions go through one or more of the four ACH operators. Similar to online debit transactions, a risk of double counting exists when a transaction is routed through more than one operator. To avoid any potential double counting, data were collected on originated transactions only. That is, operators were asked to include only transactions that originate within their own network (whether it is transmitted to another operator or is transmitted to the RDFI).

5.4.4.4 ACH Transaction Classifications

There are several ways an ACH transaction can be classified. These are described below:

5.4.4.4.1 Network vs. On-Us Transactions

In addition to ACH network volume that goes through one of the ACH operators, ACH transactions may occur "on-us" at the financial institution level. An example of this would be a case where a single DFI is both the ODFI and the RDFI for a given transaction. The DFI would not need to route the transaction through one of the ACH operators.

Counting the entire population of on-us transactions would require surveying all financial institutions that use ACH. NACHA surveys the 50 largest financial institutions to form an estimate of total on-us transaction volumes. Those estimates were added to the network data collected from the operators.

5.4.4.4.2 Originated vs. Received Transactions

An ACH operator can originate or receive a transaction. All ACH transactions are originated through one operator, and they may or may not be passed on to another "receiving" operator. If the transaction is passed on, and both operators count it, then it would be double-counted. To avoid this, operators were asked to provide data on originated transactions only.

5.4.4.4.3 Inter- vs. Intra-Operator Transactions

ACH operators also classify their transactions as inter- or intra-operator transactions. *Inter*-operator transactions are those that are transmitted to another ACH operator. *Intra*-operator transactions are those that are *not* transmitted to another ACH operator. This would be the case if the operator were the ACH operator for both the ODFI and the RDFI. This survey wanted to capture ACH transactions regardless of whether they went through one or more operators (noting the risk of double-counting mentioned above), so operators were asked to provide a combined total of inter- and intra-operator volumes.

5.4.4.4.4 Debits vs. Credits

All ACH transactions are classified as an ACH debit or an ACH credit, depending on whether the originator is crediting an account or debiting an account. Either of these is considered a transaction, so they are combined to an aggregate total for purposes of this study.

5.4.4.4.5 Returns

Like a credit card or debit card transaction, ACH transactions can be returned. However, the reporting of returned transactions is more complex within the ACH system. ACH operators report returns differently.

EPN and the Fed report the number of returns by SEC code, and these can be subtracted from each SEC code's transaction volumes. In cases where the original SEC code was not available, the return is reported under the "RET" SEC code. These operators do not report dollar value of returns. To estimate these volumes, the average transaction size for each SEC code was calculated by dividing dollar value by transactions, and multiplied by the number of return transactions.

ACHA and Visa report total returns only; they do not provide this data by SEC code. However, they do provide both the number and dollar value of returns. To estimate the returns by SEC code, the share of transactions by SEC code was calculated by dividing each SEC code's transactions by the total transactions, and applying this percentage to the total returns. The same was done on the dollar value side. These estimated returns were then backed out of each SEC code.

5.4.4.4.6 SEC Codes

All ACH transactions are routed under one of several Standard Entry Class (SEC) Codes defined by the ACH operating rules. There were 21 such codes effective during the year 2000, though no data were reported under four of the codes. About half of the active codes relate to domestic payment transactions, and are therefore included in this study. The other half concern cross-border transactions, ATM withdrawals or simple notifications, and are therefore excluded from our totals. A list of which SEC codes are included and excluded from the study results is shown in the following table.

Table 41: SEC Codes Included in ACH Aggregates

Code	Description
CIE	Consumer Initiated Entry
CTX	Corporate Trade Exchange
POS	Point of Sale Entry
PPD	Prearranged Payment and Deposit Entry
POP	Point-of-Purchase Entry
RCK	Re-presented Check Entry
SHR	Shared Network Transaction
TRC	Truncated Entry *
TRX	Truncated Entries Exchange *
XCK	Destroyed Check Entry

* Inactive code

Table 42: SEC Codes Excluded from ACH Aggregates

Code	Description
ACK	ACH Payment Acknowledgement
ADV	Automated Accounting Advice *
ATX	Financial EDI Acknowledgement *
CBR	Corporate Cross-Border Payment
CCD	Cash Concentration or Disbursement
COR	Automated Notification of Change
DNE	Death Notification Entry
ENR	Automated Enrollment Entry
MTE	Machine Transfer Entry
PBR	Consumer Cross-Border Payment
RET	Automated Return Entry

* Inactive code

The network totals calculated from the survey responses were about one percent different from the data published by NACHA. This difference may be accounted for by the fact that some of the data collected from the operators had been revised since they were given to NACHA.

Table 43: ACH Transactions By SEC Code

SEC Code	Transactions (Millions)	Dollar Value (Millions)	Average Trans. Size
CIE	36.3	$24,498	$675
CTX	33.6	915,381	27,260

POP	14.6	1,088	75
POS	29.8	1,607	54
PPD	5,467.5	4,729,293	865
RCK[39]	2.9	483	165
SHR	37.2	2,472	67
XCK	0.1	28	245
Total	5,622.0	5,674,851	1,009

As shown in the table, the PPD code is the largest by far, accounting for 97% of the transactions and 83% of the dollar value. The PPD code (for Prearranged Payment and Deposit Entry) includes such items as direct deposit of payroll, pre-authorized bill payment and check conversion.

Also notable is that different SEC codes can have dramatically different average transaction sizes. This is due to the different nature of the transactions routed under each code. For example, CTX transactions are corporate exchanges from one organization to another, and therefore are very high. POS transactions are individual purchases at the point of sale and are therefore relatively small.

5.4.5 Electronic Benefit Transfer

5.4.5.1 Background[40]

Electronic Benefit Transfer (EBT) is an electronic system that allows a recipient to authorize transfer of his/her government benefits from a Federal account to a retailer account to pay for products received. EBT is currently being used in many states to issue food stamps and other benefits. Nearly 80 percent of food stamp benefits are currently being issued by EBT.

EBT accounts are established in the participant's name, and food stamp and other benefits are deposited electronically in the account each month. A plastic card, similar to a bank card, is issued and a personal identification number (PIN) is assigned or chosen by the recipient to give access to the account.

States are steadily bringing new EBT projects on line. As of September 2000, forty states, the District of Columbia, and Puerto Rico were using EBT in some form to issue food stamp benefits: The remaining states are in various stages of planning for EBT. The Welfare Reform Act of 1996 mandates that all states must switch to EBT issuance for the Food Stamp Program by October 2002. Although this act only applies to food stamp benefit distribution, more and more states are adding cash benefits to their EBT system. Cash benefits can, depending on the state, be withdrawn at an ATM or spent at a retailer with a POS terminal.

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[39] The RCK volume and value are considered electronic payments for the purposes of this study. It should be noted, however, that for each RCK transaction the original intent of the payor and payee was to settle using the check system. The inability to settle via the check system caused the check to be collected via ACH.
[40] Condensed from the Food & Nutrition Service's Website

5.4.5.2 Organizations

All states participating in EBT have a single primary contractor that administers their EBT payments program. That contractor may subcontract processing or any other aspect of the program to another company. Because of these complex relationships, and to ensure that no transactions were double counted, only the primary contractors were surveyed. There are currently only four primary EBT contractors.

In addition to these four contractors, we surveyed the Food & Nutrition Service (FNS). FNS collects data on food stamp benefits administered through EBT programs, but does not have data on cash benefits that may also be administered through EBT programs.

5.4.5.3 Survey Data: Electronic Benefit Transfer

The EBT contractors were surveyed for total approved and settled purchase transactions for calendar year 2000.

The following information was requested of survey respondents:

- Required Data
    - Number and value of purchase transactions processed

- Optional Data
    - Number and value of transactions by type of retailer
    - Number of active and total EBT cards outstanding
    - Number of merchants, merchant locations, and POS terminals accepting cards by type of retailer

Excluded from the counts provided by survey respondents were:

- ATM transactions

EBT transactions can be broken down between food stamp benefits, which all states participating in EBT provide, and cash benefits, which some states provide. Cash benefits are primarily through Temporary Assistance for Needy Families (TANF), which replaced Aid to Families with Dependent Children (AFDC) in 1996, but may also include other state programs. Similar to a bank account with a debit card, these cash benefits can be accessed in two ways: as cash from an ATM, or as a purchase made at a retailer by swiping the card and entering a PIN. For purposes of this study, we are counting all food stamp benefits, since these are accessed by making a purchase, as well as the portion of cash benefits that are accessed as a purchase rather than a cash withdrawal.

Statistics for this category were gathered on the purchasing side rather than the funding side. That is, when an EBT cardholder makes a purchase (whether using food stamp benefits or cash benefits), that transaction is counted here. Funding transactions, including transfers from the state or federal government to financial institutions that hold funds, and transfers from those fund

pools to merchants who accept EBT cards, are not counted here. Funding transactions go through the ACH system and are included in those numbers.

This results in the same funds being counted more than once. In fact in this case, the same funds are counted three times: first as they are transferred from the government to the financial institutions, again when they are transferred from the financial institutions to the merchants, and a third time on the purchasing side when consumers make purchases on their EBT cards. However, each of these funds transfers is a separate event, and represents an opportunity for an electronic funds transfer to replace a paper funds transfer. Therefore, each transaction is counted. In the past, these would have been three separate paper transactions.

Direct Federal payments to individuals are made through the Financial Management Service (FMS) of the Department of the Treasury. These payments include Social Security, SSI, Veterans, and other government programs. These transactions are authorized and executed through the Fed ACH system and are counted, therefore, with the ACH numbers.

Table 44: Electronic Benefit Transfer Volumes

	Transactions (Millions)	Sales Volume (Millions)	Average Trans. Size
Electronic Benefit Transfer	537.7	$13,744	$25.56

All but two states use a magnetic-stripe card for their EBT program. Ohio and Wyoming implemented a chip card program. Additionally, Nevada is piloting a program to offer WIC benefits on a chip card.

5.4.6   Emerging Payment Technology Companies

5.4.6.1   Background

In recent years several new payment technologies have been developed. However, these products are generally just new front-end payment methods to the consumer, using traditional funding and settlement systems behind the scenes. Therefore, these types of transactions are counted within the basic funding and settlement systems that they use and are not separately added into the aggregates.

We surveyed a number of these companies to get a sense of the volume that they are contributing. Very few of these companies responded to our survey. In many cases, it was simply because the company was so new that it did not yet have any significant volume. In other cases it was because they are in a new and competitive market and do not want to reveal their transaction data. Still others did not respond simply because they are a small operation and did not have the time or manpower to respond to a survey.

We will continue attempting to quantify these emerging payment technologies in future studies.

Emerging payment technology companies can be categorized as follows:

- **Bill Payment Companies**. Electronic bill payment and presentment (EBPP) refers to online services that enable customers to receive, review and execute payment of their bills over the Internet.

- **Person-to-Person Payments**. A person-to-person (P2P) payment involves an electronically initiated transfer of value from one individual to another. Using PCs, handheld computers and mobile phones, individuals can use this anytime, anywhere service to send money to family members, settle debts with friends and pay for items purchased through online auctions.

- **Stored Value**. Prepaid cards are promoted for a number of uses. Though perhaps they are currently best known for their gift card application, as a replacement for a gift certificate, they are also being used for payroll, incentives, insurance, refunds and other purposes.

- **Internet Currencies**. Internet currencies are, as the name implies, currencies intended to be spent on the Web. Web merchants must be set up to accept an Internet currency, and they are generally not widely accepted, though some are much more popular than others. Some can also have their value transferred to a card and spent at a physical location.

- **Other Emerging Payment Technologies**. There are several other types of emerging payment technologies as well.

  o Several companies are working on ways to allow consumers to use their online debit cards for Internet purchases. These technologies route transactions through the EFT networks.

  o Transponders allow consumers to waive a small tag in front of a reader to pay for goods. Purchases paid for with a transponder are billed to the consumer's credit card or to a prepaid account.

  o A major processor is working with a supermarket industry trade group to pilot an ACH debit card, which works similarly to an online debit card, but routes transactions through the ACH system rather than an EFT network.

  o Several companies have developed ways to convert checks to electronic transactions at the point-of-sale. These transactions would then go through the ACH system.

6   APPENDICES

6.1   Appendix A – Statistical Methodology for The DFI Check Study

The DFI Check Study received check volume and value data from 1,256 financial institutions during March and April 2001.

6.1.1   Sample Design

The sample for *The DFI Check Study* was based on a stratified single-stage design with systematic sampling of DFIs (i.e., holding company if applicable) using a random start. The primary strata were defined on the basis of type of institution, that is, commercial banks (CMB), credit unions (CUS) and thrifts (THR).[41] The next level of stratification was carried out on the basis of size where the measure of size was the public checkable deposits (PCD) value at the highest institutional level (e.g., holding company). Public Checkable Deposits (PCD) are all checkable deposits held by a DFI that are not the deposits of other DFIs or the federal government. Checkable deposits were believed to be a better indicator of check volume than total assets or total deposits.

The sampling unit was the DFI at its highest institutional level (e.g., holding company) and the data were collected for all the institutions owned by the sampled institution.

6.1.1.1   Sampling Frame of the Financial Institutions

The sampling frame was constructed from files supplied by the Federal Reserve Board of Governors. The frame represented the population of insured depository financial institutions in the United States, which includes U.S. branches of foreign owned institutions. Only institutions with checkable deposits above $100,000 were included in the frame. It is possible that a bank holding company could have no checkable deposits, in which case it would be eliminated from the frame.

More specifically, the frame consisted of:

- 6,846 commercial banks and bank holding companies, plus 6 "anomalous banks"
- 6,551 credit unions,
- 1,293 thrifts.

The six anomalous banks were identified and surveyed as a certainty stratum, because their paid check volume was known to be poorly correlated to PCD. Relatively speaking, these were small

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[41] Thrifts include savings banks and savings and loan associations.

banks (low PCD value) that process a high volume of low-dollar value rebate checks. These institutions were surveyed as a certainty stratum to avoid the risk of selecting them as part of a random sample. They are not representative of most other institutions their size. Their data would skew the results of a national estimate if it were extrapolated to estimate volumes processed by non-sampled banks.

The frame also contained numerous variables, some of which were used in stratification, and some of which were used as identifiers. Public checkable deposits (PCD) was the stratifying variable.[42] Variables used for identification, but not stratification were bank name, city, state, ID_RSSD, ID_TOP and ABA_RTN.[43] The identifier variables were used to map institutions to appropriate data sources for mailing lists, for example, Thomson's Financial Databank, an industry directory of the banking industry.

6.1.1.2 Stratification of Sampling Frame

The primary strata were based on the type of institution: CMB, CUS, and THR. This means that all of the CMB constituted a stratum, all CUS another stratum, etc. Within the primary strata (the CMB, CUS, and THR) there was further stratification by size. For instance, the largest institutions were in one stratum, the next largest in another, all the way to the very smallest in the last stratum.

Because the largest institutions account for the majority of total paid check value and volume, the 100 largest institutions were included with certainty. All institutions in the certainty stratum were included in the sample. Sampling was conducted to select institutions from the other strata.

The total sample of 2,339 institutions was allocated across 14 design strata defined by type of institution and size (plus one stratum of anomalous banks).

6.1.1.3 Sample Size and Sample Allocation

The survey estimates were based on assumptions for each of the primary strata (CMB, CUS and THR), and the aggregates of these strata:

- Expected response rate of 65 percent.
- Sample allocated to achieve less than a 10.0 percent confidence value (CV) for commercial banks, credit unions and thrifts for the size measure under the assumption of a 65 percent response rate within each stratum.

Since survey estimates were produced both at the primary stratum level (type of institution) and at the aggregate level the criteria were also applied so that the sample allocation across primary strata should result in certain desired CVs for the primary strata. As discussed earlier, the primary strata were the three types of institution and the secondary strata were defined on the

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[42] The CUS list included a share draft field, S_DRAFT, as the stratifying variable. For simplicity, however, we refer throughout the report to PCD as the stratifying variable for all DFIs.

[43] ID_RSSD is an identification number the Federal Reserve assigns to every entity listed in its database (including DFIs, DFI branches, bank holding companies, etc.). It stands for IDentification_Research, Statistics, Supervision, and Discount. The ID_TOP for a bank is the ID_RSSD of the highest level holding company that owns that bank. It stands for IDentification of the TOP Holder. ABA_RTN is the Routing Transit Number for the institution.

basis of a measure of size (PCD). The desired CV of 10 percent or less was obtained under the assumption of a uniform response rate of 65 percent within the secondary strata including the TAKE-ALL strata.

The Lavallee and Hidiroglou (1988) procedure, which defines optimum TAKE-ALL (certainty) and TAKE-SOME (sampling) strata boundaries, was used to determine the minimum sample sizes. The procedure minimizes the total sample size while achieving the required relative standard error. Also, by using the Lavallee and Hidiroglou (1988) procedure, we not only determine the required sample sizes, but we also obtain the size stratification within each primary stratum. The number of size strata was 5 for each of the commercial banks and the credit unions, and 3 for the thrifts. Thus, the total number of design strata was 13 out of which 10 were TAKE-SOME (or sampling) strata. The TAKE-ALL stratum for the commercial banks was further divided into 2 TAKE-ALL strata for operational reasons. Moreover, this would also result in more homogeneous nonresponse adjustment classes as discussed later.

By applying the above procedures and taking into consideration the expected response rate of 65 percent, we arrived at a total sample of 2,339 institutions. The table below gives the number of institutions in the sample frame and the number sampled by sampling stratum. There are 14 sampling (or design) strata. Out of the 14 design strata, the sampling was conducted in 10 strata only and the remaining 4 were defined to be TAKE-ALL (or certainty) strata.

Table 45: Number of Institutions Sampled by Size Stratum (Original Design)

Primary Stratum	Size Stratum	Number of Institutions	Number Sampled
Commercial Banks	1	204	204
	2	329	329
	3	845	336
	4	1,408	300
	5	2,036	242
	6	2,008	156
	All	6,830	1,567
Credit Unions	1	104	104
	2	344	181
	3	723	134
	4	1,742	112
	5	3,199	69
	All	6,112	600
Thrifts	1	40	40
	2	347	114
	3	850	44
	All	1,237	198
TOTAL		14,179	2,365

6.1.1.4 Sample Selection

The sampling was performed at the highest institutional level. Where applicable, therefore, the sampling unit was the holding company. The sample was selected using a systematic sampling

procedure within each sampling stratum. The institutions in the sample frame were first sorted by size within each of the design strata for systematic sampling.

6.1.1.5 Selection Probabilities

The sample design for the survey of financial institutions is a single stage stratified design with systematic sampling of institutions from within strata. The selection probabilities for all units within a stratum are equal to the sampling rate for the stratum. The selection probabilities are equal to 1 for all institutions in the TAKE-ALL strata.

Let h denote the stratum and the index i denote an institution (e.g., holding company) within the stratum. In order to keep the notation simple, we will use the index h to denote the final design strata obtained after the size stratification. If we select n_h (the sample size for stratum h) out of the N_h (the population size for stratum h) institutions in stratum h, then the selection probability for stratum h, say π_h is given by

$$\pi_h = {n_h}/{N_h}.$$

The selection probabilities π_h define the base weights as discussed in Section 6.1.2.1.

6.1.2   Sample Weighting

6.1.2.1 Base Weights

Survey responses from the respondents are inflated to obtain estimates for the entire population using sampling weights. These weights are designed to (1) compensate for unequal selection probabilities; (2) attempt to compensate for unit nonresponse, that is, nonresponding institutions; and (3) attain greater precision for the survey estimates through poststratification (or ratio estimation) if auxiliary data for poststratification are available. As discussed in Section 6.1.1.5., the selection probabilities of the institutions will vary by stratum due to different sampling rates for the strata. The base weight for a sampled institution is defined to be the reciprocal of sampling rate for the corresponding stratum, which is also the selection probability of the institution. Such base weights produce unbiased estimates of totals and percentages in the absence of any nonresponse in the survey.

If π_h is the selection probability for the sampled institutions from stratum h then the base weight (or design weight) assigned to the corresponding institutions is defined as

$$W_h = 1/\pi_h \ .$$

Properly weighted estimates using the base weights (as given above) would be approximately unbiased if every sampled unit agreed to participate in the survey. However, nonresponse is always present in any survey operation. *The DFI Check Study* was no exception; a number of sampled institutions declined participation in the study. Thus, weight adjustments were necessary to minimize potential nonresponse bias.

Ratio adjustment of sample weights at the individual stratum level was also performed using the auxiliary variable (PCD) to reduce the variability of sample estimates. The improvement in the reliability of the estimates due to ratio adjustment depends on the correlation between the study variable and the auxiliary variable used for ratio adjustment.

6.1.2.2 Nonresponse Adjustment

The base weights are adjusted to account for the nonresponding institutions. As described in Section 6.1.2.1. the base weights would produce approximately unbiased estimates only if there were no nonresponding institutions. Due to the presence of nonresponse, a weight adjustment was required to account for nonresponding institutions. This weight adjustment was obtained by increasing the weights of the sampled institutions for which data were collected. The nonresponse weight adjustment was applied within each stratum. Suppose that n_h institutions were sampled from stratum h and data were collected for r_h institutions only. Then the adjustment is calculated as the ratio of the number of sampled institutions (both respondents and nonrespondents) in the stratum to the number of institutions that actually responded to the survey. Let $A_h^{(nr)}$ denote the weight adjustment due to the nonresponding institutions within stratum h, then

$$A_h^{(nr)} = {n_h}\big/{r_h}.$$

In order to compensate for the nonresponse, the base weight for stratum h, that is, W_h, was multiplied by the nonresponse adjustment factor $A_h^{(nr)}$ given above. The stratum level design weight adjusted for nonresponse then becomes

$$W_h^* = A_h^{(nr)}W_h.$$

The above weight can be assigned to all institutions belonging to stratum h for which survey data were obtained. Although, above weights can be used to produce unbiased survey estimates, we also used the auxiliary information on the size of institutions from the sampling frame for the purpose of ratio estimation. The benefit of ratio estimation is that it helps reduce the variability of survey estimates.

6.1.2.3 Ratio Estimation

Ratio estimation is a popular estimation procedure in which the weights of the respondents are further adjusted so that the survey estimates of an auxiliary variable are equal to the known population totals of the auxiliary variable for each stratum or some aggregate of strata. We applied the ratio adjustment at the stratum level because the sample sizes at the stratum level were adequate.

Let X_h denote the sum of the PCD values for all the institutions in the stratum denoted by h $(h = 1,2,---,L)$ as obtained from the sampling frame, and let $\hat{X}_h$ be the corresponding survey

estimate obtained by using the nonresponse adjusted base weight. Then the ratio $X_h \big/ \hat{X}_h$ is used as an adjustment to define the ratio estimation weight $W_h^{(ratio)}$ as

$$W_h^{(ratio)} = \left(\frac{X_h}{\hat{X}_h}\right) W_h^{*}.$$

The superscript (ratio) denotes the ratio estimation weight and the weight is applied to all institutions in stratum h. It can easily be shown that the ratio estimation weight $W_h^{(ratio)}$ for stratum h can also be expressed as

$$W_h^{(ratio)} = \left(\frac{N_h}{r_h}\right) \frac{\overline{X}_h}{\overline{x}_h},$$

where $\overline{x}_h$ and $\overline{X}_h$ are respectively the sample mean and the population mean of the auxiliary variable PCD for the stratum denoted by h, and r_h is the number of responding institutions from stratum h. The ratio estimation weights $W_h^{(ratio)}$ are the final survey weights and these are used to tabulate the survey responses.

6.1.3   Estimation

The survey covers three types of financial institutions, commercial banks (CMB), credit unions (CUS) and the thrifts (THR). Both aggregate level and type of institution level estimates were produced from *The DFI Check Study*. In this section we discuss the estimation procedures for these two levels of survey estimates. For the sake of simplicity we will denote by W_h the ratio-adjusted survey weight for stratum h instead of $W_h^{(ratio)}$ as defined in section 6.1.2.3. Also, we will use n_h instead of r_h to denote the number of respondent institutions from design stratum h.

6.1.3.1   Estimates of Totals

The form of the survey estimate for the characteristic y at the stratum level is given by

$$\hat{Y}_h = \sum_{i=1}^{n_h} W_h y_{hi}$$

where h denotes the design stratum, and i is the sampled (and respondent) institution from stratum h. The variable W_h denotes the sampling weight for stratum h and y_{hi} is the observed value of the variable (or characteristic) y for the responding institution i from the stratum h.

The estimate of the stratum level total of the characteristic y can also be expressed in an alternate form as

$$\hat{Y}_h = N_h \left(\frac{\bar{y}_h}{\bar{x}_h} \right) \bar{X}_h$$

where $\bar{y}_h$ is the sample mean of the study variable y (or characteristic of interest).

Then the estimate of the aggregate of characteristic y is simply the sum of the estimates of the individual design strata, that is,

$$\hat{Y} = \sum_{h=1}^{L} \hat{Y}_h$$
$$= \sum_{h=1}^{L} \sum_{i=1}^{n_h} W_h y_{hi}$$

where L is the total number of design strata.

The estimate of the total of characteristic y by type of institution is simply the sum of the estimates of the individual design strata belonging to that type, that is,

$$\hat{Y}_{(CMB)} = \sum_{h \in CMB} \hat{Y}_h$$
$$= \sum_{h \in CMB} \sum_{i=1}^{n_h} W_h y_{hi}$$

where summation is over those strata that belong to the commercial banks. Similarly, the estimates for the credit unions and the thrifts can also be obtained by summing the stratum level estimates over the strata for the corresponding types.

6.1.3.2 Reliability of the Estimates

Because estimates are based on sample data, they differ from figures that would have been obtained from complete enumeration of the universe using the same instruments. Results are subject to both sampling and nonsampling errors. Nonsampling errors include biases due to inaccurate reporting, processing and measurement, as well as error due to nonresponse and incomplete reporting. These types of errors cannot be measured readily. However, to the extent possible each error has been minimized through the procedures used for data collection, editing, quality control and nonresponse adjustment.

The sampling error (or standard error) of an estimate is defined as the square root of the variance of the estimate. The standard error of an estimate is inversely proportional to the square root of the number of observations in the sample. Thus, as the sample size increases, the standard error decreases.

6.1.3.3 Variance Estimation of Estimates of Totals

The estimates of variances of the estimated totals from the survey have been computed by employing Taylor Series approximations (or Taylor linearization). The Taylor linearization technique has been used because the estimates of totals have been obtained using ratio estimation weights. Wolter (1985) is a useful reference on the Taylor Series method of variance estimation. As described earlier, the weights were computed as separate ratio estimation weights at the design stratum level using auxiliary variable PCD for ratio estimation. The estimate of the aggregate of characteristic y is simply the sum of the estimates of the individual design strata, that is,

$$\hat{Y} = \sum_{h=1}^{L} \hat{Y}_h$$
$$= \sum_{h=1}^{L} \sum_{i=1}^{n_h} W_h y_{hi}$$

where L is the total number of design strata.

The variances are obtained at the design stratum level and the variances of the aggregates are simply the sum of the stratum level variances. In order to obtain the variance of the stratum level total $\hat{Y}_h$ we define synthetic variable d_{hi} as

$$d_{hi} = y_{hi} - R_h x_{hi}$$

where R_h is the ratio of the stratum level average value of the study variable y to the stratum level average value of the auxiliary variable. The ratio R_h is unknown, and was substituted by its estimate defined as $\bar{y}_h / \bar{x}_h$, where $\bar{y}_h$ is the sample mean of the study variable y and $\bar{x}_h$ is the sample mean of the auxiliary variable "PCD." The variance of the estimated stratum level total $\hat{Y}_h$ is then given by

$$\text{var}(\hat{Y}_h) = (1 - f_h) \times \left(\frac{X_h}{\hat{X}_h}\right)^2 \frac{N_h^2}{n_h} \frac{1}{(n_h - 1)} \sum_{i=1}^{n_h} \left(d_{hi} - \bar{d}_h\right)^2 .$$

where $f_h = n_h / N_h$ is the sampling fraction in stratum h and $\bar{d}_h$ is defined as

$$\bar{d}_h = \frac{1}{n_h} \sum_{i=1}^{n_h} d_{hi} .$$

It should be noted that n_h is the number of responding institutions from stratum h and not the number initially sampled.

The variance estimate of the estimated total is simply the sum of the individual strata level variances. Thus, the variance of the estimated total $\hat{Y}$ is given by

$$\text{var}(\hat{Y}) = \sum_{h=1}^{L}(1-f_h) \times \left(\frac{X_h}{\hat{X}_h}\right)^2 \frac{N_h^2}{n_h} \frac{1}{(n_h-1)} \sum_{i=1}^{n_h}\left(d_{hi} - \bar{d}_h\right)^2.$$

6.1.3.4 Construction of Confidence Intervals

Each of the survey estimates will have an associated standard error, which is defined as the square root of the variance of the estimate. Let $\hat{Y}$ be the estimated total of the study variable y and $\text{var}(\hat{Y})$ be the corresponding variance estimate. Then the standard error of the estimated total $\hat{Y}$ is given by

$$sd(\hat{Y}) = \sqrt{\text{var}(\hat{Y}).}$$

The 95 percent confidence interval is the interval such that there is a 95 percent chance that the unknown total Y would be within the interval. The 95 percent confidence interval is defined as

$$\hat{Y} \pm 1.96 \times sd(\hat{Y}).$$

The lower limit of the interval is

$$\hat{Y} - 1.96 \times sd(\hat{Y}).$$

And the upper limit of the interval is

$$\hat{Y} + 1.96 \times sd(\hat{Y}).$$

The width

$$1.96 \times sd(\hat{Y})$$

is known as the half-width of the 95 percent confidence interval. The smaller the half-width of the confidence interval, the more precise is the survey estimate.

The estimates and the corresponding 95 percent confidence intervals were obtained for two study variables, Volume and Value, using the months of March and April 2001. The estimates and the confidence intervals were obtained at both the primary stratum level and the aggregate level. The results of the estimation are given in Table 9 and Table 10.

6.1.3.5 Restratifying with the New PCD Data

As discussed earlier, the initial sample design was based on a stratified single-stage design with systematic sampling of institutions using a random start. The primary strata were defined on the basis of type of institution, that is, commercial banks (CMB), credit unions (CUS) and thrifts (THR). At the conclusion of data collection, the final data set was restratified prior to analysis to more accurately reflect both stratification variables. For the primary stratification variable, type of institution, adjustments were made to reclassify several holding companies that owned both commercial banks and thrifts (dual-type holding companies). These cases had come to the attention of the study team either from data the institutions had reported during the study, or from a review of auxiliary data sets maintained by the Federal Reserve. A decision rule was employed that reclassified each dual-type holding company into the institution type stratum containing over 50 percent of their PCD values. So a dual-type holding company owning a commercial bank (or banks) with PCDs at 75 percent of the total PCDs for all owned institutions was classified as a commercial bank, regardless of where that holding company was classified in the original design. A total of 131 institutions were moved from their initial type of institution stratum - 91 originally classified as commercial banks were reclassified as thrifts, and 40 originally classified as thrifts were reclassified as commercial banks.

The next level of stratification for the design was done on the basis of size where the measure of size was the PCD value at the highest institutional level. The initial sample design was based on PCD from 3rd quarter 2000. At the conclusion of data collection (1st quarter 2001) PCDs were available, which reflect the status of participating institutions during the same time period as the check volume and value totals reported on the survey. The 2001 PCDs were used as the size measure for the final design.

We used the PCD value as stratification variable for *The DFI Check Study* design. The information is also used for estimation purposes. We received in August 2001 files from the Federal Reserve Board with updated PCD values.

As these new PCDs were being implemented, some additional modifications to the size strata within type of institution were made to improve design efficiency. These final improvements involved adjusting the certainty strata for each type of institution stratum to obtain certainty groupings based on whether institutions responded to the survey. For commercial banks, the initial design included two certainty strata containing 533 institutions. In the adjusted design, the eighth largest commercial bank holding company did not respond, so a stratum containing the seven largest commercial bank holding companies was used as the only certainty stratum, with weights equal to 1. A similar method was used for credit unions (obtained certainty stratum with 2 institutions) and for thrifts (obtained certainty stratum with 3 institutions). For the analysis, design efficiency was improved by excluding each certainty stratum from the computation of sample variation.

Table 46: Final Depository Financial Institution Check Study Sample Information

SAMPLE	Stratum	PCD Range ($ thousands)	Sample Frame	Institutions Sampled ***	Institutions Responding	Response Rate	Sampling Weight
Commercial Banks (CMB)	Certainty	56,759,826 - 15,385,621	7	7	7	100%	1.000
	1	9,927,979 - 244,559	166	165	113	68%	1.152
	2	242,032 - 96,461	329	330	172	52%	1.918
	3	96,271 - 47,302	846	333	175	53%	4.769
	4	47,296 - 23,136	1,399	315	153	49%	8.804
	5	23,123 - 9,442	2,041	246	116	47%	17.361
	6	9,442 - 105	2,008	151	74	49%	25.270
	Below Minimum*	100 - 1	50	0	0	-	-
	TOTAL	-	**6,846**	**1,547**	**810**	**52%**	-
Credit Unions (CUS) **	Certainty	1,643,158 - 798,356	2	2	2	100%	1.000
	1	431,679 - 75,062	104	104	76	73%	1.315
	2	74,898 - 25,880	343	170	111	65%	3.065
	3	25,843 - 8,211	721	140	78	56%	7.735
	4	8,201 - 2,008	1,742	111	54	49%	32.900
	5	2,006 - 101	3,192	72	22	31%	150.302
	Below Minimum*	100 - 1	447	0	0	-	-
	TOTAL	-	**6,551**	**599**	**343**	**57%**	-
Thrifts (THR)	Certainty	5,148,010 - 2,810,146	3	3	3	100%	1.000
	1	2,107,059 - 189,311	36	37	15	41%	2.430
	2	187,228 - 28,296	346	108	61	56%	4.805
	3	28,282 - 115	894	39	18	46%	34.302
	Below Minimum*	93 - 3	14	0	0	-	-
	TOTAL		**1,293**	**187**	**97**	**52%**	-
Anom. Banks	Certainty	n/a	6	6	6	100%	1.000
All Institutions			**14,696**	**2,339**	**1,256**	**54%**	-

*   In all 3 sample groups, institutions with a PCD of $100,000 or below were not included for sampling.
**   For credit unions, the PCD values are the S_Draft (i.e., share draft) variable from the sample frame file.
***The totals in this column are adjusted for merged institutions.

6.1.3.6 Imputation

Prior to final weighting and preparing estimates from the study data, missing data were imputed for both aggregate and clearing method data fields. The imputation rules were different for the two classes of response.

6.1.3.6.1 Imputation Methodology for Aggregate Data

The aggregate total monthly volume and value data cases were identified for imputation based on giving at least one aggregate response. So if volume or value was given for either month (e.g., value for was given for both months or volume for the other month was missing), the missing values were imputed. No case with all four data elements blank (missing) was imputed. Missing aggregate data were imputed using regression imputation methodology. The linear regression models were fitted separately for the two data collection moths (March and April 2001) and the three types of institutions for each value and volume. Thus, six regression models were fitted for imputing the missing data for the variable check volume (one regression model for each of the three institution types for each of the two months). Similarly, six regression models were fitted for imputing the missing data for the variable check value. The PCD value was used as the dependent variable in the regression model. Each regression model was fitted twice, first to detect the outliers and then to re-estimate the same model by removing the outliers, which was used for imputation. The criteria for the outlier detection was that the normalized residuals from the regression were greater than 3.0 in absolute value. Although, the outliers were not used to estimate the model for the purpose of imputation, these outlier values were not imputed either.

The goodness of the model fit was judged from the R^2 value of the model. These values for the different models are reported in Table A.

Table A: R^2 **values for different models**

Institution Type	Month	Variable	R^2 Value
Commercial Banks	March	Volume	91.1 %
Commercial Banks	March	Value	98.7 %
Commercial Banks	April	Volume	87.8 %
Commercial Banks	April	Value	98.5 %
Credit Unions	March	Volume	92.3 %
Credit Unions	March	Value	95.3 %
Credit Unions	April	Volume	80.7 %
Credit Unions	April	Value	96.4 %
Thrifts	March	Volume	88.3 %
Thrifts	March	Value	78.1 %
Thrifts	April	Volume	88.2 %
Thrifts	April	Value	77.2 %

As we can note from the above table, the regression model fit is better for Commercial Banks and Credit Unions as compared with Thrifts. Moreover, the regression model did not have as

good fit for Value in April as for the other Thrift variables, i.e., March Value and Volume, and April Volume. Nevertheless, the regression models were adequate for imputing the missing data.

6.1.3.6.2 Imputation Methodology for Clearing Method Data

For detail data about paid check volume/value allocated by clearing method, the criterion to do imputation was respondent completion of any of the clearing method data fields or of returned check data fields. In addition, the following rules were used to guide imputation decisions on each separate data field. The same rule was applied to volume and value for each variable (e.g., Federal Reserve Presentments).

1. If a respondent returned the short form (no detail data fields), no clearing method details were imputed.
2. If the survey response for any clearing method detail field or for Return Items was "Don't Know," the clearing method detail data were imputed for volume and value.
3. If the field was left blank for Federal Reserve Receipt Items, On-Us Deposit Items, or Return Items, volume and value were imputed.
4. If the field was left blank for any other detail field (Clearing House, Same-Day Settlements, Other Paid Check Volume), the volume and value were set to zero.
5. The imputation method was done as a linear proportion using PCD values for "nearest neighbor" with next highest and next lowest actual responses for that data element. Any imputed values were created in the same proportion of those responses as the PCD from institution with missing data had to the range between the two nearest neighbors with actual responses.

After imputation, the volumes and values of the clearing method data were proportionally adjusted to equal the Total Paid Checks volume and value of their respective months. The proportional adjustment was done for both imputed and respondent provided data.

6.2 Appendix B – Statistical Methodology for The Check Sample Study

6.2.1 CSS Sample Design

For the first phase of the sampling for this study, an approach similar to *The DFI Check Study* was used, with the same three institution type strata constructed, followed by size (PCD) based strata within each. For commercial banks, a certainty stratum was established that contained many of the same banks in the first certainty stratum for *The DFI Check Study*.

The second phase of the sampling addressed the allocation of checks. Since the goal of the CSS was to describe the universe of checks, the sample for the CSS was based on a stratified two-stage design. This was a way of ensuring the same probability of selection for each check from the universe of interest. The approach to the first stage of sampling was similar to the approach for *The DFI Check Study*. The primary strata were defined on the basis of type of institution, i.e., commercial banks (CMB), credit unions (CUS) and thrifts (THR). The next level of stratification was carried out on the basis of size where the measure of size was the PCD value at the highest institutional level (e.g., holding company). The end of first quarter 2001 PCD value for each institution was used to generate a required sample number above a minimum number.

Like *The DFI Check Study*, a certainty stratum was defined for the commercial banks. And like *The DFI Check Study*, the sampling unit was the DFI at its highest institutional level (e.g., holding company), with the data collected for all the institutions owned by the sampled companies. In contrast to *The DFI Check Study*, beyond the certainty stratum, the sampling strata within type of institution were defined by selecting a minimum number of strata for projected efficiency, then allocating the frame to those strata in such a way that the total PCD values for each were approximately equivalent. Although this was a study of checks, minimizing the number of institutions to be recruited to provide checks made the data collection effort more efficient and cost effective. Additional reasons for using this approach for this stage were that it was similar to *The DFI Check Study* approach, enabling comparison to *The DFI Check Study* findings, and it ensured representation of the largest institutions, especially the top 100 banks. The number of institutions and strata for each type are reported in the table below.

Table 47: Stage One Sample Allocation – DFIs Sampled per Stratum

	Type of Institution			
Stratum	Commercial Banks	Credit Unions	Thrifts	TOTAL
Top '100'	87			87
1	31	41	17	89
2	42	31	43	116
3	31	23	44	98
4	59	40		99
5	62			62
TOTAL	312	135	104	551

Once the stage one sample was selected, the second stage of the sample design was implemented to allocate a required number of checks to each institution in the sample. The target number of checks was set at 40,000 to achieve the desired precision across the types of institutions in the study. The required number of checks was initially set based on assignment proportional to PCD values. The approach defined the number of checks per institution, ranging from over 3,200 for the largest bank to one check for smaller banks. The design required that a minimum number of checks be required from each participating institution. This number was initially set at 100 to achieve a desired total number of checks of 40,000, based on an assumed response rate of 65 percent. Requesting 100 checks was done in part to ensure institutions took the effort seriously enough to devote the necessary resources to the data collection effort. Based on feedback obtained during pretesting of the study materials, the minimum number per institution was reduced to 90 checks, thereby lowering the target to 36,000 checks. Those institutions for which the PCD allocation led to more than 90 checks became a certainty stratum for each type of institution. The remaining 90-check institutions could then be sampled from within the predefined size strata to fulfill the required contribution for that stratum.

Table 48: Stage Two Sample Allocation – Checks Desired per Stratum (Design)

	Type of Institution			
Stratum	Commercial Banks	Credit Unions	Thrifts	TOTAL
Top '100'	12,451	-	-	12,451
1	1,523	2,080	2,146	5,749
2	1,952	1,475	2,046	5,473
3	1,475	1,095	2,094	4,664
4	2,808	1,904	-	4,712
5	2,951	-	-	2,951
TOTAL	23,160	6,554	6,286	36,000

The overall approach of the design was to achieve nearly the same probability of selection for each check in the sample universe. Selected institutions were asked to report their overall deposit volume as part of the preliminary information for the CSS. Institutions could then have their responses weighted by deposit volume adjusted for the number of sampled checks and PCD value.

6.2.2   CSS Sample Weighting

Data collected from *The Check Sample Study* (CSS) were inflated to the universe level using weights designed to (1) compensate for unequal selection probabilities; and (2) adjust for non-responding depository financial institutions (DFIs). As discussed in Section 6.2.1, the CSS employed a two-stage sample design to select the sample of checks. The DFIs were selected at the first stage of sampling, and the checks from the sampled DFIs were sampled in the field at the second stage. The DFIs in the certainty strata were all selected for the study. The sample of DFIs from the non-certainty strata was selected with probability proportional to size (PPS) sampling from within strata. The sample of checks was selected independently from each sampled (respondent) DFI using systematic sampling procedure. Two weights were constructed corresponding to the two stages of sampling, i.e., a DFI weight to represent the non-sampled and non-respondent DFIs and a check weight to represent the non-sampled checks within the respondent DFIs. The final CSS weight was obtained by multiplying the two weights, i.e., the DFI and check weights.

The size measure for the PPS sampling was the PCD value. The selection probabilities will vary within strata due to PPS sampling except for the certainty strata. The base weight for a sampled DFI was defined to be the reciprocal of selection probability of the DFI. If π_{hi} is the selection probability for the DFI labeled i in stratum h then the base weight (or design weight) assigned to the corresponding DFI is defined as

$$W_{hi} = 1/\pi_{hi} .$$

The base weights for the DFIs in the certainty strata were equal to unity. The base weights were adjusted to account for the non-responding DFIs. The nonresponse adjustment factor was applied within each stratum. The nonresponse adjustment factor was defined as the ratio of the number of DFIs sampled from the stratum and the number responding from that stratum.

This weight adjustment was applied to increase the weights of the sampled DFIs for which data were collected. As discussed above, the nonresponse weight adjustment was applied at the stratum level. The weighted adjusted for nonresponse were simply the product of the base weights and the nonresponse adjustment factor for the stratum. Suppose that n_h DFIs were sampled from stratum h and data were collected for r_h DFIs only. Let $A_h^{(nr)}$ denote the weight adjustment due to the nonresponding DFIs within stratum h, then

$$A_h^{(nr)} = n_h \Big/ r_h .$$

In order to compensate for the nonresponse, the base weight for the sampled DFI i in stratum h, i.e., W_{hi}, for which checks were sampled was multiplied by the nonresponse adjustment factor $A_h^{(nr)}$ given above. The design weight adjusted for nonresponse then becomes

$$W_{hi}^{(bank)} = A_h^{(nr)} W_{hi} .$$

We also applied ratio adjustments to the strata that were originally designed as certainty strata but weights had to be applied to these DFIs due to nonresponse.

At the second stage of sampling, the checks were sampled with an equal probability systematic sampling procedure from within responding DFIs. Let M_{hi} be the total number of checks deposited annually for the DFI labeled i in stratum h and m_{hi} be the number of checks that were sampled. Then the corresponding check weight is given by

$$W_{hi}^{(check)} = M_{hi} \Big/ m_{hi} .$$

It should be noted that the same check weight is applied to all sampled checks from a given DFI. The final weight for the estimation of various categories of check volume and value was obtained by multiplying the above two weights, i.e., the DFI weight and the check weight within the DFI. Thus, the final weight $W_{hi}^{(final)}$ was defined as

$$W_{hi}^{(final)} = W_{hi}^{(bank)} * W_{hi}^{(check)} .$$

The super-script *(final)* denotes that it is the final weight for analysis purposes and the final weight $W_{hi}^{(final)}$ was the analysis weight for all sampled checks from the responding DFI i in stratum h.

6.2.3 CSS Estimates
In this section we discuss the estimation procedure for various categories of payer, payee and purpose or cross-classifications of these categories. We discuss the procedure for a category or domain denoted by d where domain can be defined from any cross-classification of the observed categories of payer, payee and purpose. For example, a domain can be defined as counterparty

equal to "consumer to consumer (C2C)" and purpose equal to "casual." The domain estimates can be constructed by defining an indicator variable to flag the presence or absence of the characteristics (or domain) of interest as follows.

$$\delta_{hij} \begin{cases} = 1; & \text{if } (hij) \in d \\ = 0; & \text{otherwise} \end{cases}.$$

The symbol *(hij)* denotes the check *j* sampled from DFI *i* in the design stratum *h*. The estimated number of checks for the domain *d* was obtained as

$$VOL^{(d)} = \sum_h \sum_i W_{hi}^{(final)} \sum_j \delta_{hij}.$$

Similarly, the value of those checks in the domain denoted by *d* can be estimated as

$$VAL^{(d)} = \sum_h \sum_i W_{hi}^{(final)} \sum_j \delta_{hij} y_{hij},$$

where y_{hij} is the dollar amount on the sampled check *j* from the DFI *i* in stratum *h*.

6.2.4   Random Sampling in the Field

The objective to achieve randomness of the sample within each DFI presented a unique challenge for the survey research team. It was important that checks not all be sampled from the same date, obviously, but also not from the same processing facility, sorter device, time of day, roll of microfilm, etc. A bank with a large corporate customer, who always deposits a large volume of checks early in the morning, for example, could seriously bias that bank's sample if all checks were sampled from the first roll of microfilm for each of the randomly selected days. The sampling process required that many variables be randomized to ensure the most representative random sample.

6.2.4.1   The Sampling Parameters Request Form

In an effort to maintain as much methodological control as possible over the sampling process, while at the same time sampling in the most appropriate and efficient way for each institution, the survey research team developed the Sampling Parameters Request Form (Appendix E). The form was a pre-survey instrument or screener that allowed each DFI to describe the environment in which checks would be sampled. An institution could indicate, for example, its number of processing facilities; the average monthly volume of checks captured at each facility; whether its check archival system assigns a unique trace number or sequence number to each item in archive; and whether checks are archived on microfilm, digital image media or a combination of the two.

This information allowed the survey research team to design a customized set of sampling instructions for each DFI that completed the Sampling Parameters Request Form – instructions

that ensured the most random and representative sample of checks. If an institution had multiple processing facilities, for example, the survey research team specified exactly how many checks should be sampled from each of the institution's processing facilities, from what dates and from exactly where in the sequence of each day's check processing volume.[44]

6.2.4.2 Master List of Random Checks

This information was conveyed to institutions that completed the screener through a Master List of Random Checks, which accompanied each institution's sampling instructions. The Master List included for each item to be sampled the date on which it was processed and a specific Random Check Number. Dates were chosen at random from the 252 eligible processing days in the May 1, 2000 to April 30, 2001 survey period. The Random Check Number for a given date was chosen at random between 1 and the institution's average daily volume of checks processed.

The average daily volume was calculated using volume data provided via the screener. For institutions that commingle deposited checks with inclearings, the upper bound on this Random Check Number was the average daily prime pass volume – essentially, the combined volume of both inclearings and deposits. This ensured that each deposited check had an equal probability of being selected from the commingled archive, regardless of whether it fell at the end of a batch of inclearings. For institutions that archive deposited checks separately from inclearings, the upper bound on the Random Check Number was simply the average daily deposit volume.

The Random Check Number meant different things to different institutions, depending on their processing environment and archival practices. We could not expect, for example, an institution with 5 processing facilities and 4-5 sorter devices per site – all working in parallel – to choose the 5,439[th] item on a given date. How would the respondent know which item to select from a central archive? As a practical matter the notion of a Random Check Number worked well for smaller institutions but was overly simplistic for many of the larger institutions in the survey. Therefore, Global Concepts developed a process of randomizing each variable in a DFI's archival environment to best accommodate its particular sampling requirements. This process was highly customized and labor-intensive, but it paid off in the randomness of the sample.

6.2.4.3 Master List of Random Sequence Numbers

The primary method of randomizing the sample was through the use of Random Sequence Numbers. Many institutions perform check photo copy retrieval based on an indexing scheme of sequence numbers or trace numbers. A Random Check Number was meaningless to many institutions that require a sequence number to retrieve film. For these institutions the research team provided instructions for how to create a Master List of Random Sequence Numbers. In practice, this was the most cumbersome aspect of the sampling process and often was disregarded in favor of less onerous methods of sampling checks at random. Nevertheless, many institutions relied on a Master List of Random Sequence Numbers as the basis for photo retrieval of sample checks.

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[44] It is common for a financial institution to have a single archive for checks processed at multiple capture facilities. All checks were, of course, sampled from the central archive in these situations, but they were sampled in such a way as to accurately represent the distribution of check volume across multiple capture facilities.

Often the Master List was generated manually by Global Concepts. Global Concepts worked closely with dozens of financial institutions to document exactly how their individual sequence numbering schemes were organized. By understanding the variables that constitute a sequence number (e.g., site number, sorter device number, date, etc.) as well as the average daily range of each of those variables, Global Concepts was able to produce a customized Master List of Random Sequence Numbers for each institution that requested one. These lists included numerous Alternate Random Sequence Numbers in case the principal Random Sequence Number did not point to an actual item for the given date. In that event, the Alternate Random Sequence Number was used, and so on.

6.2.4.4 Random Sampling Wizard

Some institutions were made self-sufficient in the creation of a Master List of Random Sequence Numbers with the help of a software tool Global Concepts developed specifically for that purpose. The Random Sampling Wizard was sent along with the sampling instructions to all institutions who indicated on the screener that their photo retrieval process requires the use of sequence numbers. The Wizard was essentially a Microsoft Excel file with Visual Basic macros that walked the respondent through a series of questions about the institution's sequence numbering scheme. The Wizard asked, for example, which variables constitute a sequence number, their sequential order in the sequence number format, the average daily range of each variable (e.g., how many sorter device operate per day), the appropriate format of each variable (e.g., how many digits, the proper date format), and so on. The Wizard then randomized each variable in the sequence number and produced a Master List of Random Sequence Numbers complete with random dates and several Alternate Random Sequence Numbers.

The Wizard ultimately proved to be overly simplistic for the diversity of sequence numbering schemes in practice in the industry. A primary shortcoming was the Wizard's inability to accommodate sequential gaps in the component variables of a sequence number. Many institutions with multiple processing sites include a sorter device number field in their sequence numbers, and these sorter numbers often include large gaps in their sequence. For example, the devices at Smallville may be numbered 01 through 07, and the devices at Metropolis numbered 20 through 25 with neither site accounting for numbers 08 through 19. In other cases an institution may have sorters 25 through 27, sorters 34 through 36 and sorter 56 all in the same processing facility. These situations pushed accurate list generation beyond the capabilities of the Random Sampling Wizard, which would attempt to randomize the sorter device number between the lowest and highest numbers provided without consideration for sequential gaps. In short, it was prone to producing sequence numbers that did not exist. As such, Global Concepts generally performed custom development of sequence number lists for these institutions. In general, Master List production was a highly customized process, whether the institution chose a Master List of Random Sequence Numbers or otherwise.

6.2.4.5 Customized Randomization Schemes

Dozens of institutions – even those who generally use sequence numbers to perform photo retrieval – opted for another customized approach than one based on Random Sequence Numbers. Formatted correctly or not, a Master List of Random Sequence Numbers is no guarantee in itself that each Random Sequence Number on the list is an actual sequence number in the archive. Many institutions preferred to avoid the process of hit-and-miss.

Global Concepts worked with numerous institutions to create custom Master Lists that randomized each of a series of known variables. A typical scenario involved randomization of the site number, sorter device number, microfilm roll number and the location of the check on the chosen roll of film. Information about each of these variables, such as the number of sorter devices per site or the average daily number of microfilm rolls per sorter, were provided by the respondent to Global Concepts in order to create the Master List.[45] Global Concepts randomized each variable to produce a list – not of sequence numbers – but of individually randomized variables. The respondent would then retrieve, for example, a check from the second roll of microfilm produced by sorter device #3 at the Smallville location on a randomly generated date.

The location of a check on a roll of microfilm was randomized using a random time variable. Photo retrieval staff were instructed to advance the roll of microfilm for a particular number of seconds and to choose the nearest BFD item to their stopping place. Institutions that use image archives frequently would use a list of randomly generated dates combined with a random time variable if the photo retrieval system allowed them to scroll through the day's volume of checks and then stop at the specified random time.

6.2.4.6 Photo Retrieval Latitude

As noted above, there was no guarantee that a Random Check Number or Random Sequence Number provided by Global Concepts would point to an actual deposited check. In some cases, the Random Number would exceed the total volume processed that day. In other cases, the Master List may have listed an item for which the DFI was not the bank of first deposit, a deposit slip or a general ledger (GL) ticket.[46] For that reason each Master List included alternate Random Check Numbers or Sequence Numbers to increase the likelihood of a "hit" on a given date. Even these were no guarantee. Therefore, all institutions were instructed to find the deposited check nearest to the Random Check Number or Sequence Number specified. Generally, this meant rewinding microfilm or advancing to the next item in an optical image archive.

6.2.4.7 DFI-Selection of Sampled Checks

Not all respondents who completed *The Check Sample Study* responded to the Sampling Parameters Request Form. In total, 127 of the 149 institutions that surveyed a random sample of checks completed the screener prior to surveying a sampled of checks. For the remaining institutions the survey research team could not specify – without communication with these DFIs – the proportion of checks to sample from each of their processing sites or the Random Check Number to be retrieved. We lacked the information needed to make an accurate estimate of either of these factors. Therefore, a more simplified Master List was provided to these institutions.

For the 22 DFIs that did not complete the Sampling Parameters Request Form, the research team provided a randomly selected date from which to sample BFD items and specific instructions about how to ensure the most random and representative sample of BFD items. These instructions included clear guidelines about weighting the sample across multiple processing

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[45] Global Concepts used the exact sorter numbers or site numbers in the randomization routine to avoid the non-sequential difficulties that crippled the Random Sampling Wizard. While time consuming on the front end, this proved highly effective in terms of a "hit ratio" for photo retrieval on the back end.
[46] BFD items are distinguished by the presence of only one DFI endorsement.

sites (if applicable) in proportion to the proof-of-deposit volume processed by each of those sites. As a practical matter many of these institutions contacted Global Concepts after receiving the survey materials, and Global Concepts provided a customized Master List as described above.

6.3   Appendix C – The DFI Check Study Survey Instrument
(Follow this link.)

6.4   Appendix D – The Check Sample Study Survey Instrument (Answer Sheet)
(Follow this link.)

6.5   Appendix E – The Sampling Parameters Request Forum (The Screener)
(Follow this link.)

Appendix C:

The DFI Check Study Survey Instrument

Depository Financial Institution Check Study

Survey of Paid Check Volume and Value

Survey Period: **March 1, 2001 – April 30, 2001**

IMPORTANT… Report paid checks <u>only</u>.

▼ Do not include ATM, ACH or other debits.

▼ Do not include transit items.

▼ Include only your Inclearings and over-the-counter On-Us checks.

A project conducted by The Federal Reserve, Global Concepts and Westat

About the Study

This survey is part of the Federal Reserve's Check and Electronic Payments Research Project. The aim of this project is to establish the total volume and value of U.S. non-cash payments, identify emerging payment types, and provide data to help the industry and the Federal Reserve to identify opportunities for improving the efficiency of the nation's payments system. The data we are asking you to collect as part of *The Depository Financial Institution Check Study* will be used to estimate the total volume and value of checks paid in the United States.

Please read all instructions and the Appendix of Important Terms carefully before you start completing the survey. To ensure consistency of responses, it is important that your institution use the definitions of paid checks provided. If you have any questions, please call Westat toll free at **(888) 263-9854**. One of the Westat staff will be happy to answer your questions or direct you to the appropriate individual at Global Concepts or the Federal Reserve.

Key Dates and Instructions for Returning Survey

▼ The survey period is March 1, 2001 – April 30, 2001.

▼ Please fill out all three pages of the survey, including the questionnaires for:

— Paid Check Volume and Value (dollar value rounded to nearest $1,000s)

— Outgoing Return Checks Volume and Value

— Active Routing Transit Numbers

▼ Respond to every item on the surveys of Check Volume and Value. If an item does not apply, or if its volume or value is zero – please enter a zero in the space provided.

▼ Respond to all items at the highest institutional level (i.e. include volume from all subsidiary institutions and processing sites).

▼ Before **May 18,** photocopy your completed *Survey Forms* so that you have a backup on file. Keep your backup copies on hand until August 1, 2001.

▼ Please send us your completed *Survey Forms* by Friday, May 18, 2001. You may mail them, fax them, or enter your data online.

Option 1:	Option 2:	Option 3:
Mail to... DFI Check Study c/o Westat 1650 Research Blvd. Rockville, MD 20850	Fax to... (888) 783-1782	Visit... http://www.checkstudy.com

Thank you...for your time and effort on behalf of the Federal Reserve. We understand that your participation in this study involves a time commitment for some of your staff. We appreciate your willingness to assist us in gathering this data and creating valuable information for the entire financial services industry.

Survey of Paid Check Volume/Value: *March 1 - April 30, 2001*

Note: *Total Paid Checks* is the sum of all items (a-e) below it. Also, before starting, please review the Appendix of Important Terms beginning on page 6. Please include any Merged Volume. Round dollar amounts to the nearest thousand. If the volume and value of an item can not be determined, please check, "Don't Know."

MONTH 1: MARCH 1 – 31, 2001	**Volume of paid checks**	**Value of paid checks**	**Don't Know**
1. TOTAL PAID CHECKS (MARCH) — Total received by your institution March 1 - 31, 2001.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	
1a. Federal Reserve Receipt Items — Total received from the Federal Reserve presented by the Federal Reserve. Not Same Day Settlement.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	
1b. On-Us Deposit Items — Total received by your institution for which you were the BFD.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	❑ dk
1c. Clearing house / Local Exchange Items — Total received from clearing houses or other local exchanges. Not Same Day Settlement.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	❑ dk
1d. Same Day Settlement Receipt Items — Total received under Same Day Settlement rules. Not Federal Reserve or Clearing House Items.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	❑ dk
1e. Other Paid Check Volume — Include any volume that you did not or cannot allocate above.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	

MONTH 2: April 1 – 30, 2001	**Volume of paid checks**	**Value of paid checks**	**Don't Know**
2. TOTAL PAID CHECKS (APRIL) — Total received by your institution April 1 - 30, 2001.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	
2a. Federal Reserve Receipt Items — Total received from the Federal Reserve presented by the Federal Reserve. Not Same Day Settlement.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	
2b. On-Us Deposit Items — Total received by your institution for which you were the BFD.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	❑ dk
2c. Clearing house / Local Exchange Items — Total received from clearing houses or other local exchanges. Not Same Day Settlement.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	❑ dk
2d. Same Day Settlement Receipt Items — Total received under Same Day Settlement rules. Not Federal Reserve or Clearing House Items.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	❑ dk
2e. Other Paid Check Volume — Include any volume that you did not or cannot allocate above.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	

Survey of Return Checks (Outgoing): *March 1 - April 30, 2001*

Please indicate the number of outgoing returns. Please provide a total for checks only sent by your institution during each month of the survey period. Do not include electronic returns. Please include any Merged Volume. Round dollar amounts to the nearest thousand. If the volume and value of your returned checks can not be determined, please check, "Don't Know."

MONTH 1: MARCH 1 – 31, 2001	Volume of checks Returned	Value of checks returned	Don't Know
3. Return Checks (Outgoing) Total checks returned unpaid during the survey period.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	❏ dk

MONTH 2: April 1 – 30, 2001	Volume of checks Returned	Value of checks returned	Don't Know
4. Return Checks (Outgoing) Total checks returned unpaid during the survey period.	|__||__|__|, |__|__|__|, |__|__|__|	$ |__|__|__|, |__||__|__|, |__|__|__|, **000.**	❏ dk

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▼   You have completed the volume/value sections of the survey.

▼   Please complete the Survey of Routing Transit Numbers on page 4.

▼   To avoid double counting of items, it is important that we understand what RTN volume and value data are included in your totals.

▼   If you prefer to submit a pre-formatted report that shows your RTN's, please just attach it to the RTN Survey form.

Survey of Active Routing Transit Numbers

Please write in all of the active 9-digit Routing Transit Numbers (RT's) owned by your institution that correspond to the paid check volume/value reported in the previous two tables. Also indicate which, if any, RT's were acquired through a merger or acquisition during March 1, 2001 – April 30, 2001, and when they were acquired.

If necessary, please photocopy and fill out additional copies of this page. If you prefer, you are welcome to present a list of RT's on pre-existing reports; however, please be sure to indicate on your documents which RT's were acquired during the survey period and when they were acquired

9-digit routing transit number	Acquired during survey period?	If "yes," Date RT acquired	9-digit routing transit number	Acquired during survey period?	If "yes," Date RT acquired
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	
	❑ Yes ❑ No			❑ Yes ❑ No	

Your Comments...

Thank you for completing the survey. Please use the space below to provide any comments or suggestions that you feel might be useful for us to better understand your response or to improve subsequent versions of this survey. For example, you might comment about the effort required to report the various data elements, the time required to respond, the clarity of the definitions, the design of the survey instrument, etc.

_____

_____

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_____

_____

APPENDIX

Please carefully read the definitions of the survey terms that we use in our materials. Although some of the terms may be familiar to you, their definitions may differ slightly from those commonly used within your institution. To make sure that our results are comparable, it is important that all financial institutions understand each term to mean the same thing and report data accordingly. So, please take the time to review the *General Terminology* and *Survey Data Elements* that follow. If you have any questions, please feel free to call us.

General terminology

Check – A negotiable instrument drawn on a financial institution. For this study, please follow our guidelines:

Checks include...	Checks do <u>not</u> include...
▼ Checks written by individuals, business or government entities	▼ Deposit slips
▼ Traveler's checks	▼ Rejected items (i.e., checks)
▼ Money orders	▼ General ledger tickets
▼ Cashier's checks	▼ Other non-check documents, such as payment coupons
▼ Teller's checks	
▼ Payable through drafts	
▼ Truncated checks (i.e., ECP file items)	

Paid Check — A check for which your institution is the payor bank as defined by Regulation CC.

▼ Do not include checks that you receive as a "pass through correspondent" for which another institution is actually the payor bank.

Electronic Check Presentment (ECP) — ECP items are paid checks that you — the paying bank — receive in an electronic file that may be used for posting. ECP items are considered received when the electronic file arrives. ECP includes two types of volume:

▼ Truncation: If your institution receives paid checks via ECP and no corresponding paper checks follow, be sure to count this volume in your results.

▼ Paper to Follow: If your institution receives paid checks via ECP and the corresponding paper checks follow at a later date, do not double count these items — once in the electronic file, and again when the physical items arrive.

Merged Volume — The total combined volume of your institution and any institution with which you merge during the survey period.

Note: If at any point during the survey period another institution merges with your institution, please report your merged volume for the entire survey period – as if the merger had occurred the day before the survey period began.

Survey Period — Include all paid checks <u>received</u> during the survey period: March 1, 2001 – April 30, 2001.

Received Checks — An item is received when it is:

▼ Presented by another depository financial institution, either directly or through a clearing arrangement (e.g., Clearing House)
▼ Presented by the Federal Reserve Bank
▼ Deposited
▼ Cashed
▼ Received as payment (e.g. loan payment)

Since the date that an item is received may be different from the date the work is processed:

▼ Include volume you receive during the evening of April 30, 2001 that you do not process until the following day (after the survey period) — *for example*, a batch of branch deposits received on April 30, 2001 but processed on May 1, 2001.

▼ Do not include volume you receive on February 28, 2001 (the day before the survey period), that you process the morning of March 1, 2001 — *for example*, late night presentments from the Federal Reserve on February 28, 2001.

1, 2.   Total Paid Checks — All paid checks received by your institution during the survey period. This total should be the sum of all data elements defined below.

1,2a.   Federal Reserve Receipt Items — All paid checks received from the Federal Reserve Bank that are presented by the Federal Reserve Bank during the survey period.

▼   Do not include Same Day Settlement Volume if the Federal Reserve is your designated presentment point for Same Day Settlement. This includes Same Day Settlement volume that is:

— Delivered by, but not processed by, the Federal Reserve.

— Processed, truncated, and delivered by the Federal Reserve as an ECP file.

Same Day Settlement volume received from the Federal Reserve should be reported in the Same Day Settlement category (below).

▼   Include truncated items that are <u>not</u> Same Day Settlement items if the Federal Reserve truncates checks presented to your institution as part of an ECP service.

1,2b.   On-Us Deposits — All paid checks received during the survey period through your institution's branches, ATMs, lockbox operations, cash vault, payment processing centers, etc. This is volume for which your institution is both the payor bank and the bank of first deposit (BFD).

1,2c.   Clearing Houses and Other Local Exchange Items — All paid checks received during the survey period from a clearing house or other local exchange relationship.

▼   Do not include Same Day Settlement volume in your clearing house totals if a clearing house is your designated presentment point for Same Day Settlement or acts as the settlement agent for Same Day Settlement. This volume should be reported in the Same Day Settlement category (below).

1,2d.   Same Day Settlement — All paid checks received under the rules of Same Day Settlement. This includes items received through the <u>Federal Reserve</u> or a <u>clearing house</u> acting as your designated presentment point but settled directly with the presenting bank.

1,2e.   Other Paid Check Volume — A sub-total of paid check volume. All paid checks received during the survey period that satisfy one or both of the criteria below:

▼   It does not meet any definition of items (1,2a-d) above – such as volume received from a correspondent processor.

▼   It cannot be allocated accurately to another category – such as Clearing House, Same Day Settlement or On-Us volume that you "don't know."

3,4.   Return Checks (Outgoing) — Checks drawn on your institution that you return unpaid during the survey period.

Appendix D:

The Check Sample Study Survey Instrument
(Answer Sheet)

Coding a Check / Answer Sheet

1. Are any of these words on the front of the check?

❍ Cashier's Check or Certified Check
❍ Money Order or Postal Money Order
❍ None of the above

Payer (wrote the check)

2. Does the *Payer* name or address have any of these?

(Check all that apply)

❍ One or more persons' full names (John Smith, John and Mary Smith, John Smith, Inc.)
❍ Inc., LLC, LTD, Co., NA, Corp., Corporation, Trust, Trustee, Company, Services, .com, Association, PC
❍ Bank, Insurance
❍ Initials of Business or Association (e.g. NAACP, AT&T)
❍ State of, City of, County of, Town of, Township of, Bureau of, Municipality
❍ State Treasury, State Treasurer, County Treasurer, County Commissioner, County Controller
❍ Port Authority, Water Authority, Power Authority, Transit Authority, Department of
❍ School, High School, Elementary, University, College
❍ Apartment number (apt. #) <u>NOT</u> Suite # or Building #
❍ Mail code (e.g., MC-648)
❍ Accounts Payable, Acct. Payable
❍ *NO -- <u>None</u> of the above*

3. Based on the Payer name and address and the characteristics of the check, can you definitively categorize the Payer as any of these?

① Consumer
② Government
③ Business
④ Not Consumer – either business or government
⑤ Not Government – either business or consumer
⑥ Cannot determine

4. Your primary reason for categorizing the Payer:

① Consumer name
② Familiar with business name
③ Familiar government organization
④ Familiar, but unclear whether business or government
⑤ Not familiar, but clearly a business name
⑥ Not familiar, but clearly a government organization
⑦ Not familiar, but clearly business or government
⑧ Cannot categorize

5. Payer's *ZIP code:* | | | | | | |

Payee (paid by the check)

6. Does the Payee Line or the check itself include an address for the Payee?

① Yes
② No

7. Does the *Payee* name (or address, if present) have any of these? *(Check all that apply)*

❍ One or more persons' full names (John Smith, John and Mary Smith, John Smith, Inc.)
❍ Cash
❍ Inc., LLC, LTD, Co., NA, Corp., Corporation, Trust, Trustee Company, Services, .com, Association, PC
❍ Bank, Insurance
❍ Initials of Business or Association (e.g. NAACP, AT&T)
❍ State of, City of, County of, Town of, Township of, Bureau of, Municipality
❍ IRS, Internal Revenue Service, State Tax, County Tax, Tax Commissioner, Tax Collector
❍ Port Authority, Water Authority, Power Authority, Transit Authority, Department of
❍ School, High School, Elementary, University, College
❍ Dr., Doctor, MD, DDS, DVM, PC, Specialist, –ologist
❍ Apartment number (apt. #) NOT Suite # or Building #
❍ Mail code (e.g., MC-648)
❍ Accounts Receivable, Acct. Receivable
❍ NO -- None of the above

on the front…

8. Date of the check: | | | | / | | | | / | | |

9. Dollar amount of the check:

$ | | | | | , | | | | | , | | | | | . | | | |

10. Is the dollar amount in the Courtesy Amount Field handwritten?

① Yes
② No – it is machine printed

11. The 9-digit transit routing number:

⑊ | | | | | | | | | | ⑊

12. Is this a large format check? (*hint*: the symbol will appear somewhere <u>to the left</u> of the transit routing number.)

① Yes
② No

13. Is the memo line used?

 ①   Yes

 ②   No

If it is used, write the first 12 characters:

14. Is the signature on the face of the check hand-written or a facsimile of a hand-written signature?

 ①   Yes – Hand-written or facsimile

 ②   No – Name in printed type face or "No Signature Required"

 ③   There is no <u>signature</u>, hand-written or otherwise.

15. Are any of these items handwritten on the check? (Check all that apply)

 ❍   DL, driver's license, license

 ❍   Handwritten state initials (GA, CA, MI, etc.) followed by or preceded by a number

 ❍   Account, (e.g. acct #) followed or preceded by a number

 ❍   Phone number handwritten or circled on face of check

 ❍   Birth date written on check (Note: Date will be 1990 or earlier.)

 ❍   Stamped form (generally on the back of the check) that is filled in with handwritten characters

 ❍   NO -- None of the above

on the back…

16. Are any of these words in the *Payee* endorsement? *(Check all that apply)*

 ❍   Dollar Amount, Amount, $

 ❍   Store, Store #, register #, terminal #, branch #, location #, DL, D/L, cashback

 ❍   Inc., LLC, LTD, Co., NA, Corp., Corporation, Company, Services, .com, Association, Trust

 ❍   Bank, Insurance

 ❍   Initials of a Business or Association (NAACP, AT&T)

 ❍   State of, City of, County of, Town of, Township of, Bureau of, Municipality

 ❍   IRS, Internal Revenue Service, State Tax, County Tax, Tax Commissioner, Tax Collector

 ❍   Port Authority, Water Authority, Power Authority, Transit Authority, Department of

 ❍   School, High School, Elementary, University, College

 ❍   Dr., Doctor, M.D., DDS, DVM, PC, Specialist, –ologist

 ❍   NO -- None of the above

17. Is the Payee endorsement handwritten?

 ①   Yes – Handwritten

 ②   No – It's stamped / machine-printed

 ③   Cannot find Payee endorsement

18. On the back, is the Payee endorsement perpendicular or parallel to the writing on the front of the check? (Refer to Answer Sheet Guide example.)

 ①   Perpendicular

 ②   Parallel

 ③   Cannot find Payee endorsement

19. Do the words "Absent(ee)" or "Absent Endorsed" appear anywhere on the back of the check?

 ①   Yes

 ②   No

Categorizing Payee

20. Based on the *Payee* name/address and endorsement, can you definitively categorize the *Payee* as any of these?

 ①   Consumer

 ②   Government

 ③   Business

 ④   Not Consumer – either business or government

 ⑤   Not Government – either business or consumer

 ⑥   Cannot determine

21. Your primary reason for categorizing the Payee:

 ①   Consumer name

 ②   Familiar with business name

 ③   Familiar government organization

 ④   Familiar, but unclear whether business or government

 ⑤   Not familiar, but clearly a business name

 ⑥   Not familiar, but clearly a government organization

 ⑦   Not familiar, but clearly business or government

 ⑧   Cannot categorize

22. If Payee is business or government, mark which type:

 ①   Power, gas, phone, cable or internet service provider

 ②   Bank or credit card company or insurance company

 ③   Supermarket or Drugstore

 ④   Convenience store

 ⑤   Retail Store, retail service shop, or cataloger

 ⑥   Restaurant, bar, diner, fast food, etc.

 ⑦   Subscription, membership organization, club, etc.

 ⑧   Charitable organization, church

 ⑨ Medical (e.g., hospital, doctor's office, etc.)

 Other business or government (not individual consumer)

 ⑩ *NOT a business or government*

Appendix E:

The Sampling Parameters Request Form (Screener)

Check Sample Study

SAMPLING PARAMETERS REQUEST FORM

A Preliminary Screener for the Check Sample Study

A project conducted by The Federal Reserve, Global Concepts and Westat.

If you have any questions about what you need to do, please call us toll free at (888) 458-8608. We'll be happy to answer your questions.

Contents

Background

The Federal Reserve is conducting the *Check Sample Study* to estimate broad categories of US check payments, such as the number of checks being written by consumers and businesses and the purpose of these payments, such as bill payments or point-of-sale purchases.

The Check Sample Study requires that you survey a representative random sample of _____ deposited checks. You will be asked to select these items at random from your microfilm or image archives and record on an answer sheet information about each check's characteristics. The answer sheets will be sent in early May as part of the *Data Collect Guide*.

The purpose of this *Sampling Parameters Request Form* is to make the task of retrieving sample checks as easy as possible. To further simplify the process we encourage you, at your earliest opportunity, to notify your photo retrieval staff that they will be helping to select a random sample of deposit items later this Spring. Although the study has a few special requirements – e.g. retrieving *only* deposited checks – the retrieval process has been designed to complement their existing procedures.

Based on your response to the *Sampling Parameters Request Form*, we will send you the *Data Collection Guide*, complete with instructions for retrieving and surveying a representative random sample of deposited checks. The sampling and surveying should be performed in early May.

Thank you for your time and effort on behalf of the Federal Reserve. We understand that your participation in this study involves a time commitment for some of your staff. We appreciate your willingness to assist us in gathering this data and creating valuable information for the entire financial services industry. If you have any questions about what you need to do, please call toll free: (888) 458-8608. We'll be happy to answer your questions.

When is Your Response Due

Here's what you need to know about completing this preliminary *Request Form* on time:

▼ By April 30 please complete, photocopy, and return page 3-4 of the *Request Form* along with any additional attachments. Keep your photocopy on file as a backup until August.

▼ You may either mail or fax your completed *Request Form* to us. Alternatively, you may use our secure web site to enter data securely online: **http://www.checkstudy.com**.

<u>Mail</u> Request Form Response To: **Or <u>Fax</u> Request Form Response To:**

Federal Reserve Check Study   (888) 783-1782
c/o Westat
1650 Research Blvd.
Rockville, MD 20850

Definitions of Important Terms

Deposited Check Volume – All deposited checks received by your institution through any of various methods (e.g. over-the-counter branch deposits, ATM deposits, lockbox deposits, cash vault deposits, etc.). This includes POD (proof-of-deposit) volume and PED (pre-encoded deposit) volume. It does not include inclearings of any kind.

Inclearings – Checks received from other institutions. This includes checks drawn on your institution or an institution for which you provide processing services.

Prime Pass Volume – All checks processed by your institution or by a processor on your behalf. This includes Deposited Check Volume as well as inclearings and other items.

Sequence Numbers – Unique identification numbers, typically referred to as sequence numbers, document identification numbers, or trace numbers that are assigned to each deposited check as it is processed. Sequence numbers are used as a reference when retrieving checks for research and adjustments purposes.

Survey Period – This study will survey checks deposited during **May 1, 2000 – April, 2001.**

Answer Sheet – Check Processing Profile Information

1. **Please estimate A) your institution's average monthly volume (i.e. number) of deposited checks and B) your average monthly prime pass volume (including deposits, inclearings and other items).**

    A) Avg. <u>Deposited Check</u> Vol. per Month: |__|__|__|, |__|__|__|, |__|__|__|

    B) Avg. Total <u>Prime Pass</u> Vol. per Month: |__|__|__|, |__|__|__|, |__|__|__|

2. **Are checks deposited with your institution processed in such a way that assigns a unique identification number (e.g. sequence number, document identification number, trace number, etc.) that uniquely identifies each deposited check for lookup purposes?**

    ❑ Yes

    ❑ No

3. **Is there a unique storage practice (e.g. range of "sequence numbers," separate location/media, etc.) that distinguishes the photo records of deposits from other volume (i.e. inclearings or other items)?**

    ❑ Yes

    ❑ No

4. **By April 30, 2001 on which media will you have a photo record of <u>all checks deposited</u> with your institution (both on-us and transit items) during the survey period (May 1, 2000 – April 30, 2001)?**

    ❑ Microfilm   ❑ A <u>combination</u> of media – i.e. no single medium

    ❑ Digital Image Media (Optical or Magnetic)   ❑ <u>Neither</u> Microfilm nor Digital Images

5. **Indicate if you <u>do not have</u> in-house photo <u>retrieval</u> capabilities for any of the following?**

    ❑ Deposits – On-Us (i.e. deposits drawn on your institution.)

    ❑ Deposits – Transit (i.e. deposits drawn on another financial institution.)

    ❑ Inclearings and other non-deposit items

6. **At how many sites operated by your institution (including branches) do you capture either microfilm or digital images of <u>deposited checks</u>?**

    ❑ 0 – "All deposits processed by a third-party processor."

    – Stop. Form complete.

    ❑ 1 – "All volume in Question 1-A captured centrally."

    ❑ 2 or more – Please indicate how many: _____   – Continue.

7. **On a the following page (or by attaching your own existing reports), please…**

    A) List the location of each site <u>operated by your institution</u> (including branches) where check deposits are captured as either microfilm or digital images.

    B) For each site, indicate the average monthly volume of deposited checks captured and prime pass volume (including deposits) captured at that site.

CHECK PROCESSING SITES AND <u>AVERAGE</u> MONTHLY VOLUMES:

Note: If you do not outsource any check processing, the sum of all site volumes below should equal the total volumes you provided in *Question 1* above.

Processing <u>Site</u> (or Branch)	Monthly <u>Deposit</u> Volume	Monthly <u>Prime Pass</u> Volume
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
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