

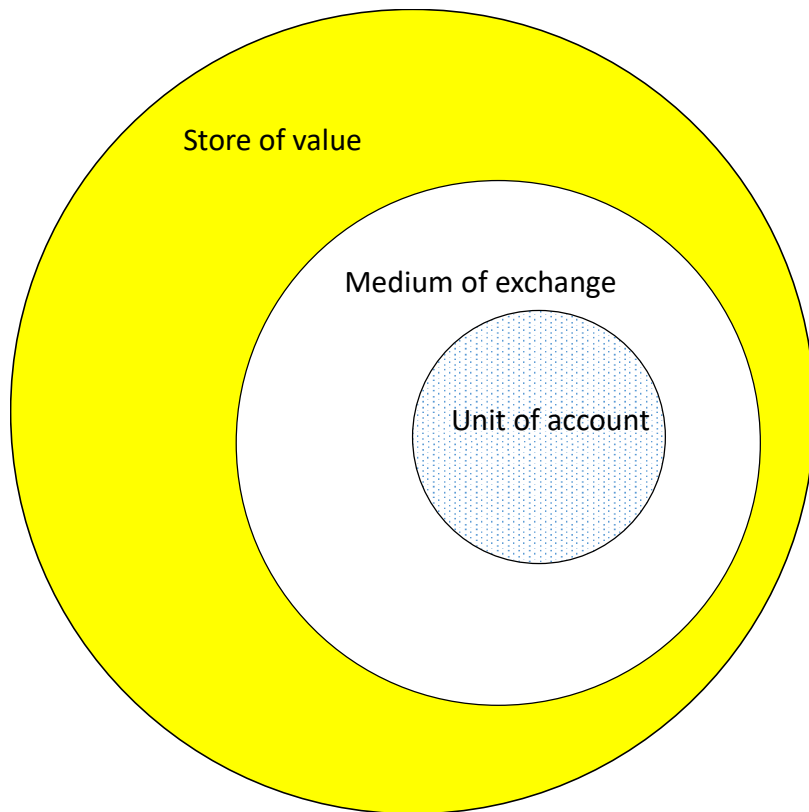
Chapter 2

Money and Payment Systems

Outline

- Properties of money
- Instruments of payment and their usage in some countries
- Dematerialized monies
- Purses and holders
- Transactional properties of dematerialized currencies
- The practice of dematerialized money

Functions of Money



- Standard of value (unit of account)
- Medium of exchange
- Store of value

Characteristics of Monetary Units

- It must be divisible to cover a wide range of amounts
- It must be convertible to other means of payment
- It must be recognized by an open community of users
- It must be protected by the coercive power of a state
 - Bitcoin is an exception

Classical Money

- Easily recognizable
- Relatively stable value
- Durable
- Easy to transport
- Easy to use
- Negligible production cost

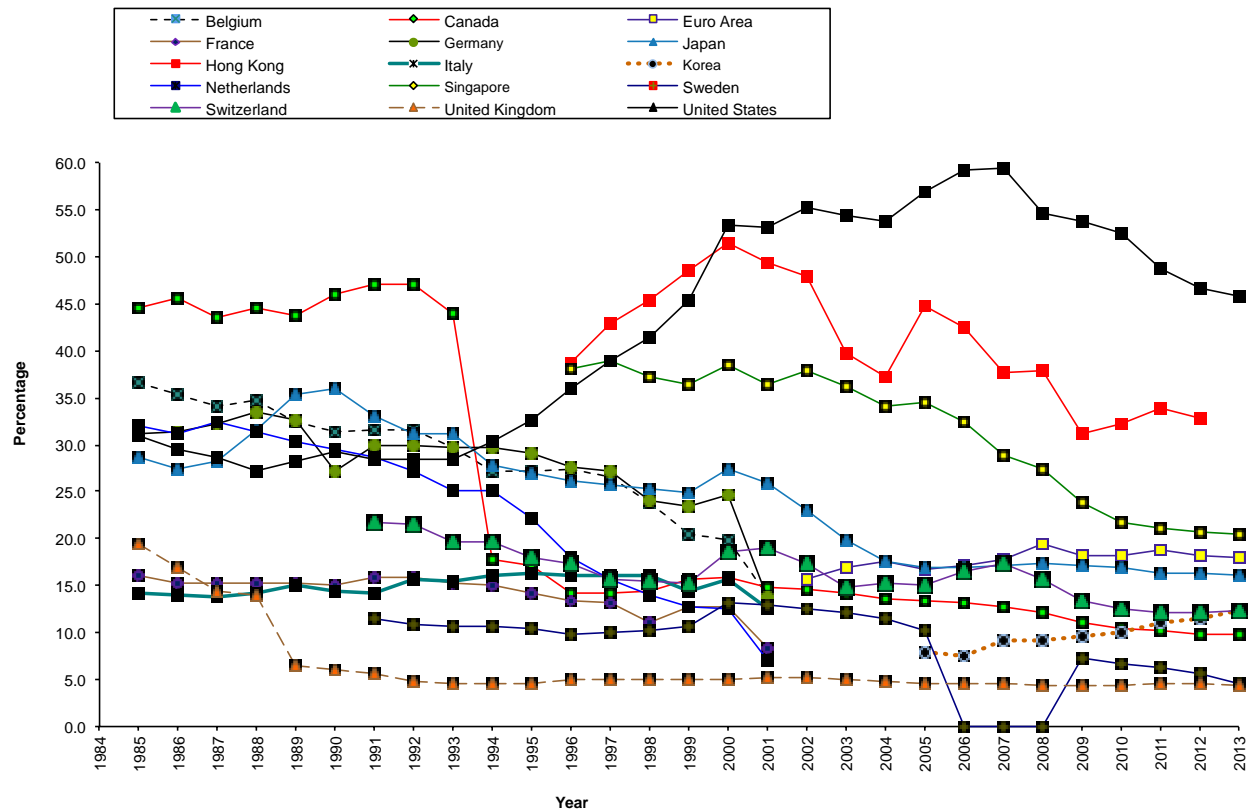
Types of Monies

- Fiduciary money (coins and notes issued by the Central Bank)
- Scriptural money
 - created by a bank
 - a merchant is free to accept or reject
- Private money
 - Tokens
 - Stocks and shares
- Digital money and cryptocurrencies

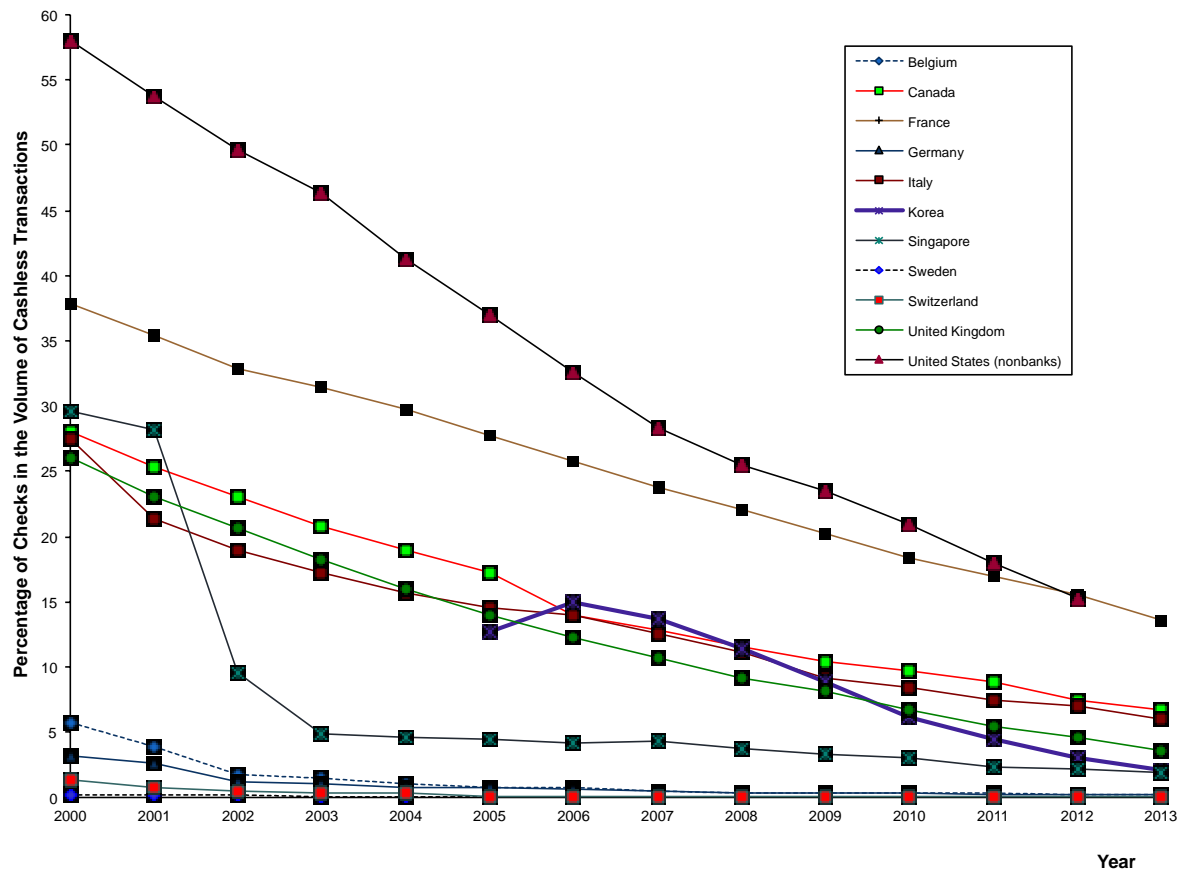
Classical Instruments of Payment

- Payment instruments are used to transfer the power of money from one economic agent to another - Some have a legal status and some are banking inventions
- Cash
- Checks
- Credit transfer
- Direct debit
- Interbank transfers
- Bills of exchanges
- Payment card

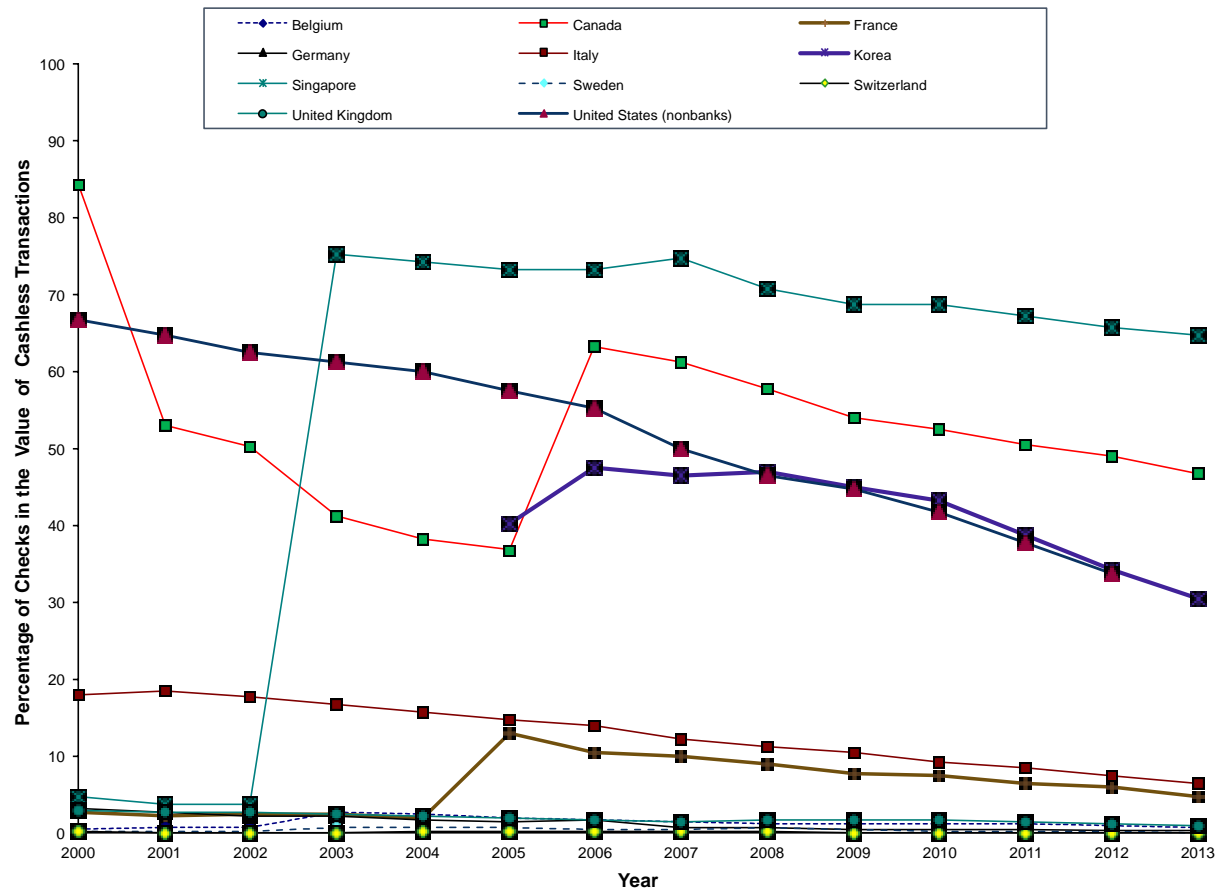
Patterns of Cash Usage in percentage of in the Narrow Money for Selected Countries



Percentage of Checks in the Volume of Scriptural transactions

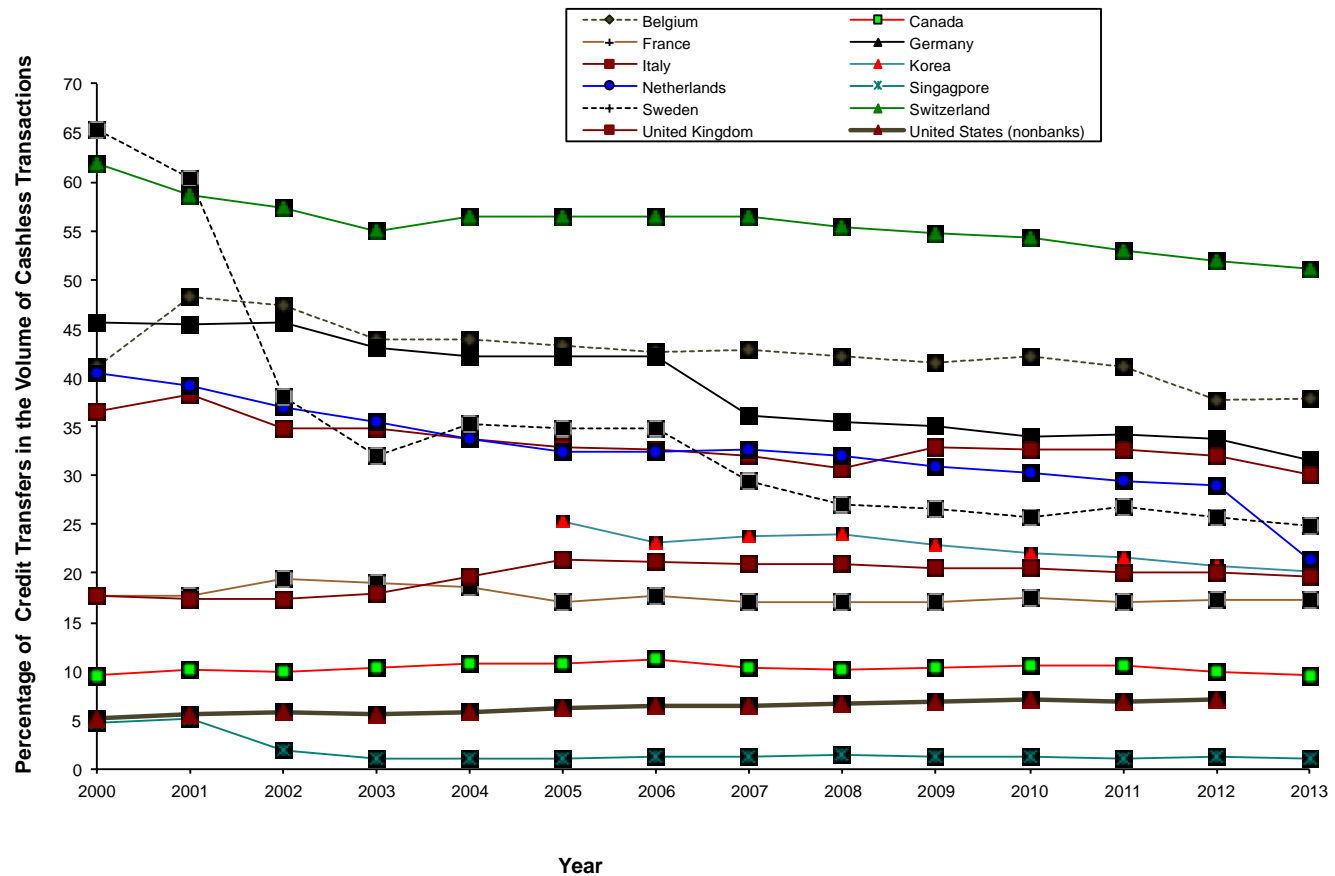


Percentage of Checks in the Value of Scriptural transactions

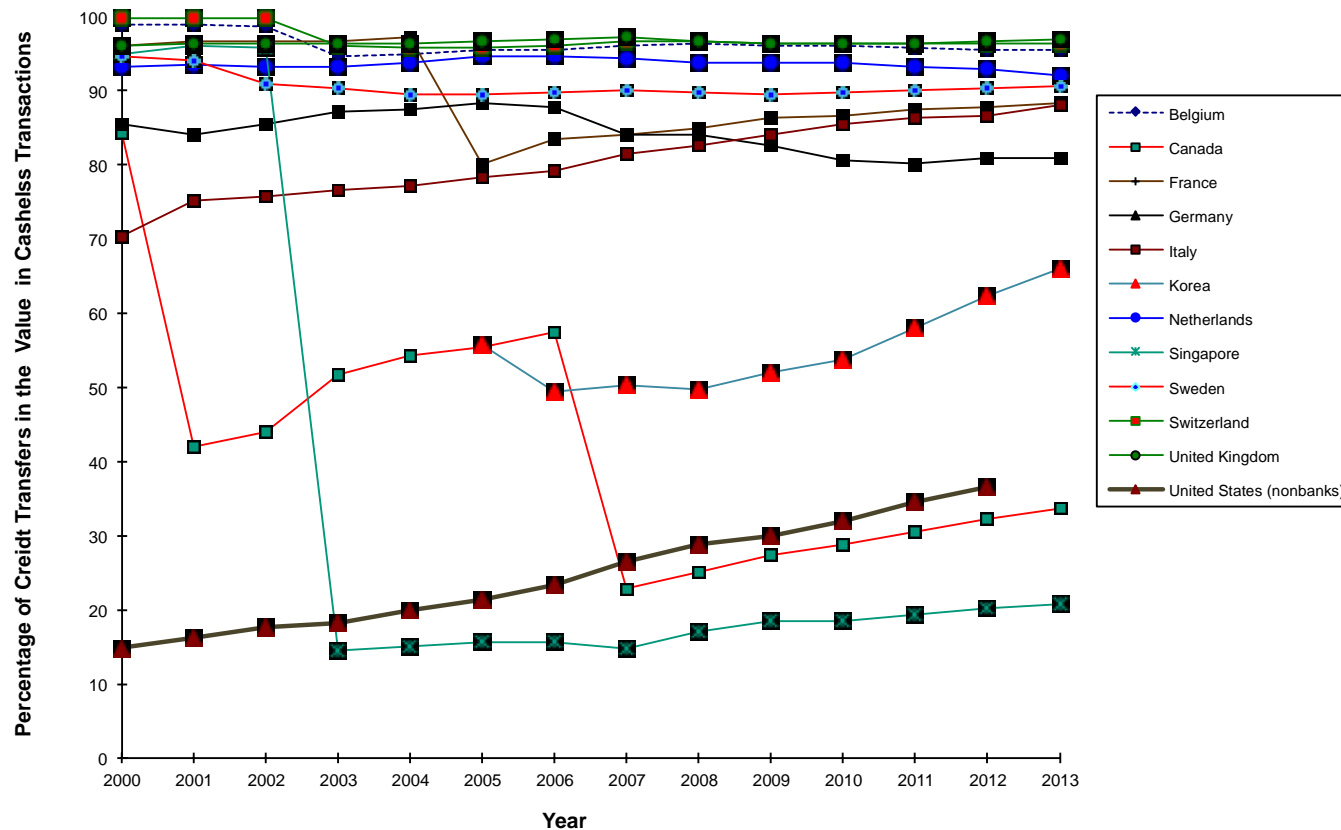


Percentage of Credit transfers in the Volume of Scriptural Transactions

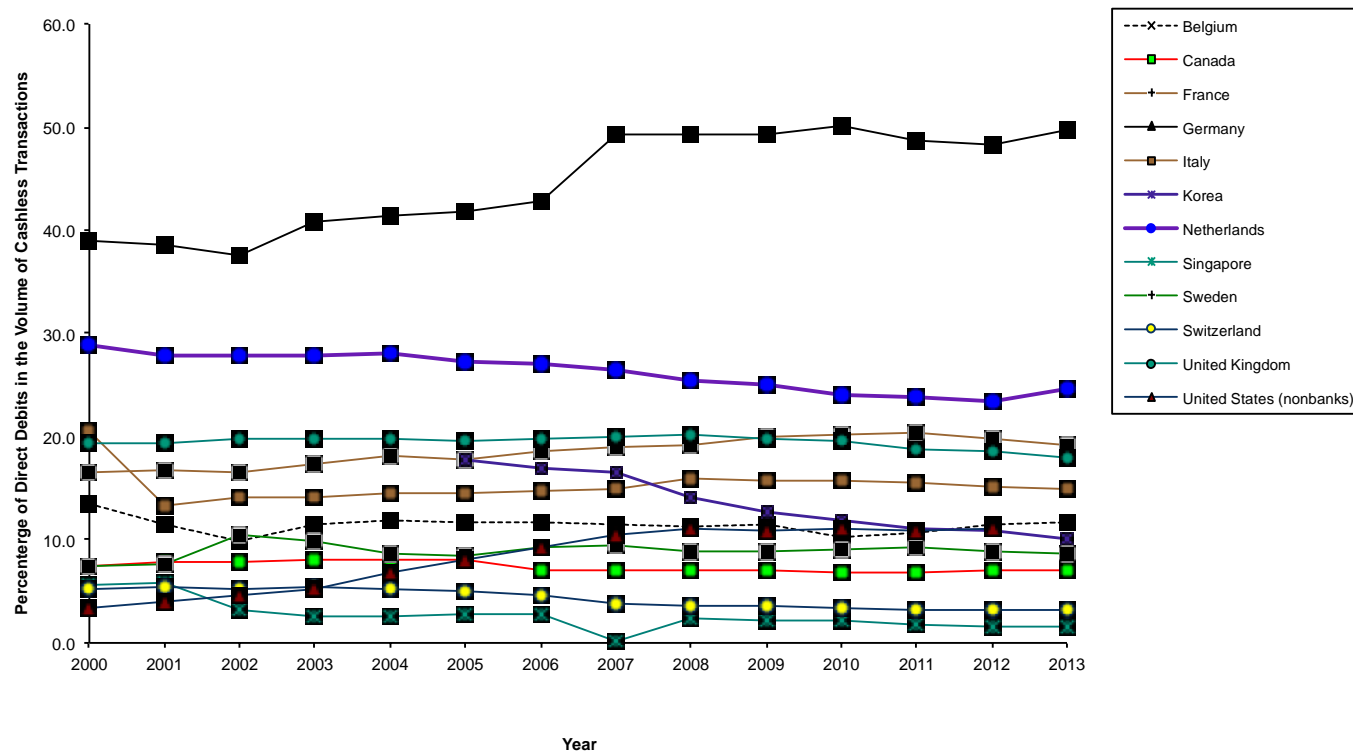
Since 1/1/99, all payments by the U.S. federal government are credit transfers except for tax refunds



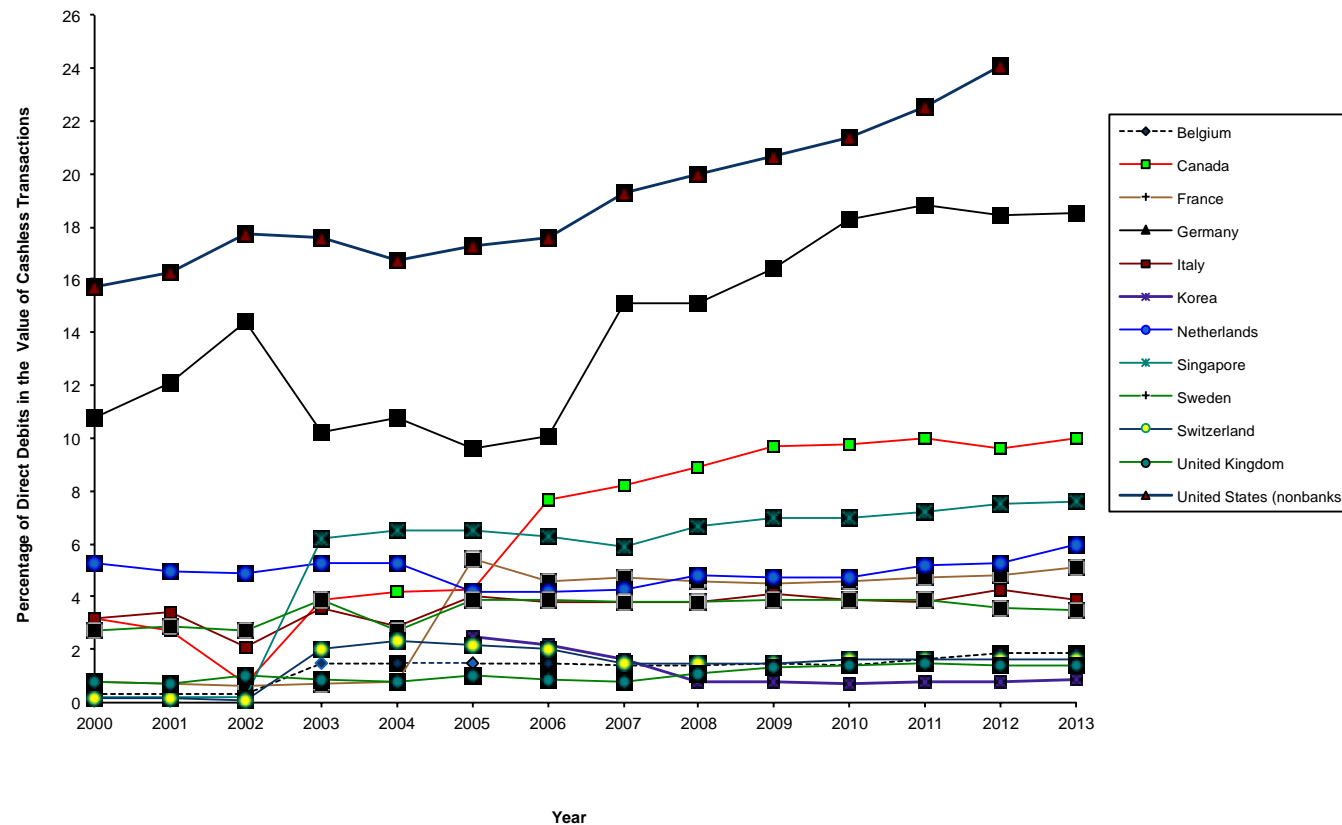
Percentage of Credit transfers in the Value of Scriptural Transactions



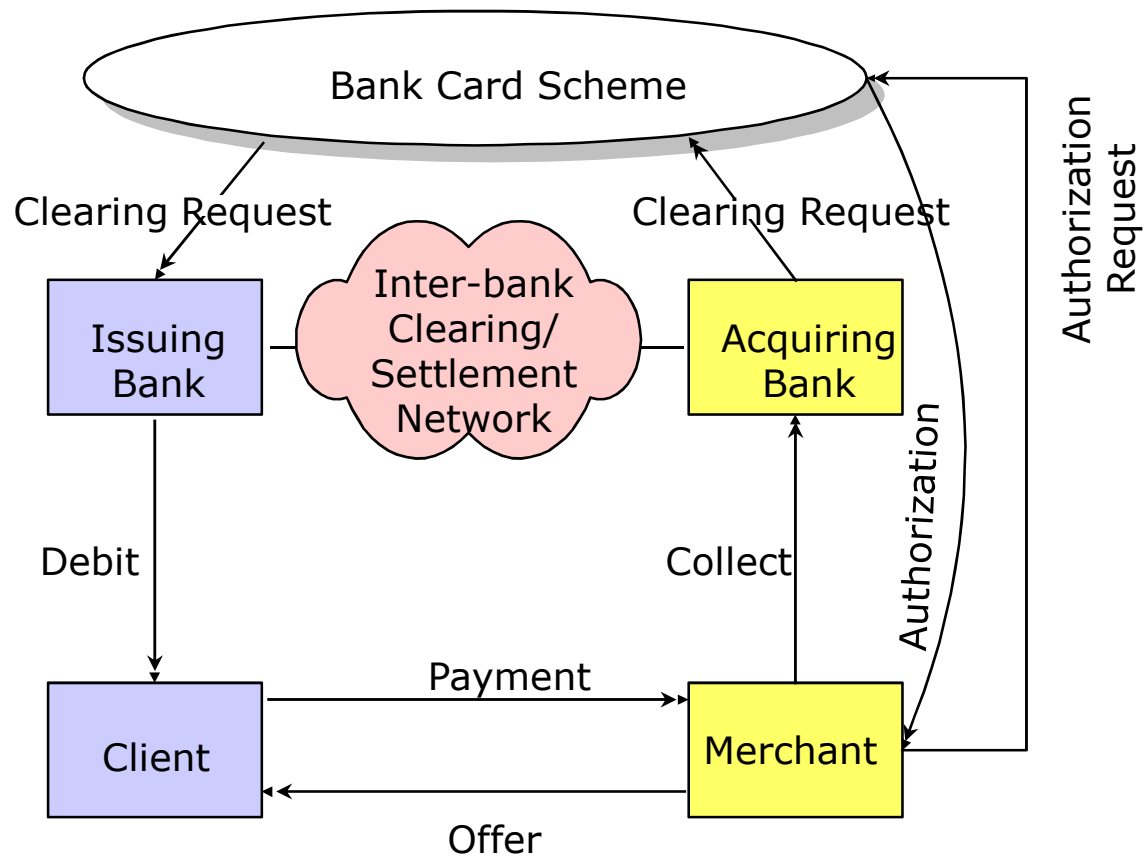
Percentage of Debit Transfers in the Volume of Scriptural Transactions



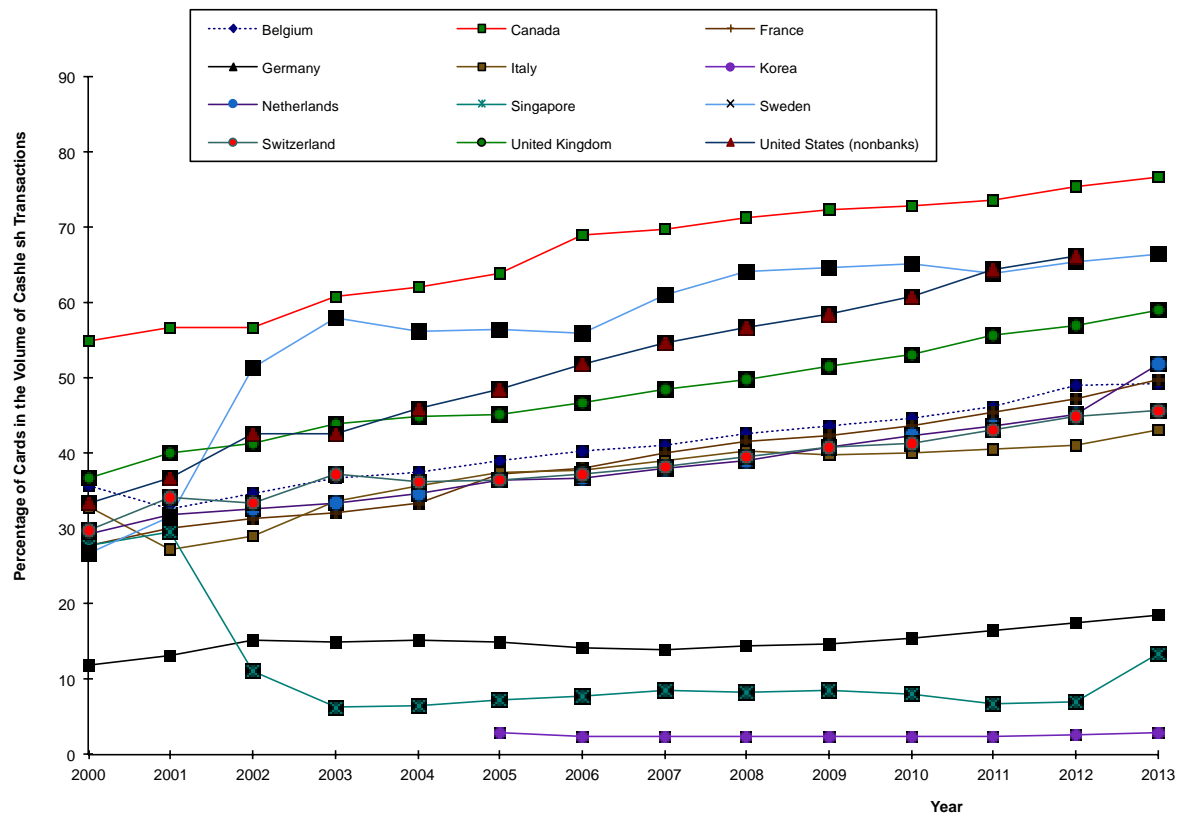
Percentage of Debit Transfers in the Value of Scriptural Transactions



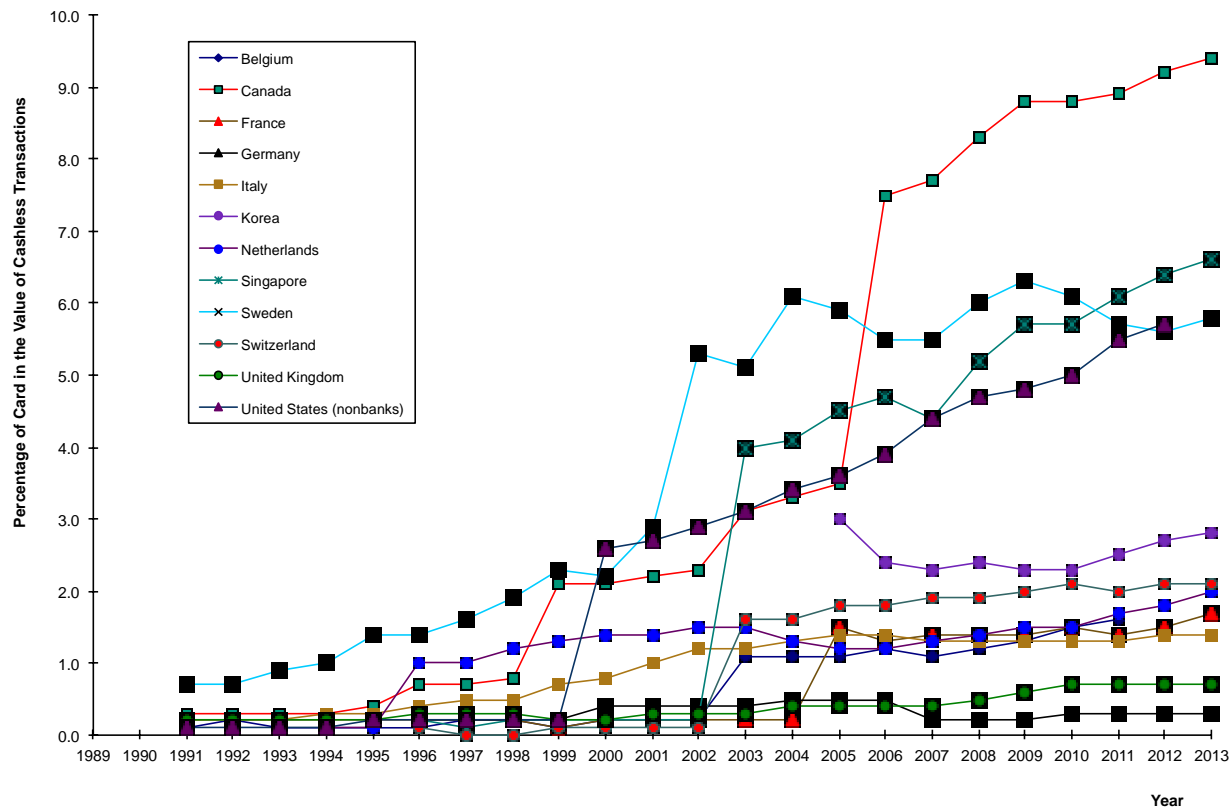
Exchanges during Bank Card Transactions



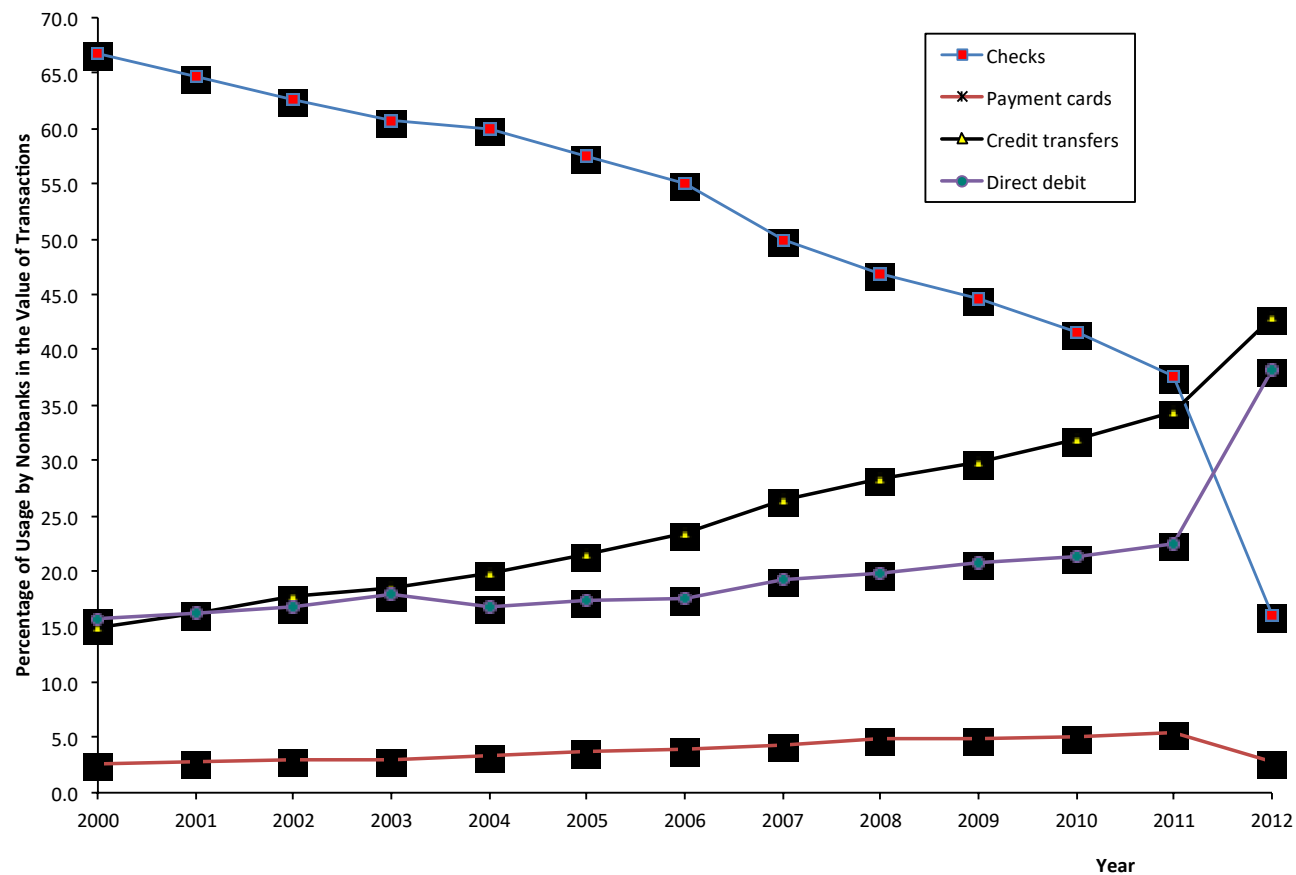
Percentage of Bank Card Transactions in the Volume of Scriptural Transactions



Percentage of Bank Card Transactions in the Value of Scriptural Transactions



Evolution of Payment Instruments by Non-Banks in the U.S. By Value



Emerging Payment Types - Dematerialized Monies

- Electronic money
 - fiduciary money stored in electronic forms
- Virtual money
 - fiduciary money
 - token (jeton)
 - QQ coins (Tencent) or Facebook Credits
- Digital Money (DigiCash, Bitcoins)
 - value stored in the form of algorithms
 - Minted by a client software
- Private money (stock options and shares)

Electronic Purses and Electronic Jeton (token) Holders

- Electronic Money within physical support
 - Electronic Purses (Mondex)
 - Electronic Token (Jeton) Holders (Telephone Cards, transportation cards)
- Virtual Money stored in software programs
 - Cloud-based payment systems
 - Virtual Purses (ExxonMobil's SpeedPass, WebMoney)
 - Virtual Jeton Holders (Millicent)

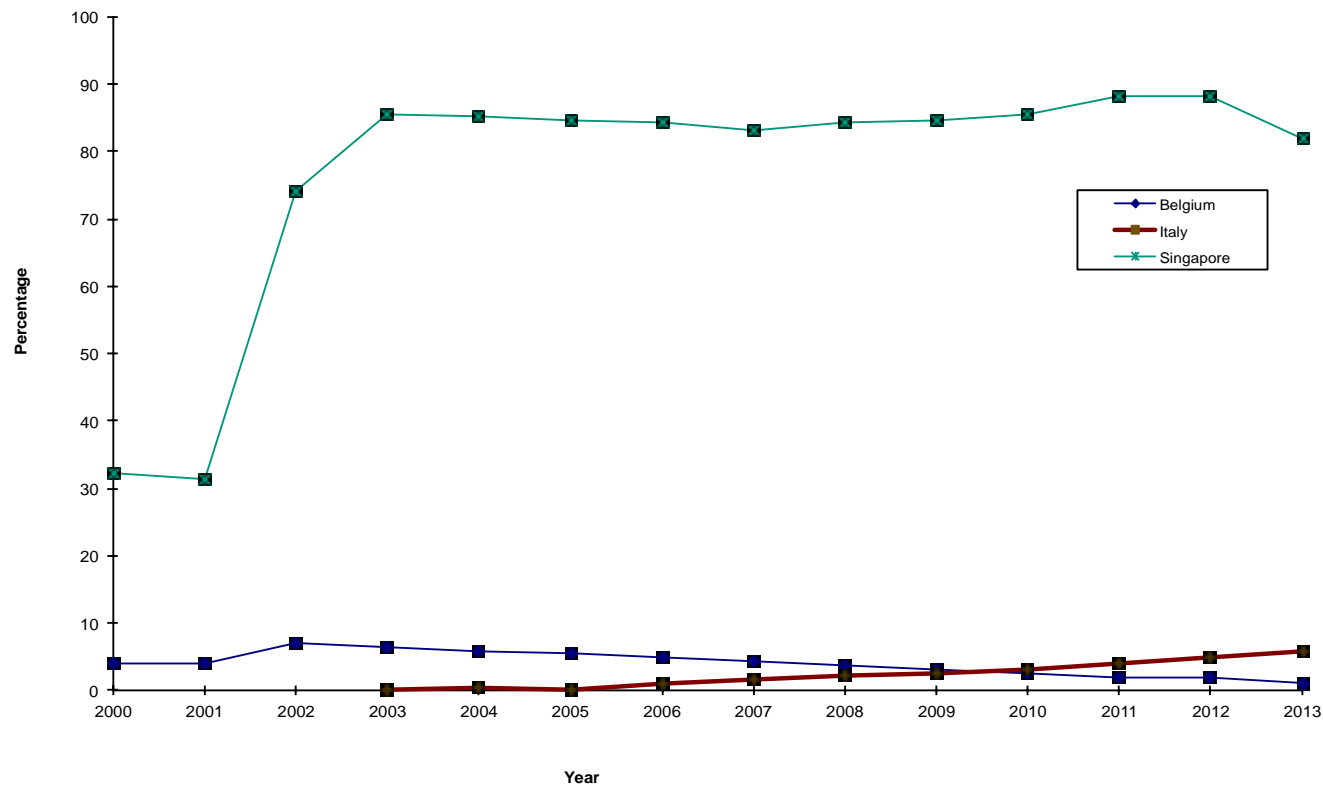
Electronic Purses and Electronic Jeton Holders

Characteristic	Electronic Purse	Electronic Jeton Holder
Expression of purchasing power	Legal tender	Consumption unit
Unit of payment	Universal: can settle any payment in a defined territory	Specific to transactions involving the issuer
Guarantor of purchasing power	Bank	Service provider
Charging of value	By a bank or its agent	Unregulated
Circuit of financial services	Open	Closed

Digital Wallets

- A digital wallet is a software on a desktop, a mobile terminal or a network server
- A mobile wallet is an app to store, access, manage and used identification and payment instruments in a secure way
- A mobile wallet can be linked to an account on a server
- Examples of mobile wallets: Google Wallet, Softcard, Apple Passbook, GoPago, QuickTap, Osaifu-Keitai, etc.

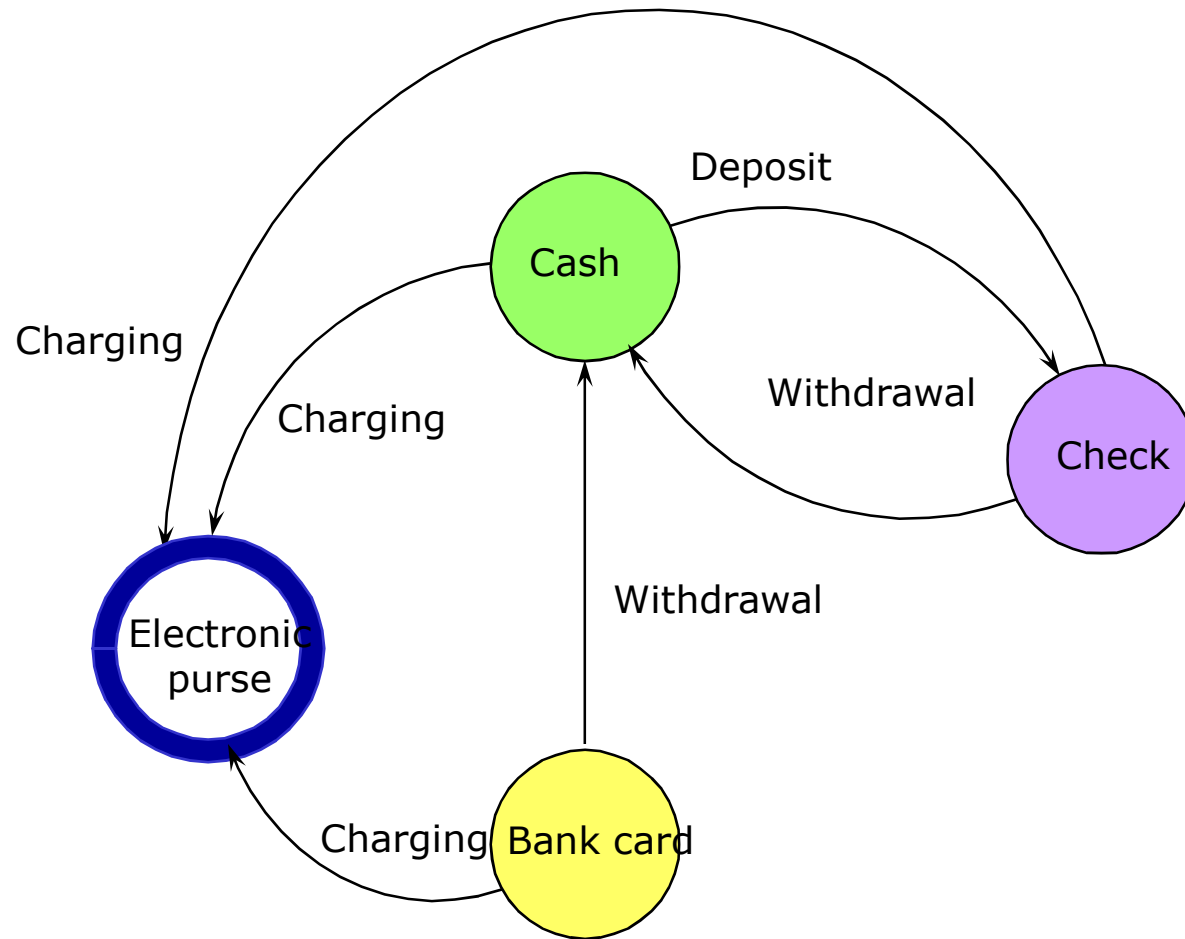
Percentage of Electronic Purse Transactions in the Volume of Scriptural Transactions



Transactional Properties of Dematerialized Currencies

- Atomicity
- Consistency
- Isolation (no interference among transactions)
- Durability (resilience to errors)
- Anonymity (not always)
- Non-traceability: anonymity + two payments by the same person cannot be linked

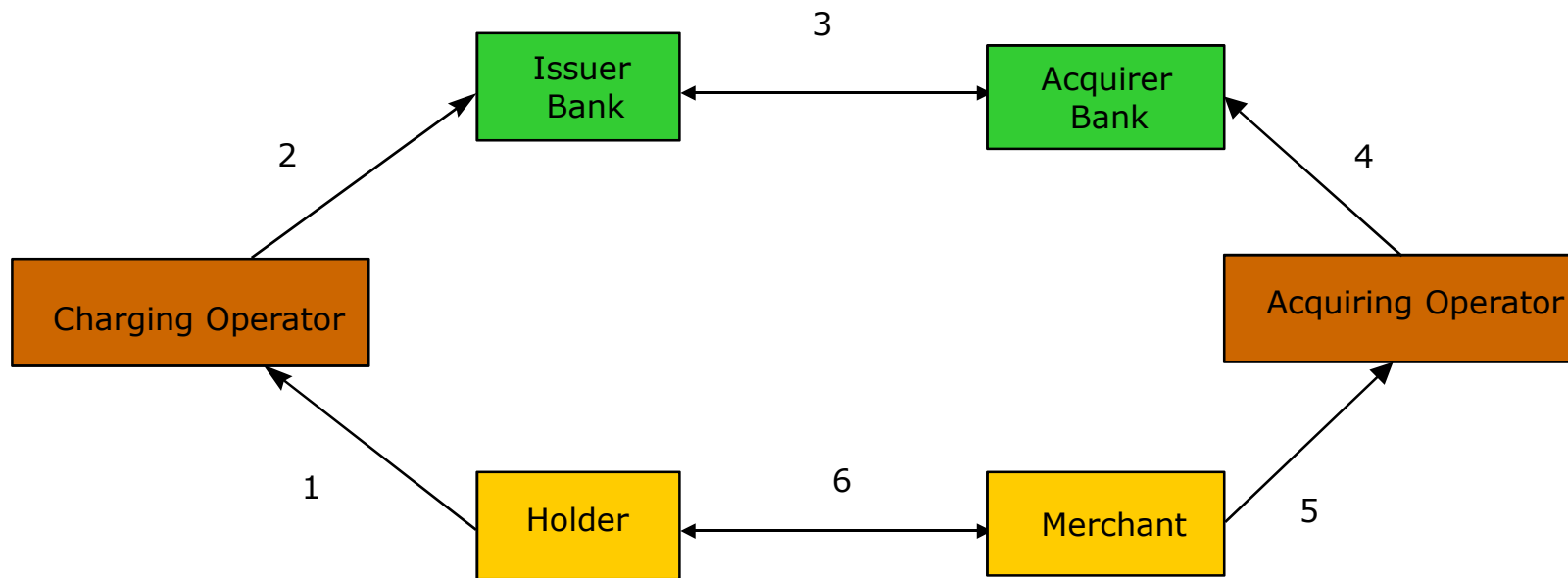
Monetary Flow among Payment Instruments



Comparison of Monies

Type of Money	Nature of Money	Support (the Container)	Value Store	Value Representation	Mode of Payment	Means of Payments (Instrument)
Fiduciary	Concrete, material	Paper, piece of metal	Safe, wallet, purse	Bank notes, coins	Face-to-face transaction	Bank notes, coins
Scriptural	Immaterial (an account maintained by a credit institution)	Magnetic, optical, electronic	Account maintained by a credit institution	Numerical value	Remote, face-to-face (retail automatic machines)	Check, debit card, credit card, credit transfer
		Integrated circuit card	Electronic purse			Electronic fund transfer
		Computer/Smart phone	Virtual purse (memory allocated by an intermediary)			

Flows in a Transaction by Dematerialized Money



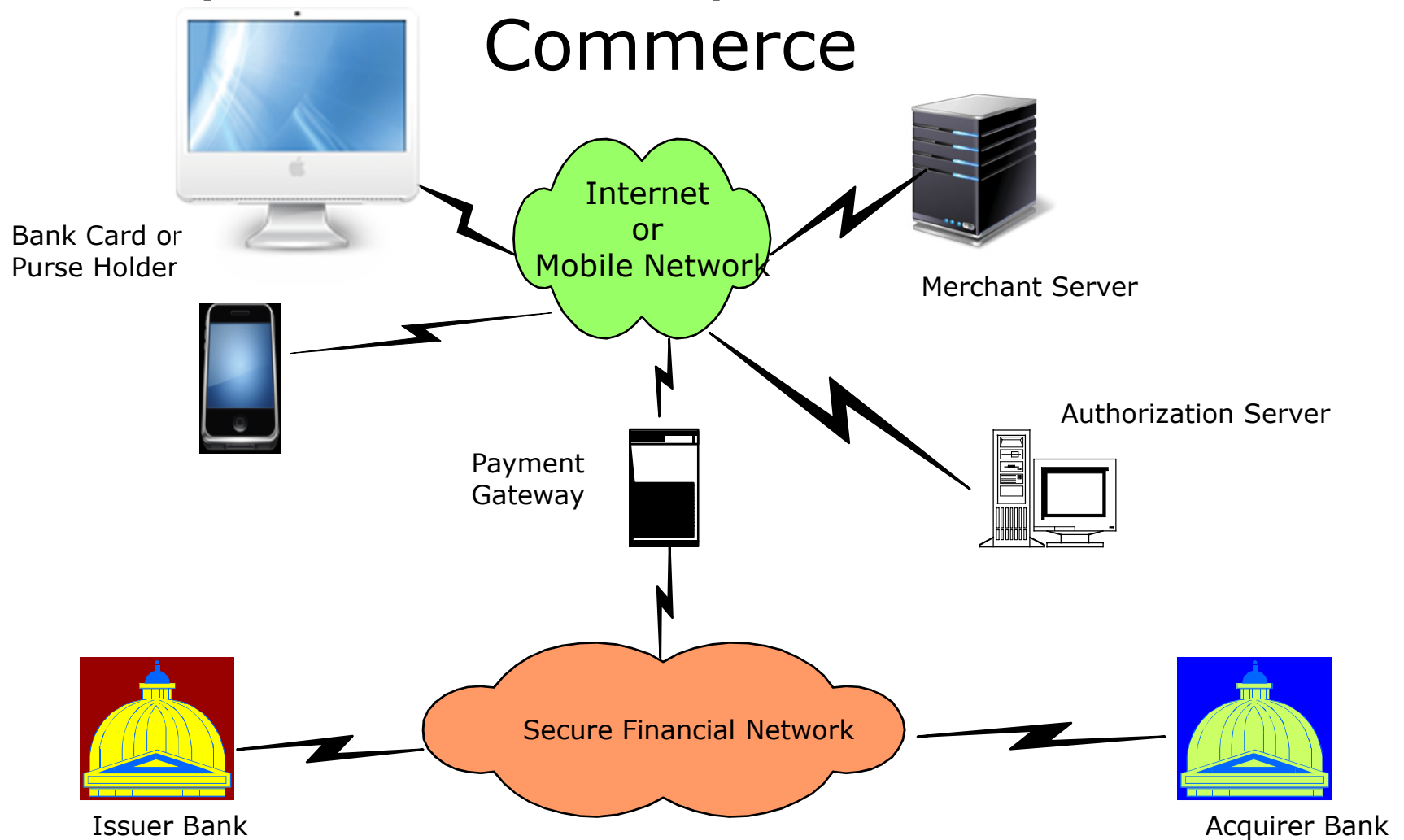
- Charging and discharging of the dematerialized money
- Purchasing and payment protocols
- Verification protocols (on line, off line, semi-online)

- Protocols for collection, acquisition and clearance
- Peer-to-peer transfer protocol

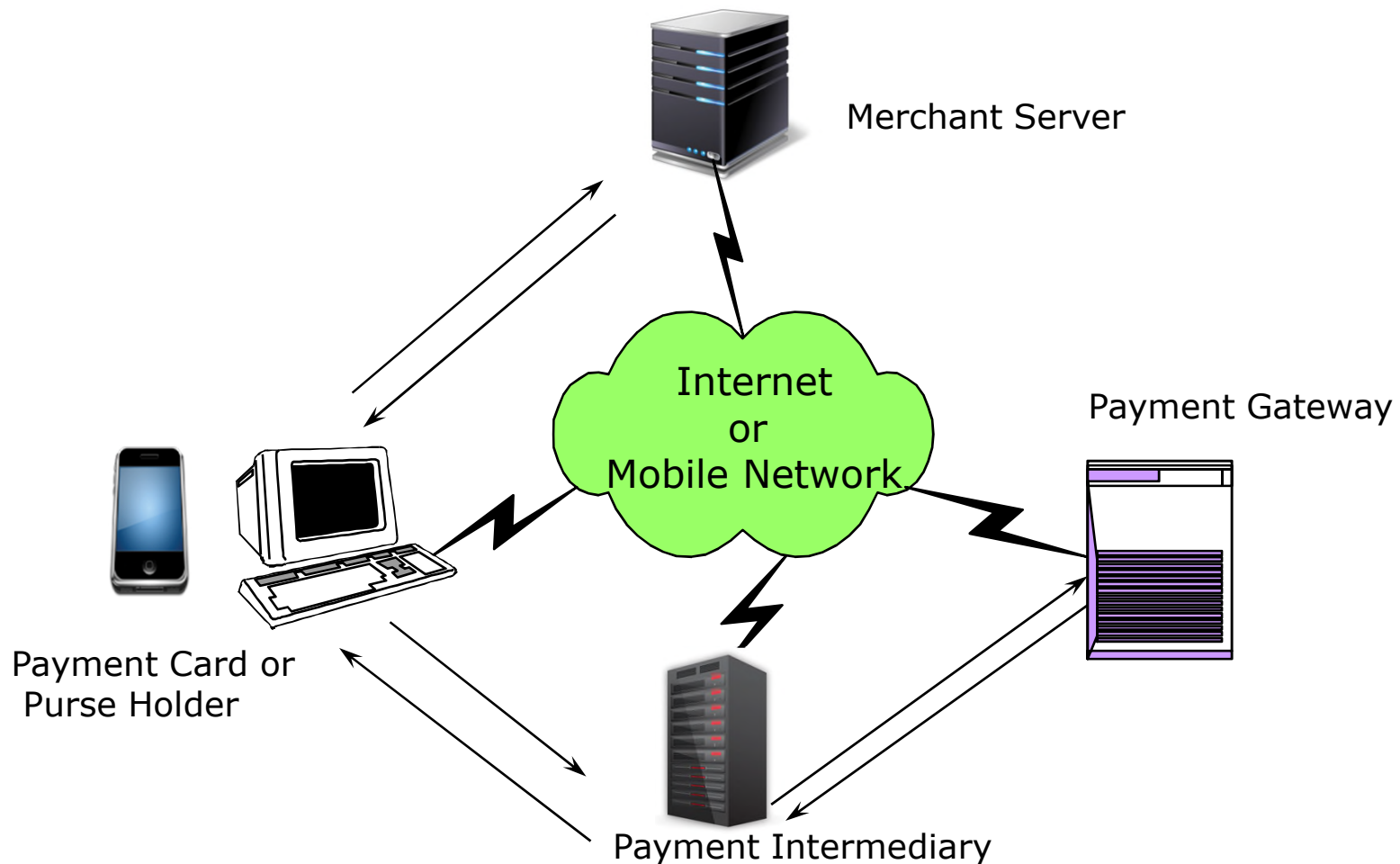
Security Requirements of Charging Protocols

- The protocols must resist attacks from outside the system:
 - Must resist misappropriation by any one of the participants
 - A 3rd-party non-participant must not be able to intercept the message to manipulate the content, modify orders, or resend valid but old messages.
 - Must resist false charges such as
 - ✗ Attributing the charge to a client other than the one identified
 - ✗ Attributing an amount different from the requested one
 - ✗ Repaying a previously authenticated charge
 - ✗ Repudiating a previously correctly executed charge
- Must be robust to return to previous state if there is an error.

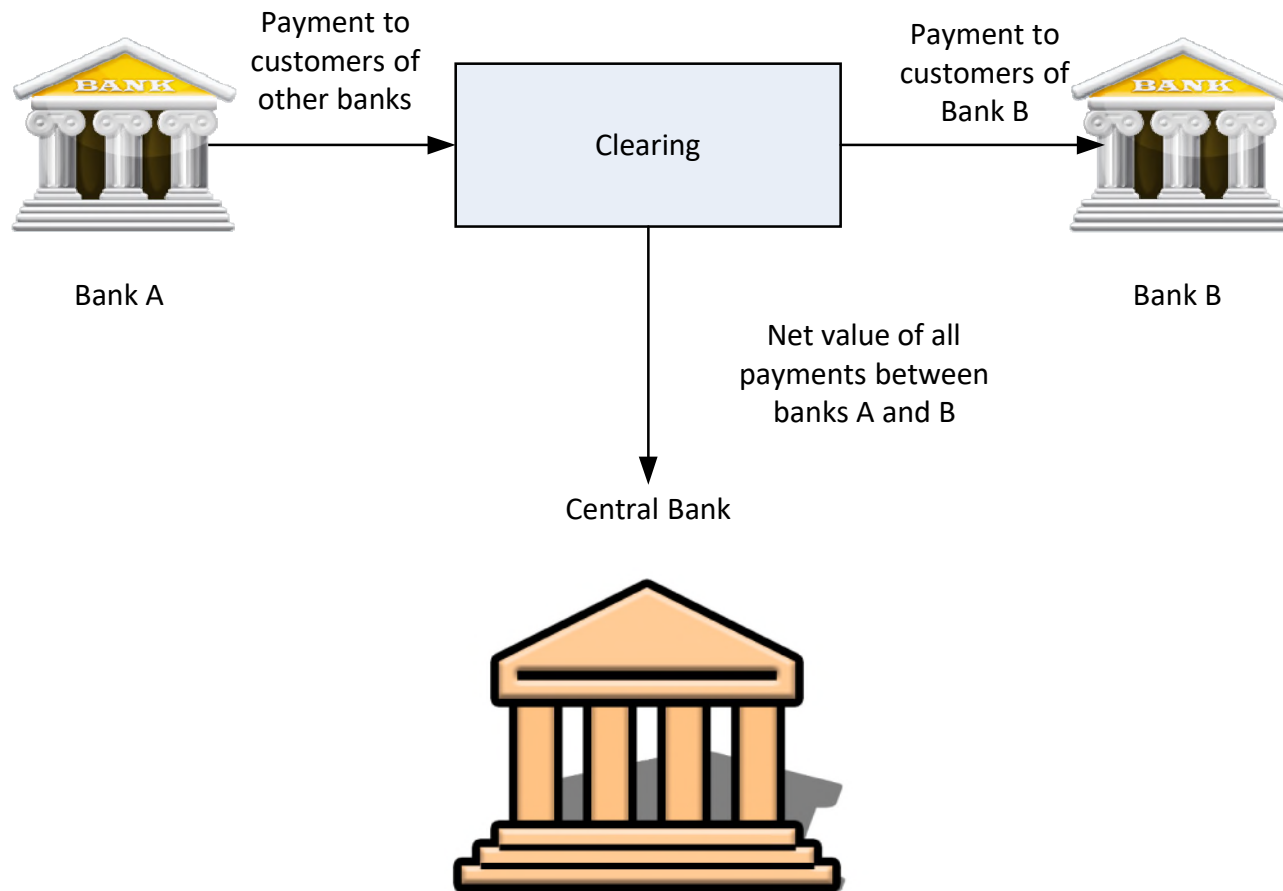
Payment Gateways in Electronic Commerce



Payment Intermediaries in Electronic Commerce



Settlement Systems



Clearing and Settlement

- Clearing & Settlement refers to the process where banks settle their accounts by exchanging money.
- All bank representatives usually meet every working day in a special *clearing house* and
 - Compare their respective credits in various financial instruments
 - Settle the account by exchanging money
- In electronic Clearing & Settlement, this process is done over computer networks.

Classification of Settlement Networks

- Nature of the processing
 - large value systems
 - mass systems (many transactions of relatively small value)
- Ownership and management of the network
 - public network owned by the central bank
 - private network owned by members of a group of banks
 - private network leased to the banks on a use basis
- The way the settlement is done
 - real-time gross settlement (the same day)
 - netting (consolidation of various transactions to avoid paying settlement charges)

United States

- Federal Reserve System
 - Central bank
 - Regulator
 - Operates the Fedwire service for large-value settlements
 - One of two large scale automated clearing house (ACH) networks
- Large-value Settlement Systems
 - Fedwire
 - CHIPS managed by the Clearing House Payments Company

ACH (Automated Clearing House)

- Two operators
 - Electronics Payments Network (EPN)
 - Federal Reserve System
- Codes defined by the Electronic Payment Association
- WEB transaction codes for web transaction
 - Online-initiated ACH credit payments
 - Person to person (P2P) payments

United Kingdom

- Clearing House Automated Payment System (CHAPS)
 - Euro component with the TARGET system
- Retail payments
 - Cheque & Credit Clearing Company Ltd. for paper credits and checks
 - BACS (Banker's Automated Clearing Service)
 - Faster Payment Service clears Internet and telephone payments up to £10,000 in 2 hours.

France

- Large-value payments: TARGET2-Banque de France
- PNS
- Retail payment System

Drivers for Innovations in Banking and Payments

- Technical developments
- Business needs
- User preferences
- Legislations and regulations
- Standards
- Ideology