

# CONVERSATIONS *with* THE FED

## The Way We Pay: Evolution or Revolution?

Terry Wright – Group Vice President



**FEDERAL RESERVE BANK  
OF RICHMOND™**

Richmond • Baltimore • Charlotte

The views expressed in this presentation are those of the speaker and do not necessarily represent the views of the Federal Reserve Bank of Richmond or Federal Reserve System

# Fed Mission, Functions and You



**MONETARY POLICY**



**SUPERVISION AND  
REGULATION**



**PAYMENT SERVICES**



**THE MONEY  
YOU SAVE  
AND  
BORROW**



**THE PRICES  
YOU PAY**



**THE ECONOMY  
YOU WORK IN**



**THE BANK  
YOU USE**



**THE PAYMENTS  
YOU MAKE**



# Fed Payment Services

The Fed helps move payments from point A to point B

- Cash
- Checks
- Electronic payments
  - Wire
  - ACH
- Services to U.S. Treasury



## Financial Services Provided

First Quarter 2018, Average Daily Volume and Value

Payment Method	Items (000)	Billions of \$
Fedwire Funds	613	\$3,163
Fedwire Securities	71	\$1,301
Automated Clearing House	65,859	\$125
Commercial Check Collection	19,525	\$32
<b>Total</b>	<b>86,068</b>	<b>\$4,621</b>
Cash (notes processed)	139,427	\$3
<b>Total Payments</b>	<b>225,495</b>	<b>\$4,624</b>

# Federal Reserve Payment Improvement Strategies

- The Fed is on a multi-year mission to help the US payments industry achieve five desired outcomes, which reflect the shared vision of the Federal Reserve and a broad spectrum of payment system stakeholders:

- Speed
- Security
- Efficiency
- International Payments
- Collaboration



## In Pursuit of a Better Payment System

In January 2015, the Federal Reserve issued a call to action in *Strategies for Improving the U.S. Payment System*, asking stakeholders to come together in pursuit of a better payment system for the future. The call was answered, with hundreds of organizations and individuals collaborating on achieving the five desired outcomes: speed, security, efficiency, international payments, and collaboration. As a result of this success, in September 2017, the Federal Reserve published its *Next Steps in the Payments Improvement Journey*, which introduced the next phase of work.

This progress report outlines important work completed and highlights next steps. We invite you to engage as these initiatives progress by visiting [FedPaymentsImprovement.org](http://FedPaymentsImprovement.org). With collaboration, inclusiveness, and transparency as guiding principles, we are confident that these efforts will continue to generate momentum for innovation in the payments industry and result in better, safer, faster payments for everyone.

# Overview of Our Conversation

- The changing payments landscape
- Consumer-facing innovations
- Payments rail innovations
- Blockchain and cryptocurrencies
- Federal Reserve perspectives

...but first, let's take a poll!

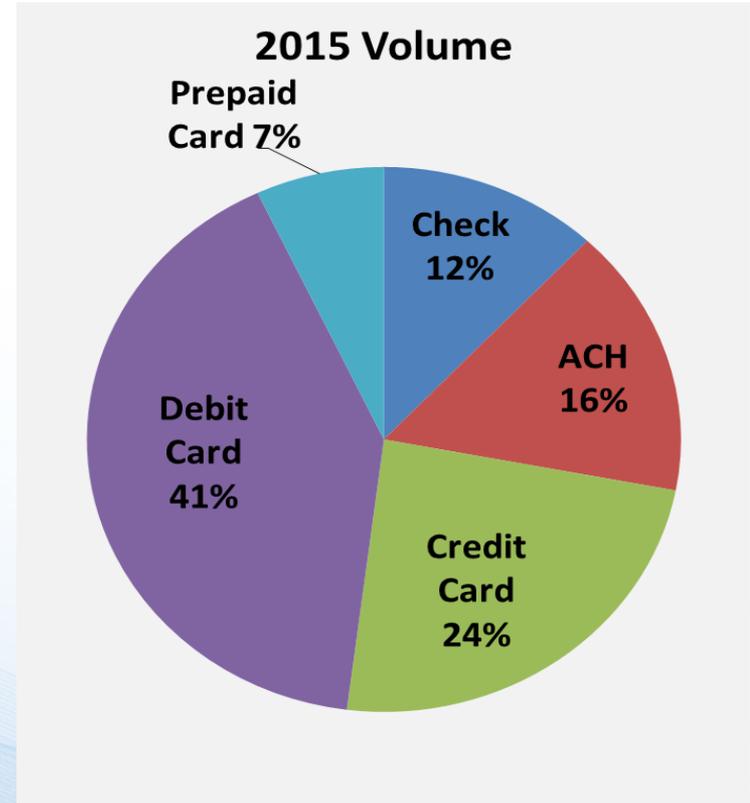
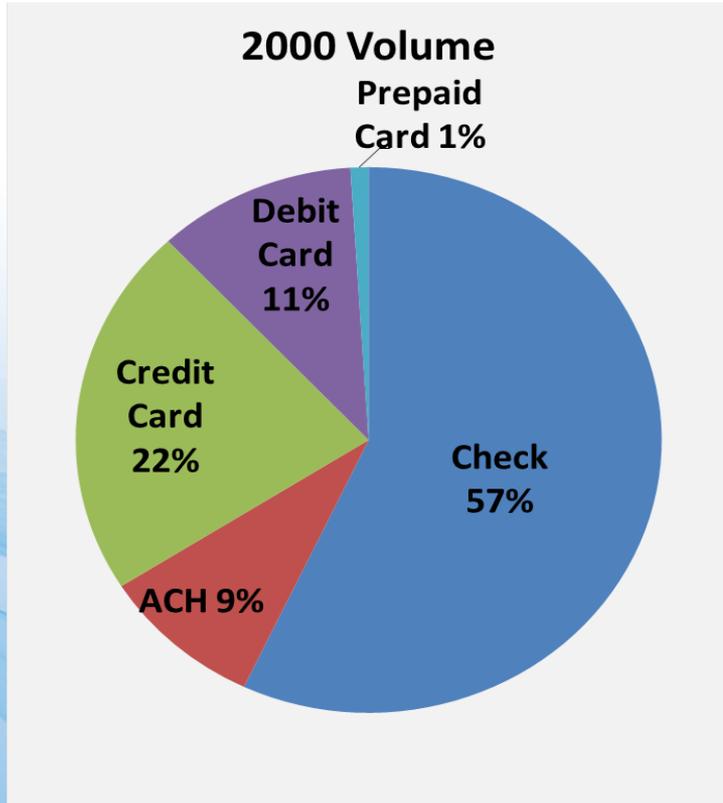
# How Do You Usually Pay For Things?

- Cash
- Check
- Credit card
- Debit card
- Electronic (ACH, PayPal, bank account payments, bill pay)
- Other (money order, prepaid cards, traveler's checks)
- Cryptocurrency (!?)



We regularly ask a few thousand consumers how they pay for things.  
How do you compare to the average US consumer?

# Distribution of Noncash Payments

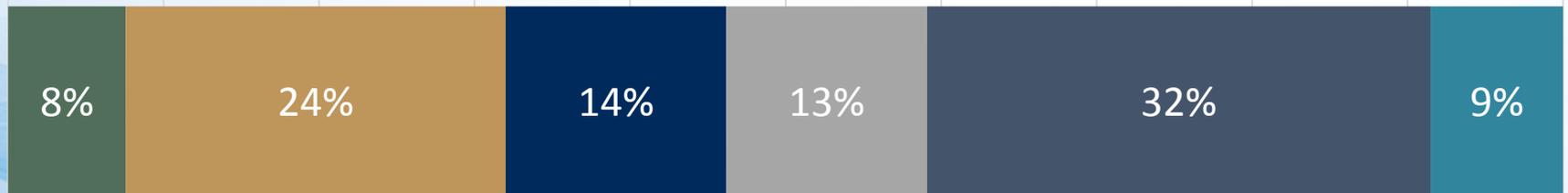


# 2016 Diary of Consumer Payment Choice Results

Percent of payments made



Percent of spend



0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

■ Cash ■ Check ■ Credit ■ Debit ■ Electronic ■ Other

# On the subject of monitoring...

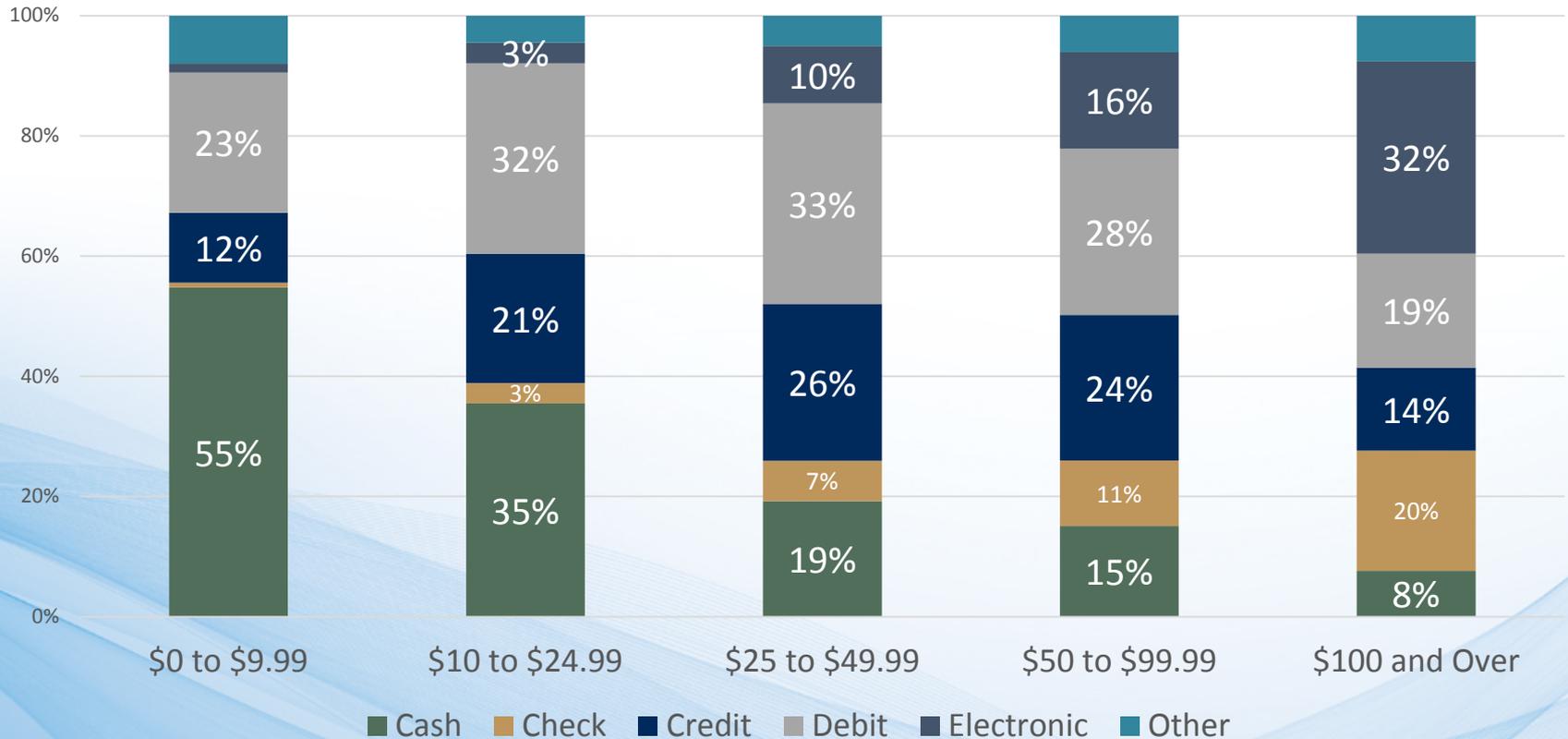
## More Diary of Consumer Payment Choice Results

How people pay, by transaction amount

How people pay, by income

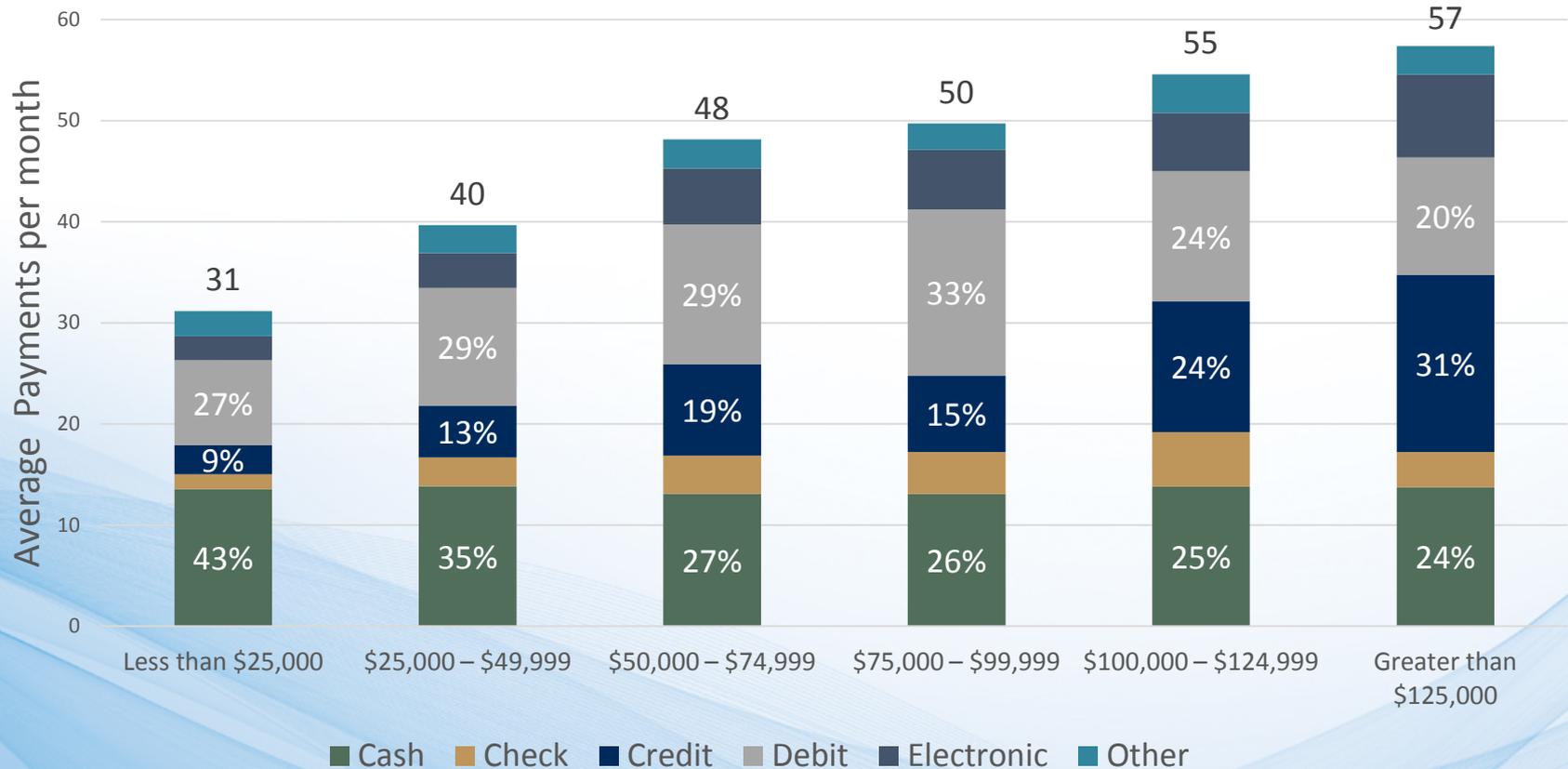
How people pay, by age group

# Payment Method Used, By Amount



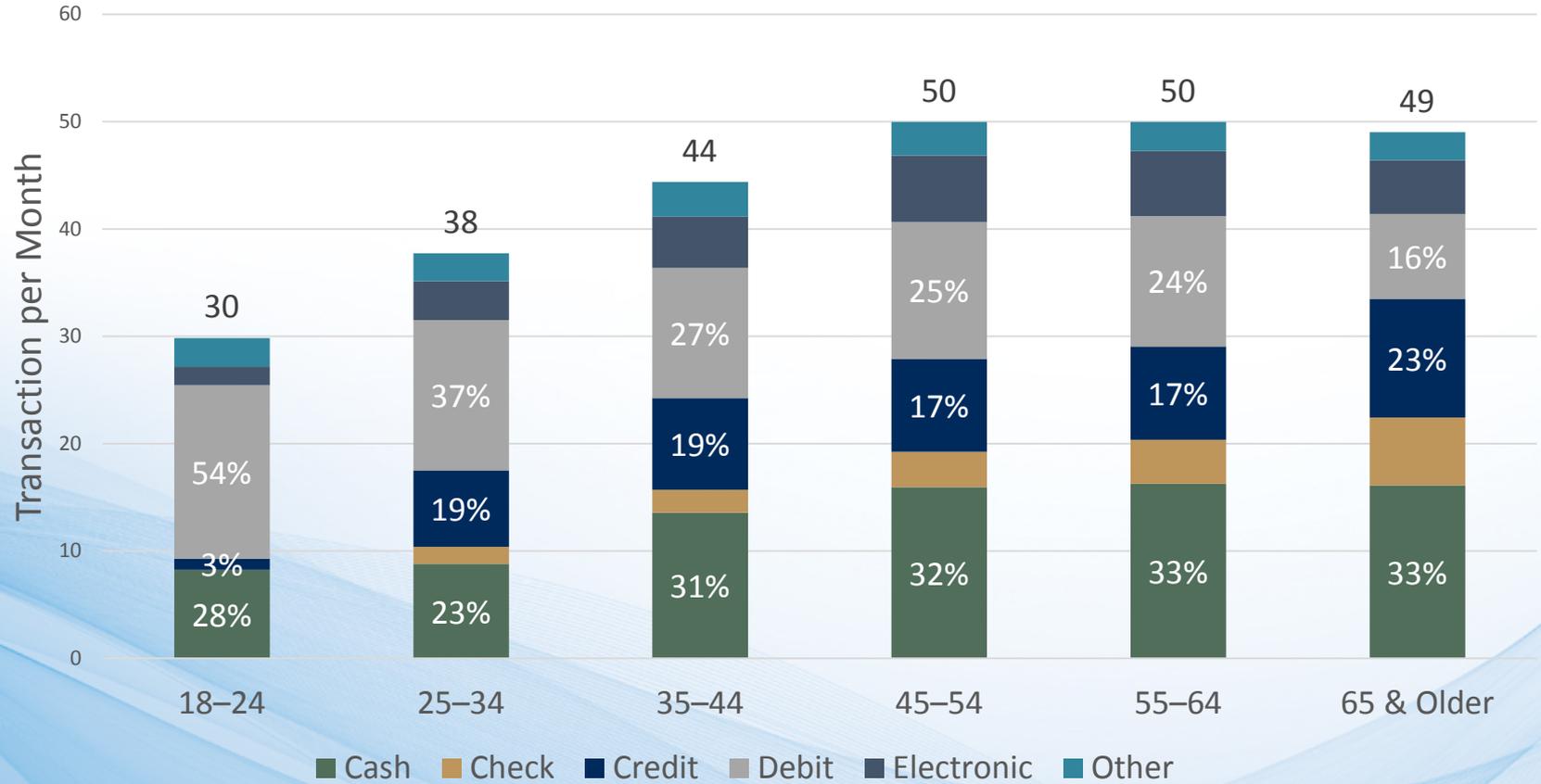
Source: 2016 DCPC

# Payment Method Used, By Household Income



Source: 2016 DCPC

# Payment Method Used, By Age Group



Source: 2016 DCPC

# Changing Payments Landscape for Consumers

There has been a LOT of recent “consumer front-end” innovation for initiating a payment, but less “back-end” or “payment rail” innovation

## Payment method innovation



## Payment rail innovation



# Consumer-Facing Innovation: Zelle



- Launched May 2017; app launched September, but also embedded in banking apps
- Uses “alias-based payments” (mobile # or email)
- Dedicated app used credit/debit card; Zelle embedded in banking app uses checking/savings
- “Split” function: users can divide the cost of a group purchase (but Venmo seems to still be where “splitting” happens more)
- All in-network banks operate under the same set of rules for payments, disputes, settlement and common user experience
- Funds sent over the Zelle network appear immediately in the recipient’s account and are made immediately available for use by the consumer

# Payment Rail Innovation: RTP

- RTP is a new rail and faster payment capability
- Product of The Clearing House (TCH), which is owned by 25 US banks
- Using “backbone” technology from VocaLink, who built UK Faster Payments
- Launched in November; open to all US depository institutions
- Uses “credit-push” model (good funds) – operates 24 x 7 x 365
- Provides immediate confirmation notices that payments have been sent, received and settled
- TCH says RTP is first new rail in 40 years, but not intended to replace others; will not be high value
- RTP is first “faster payment” out of the gate, but there could be others!

But what about non-banking innovations  
in payments?

# Blockchain – How Did We Get Here?

## 2008: The Bitcoin breakthrough

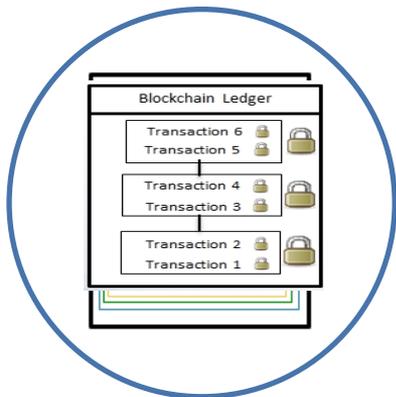
- Established trust without a central authority
  - Solved the double spend problem
- Resulted in a **distributed unalterable public ledger**



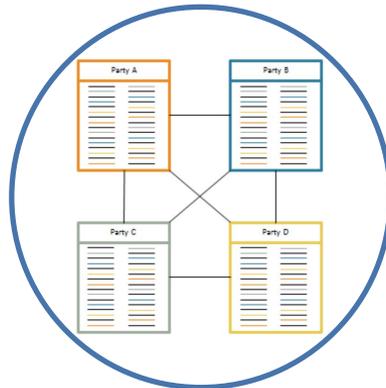
Blockchain and DLT  
(Distributed Ledger Technology)

Bitcoin and other cryptocurrencies

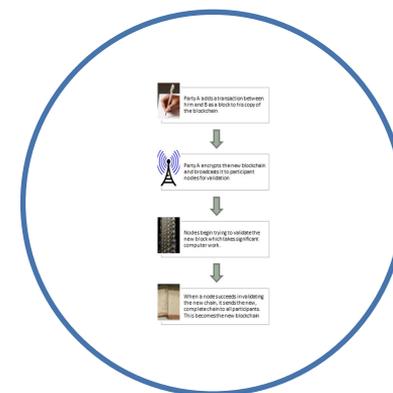
# Components of a Blockchain



Blockchain Ledger



Blockchain Distribution

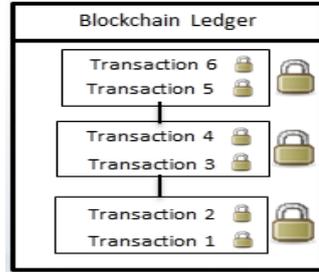


Blockchain Consensus

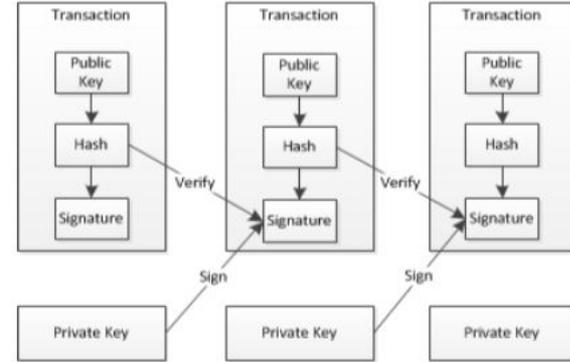
**Smart Contracts**  
(increasingly)

Note: “blockchain” and “distributed ledger technology” or “DLT” are not exactly the same, but are used interchangeably in most cases

# Components of a Blockchain



WORKFLOW OF A SIMPLE BLOCKCHAIN

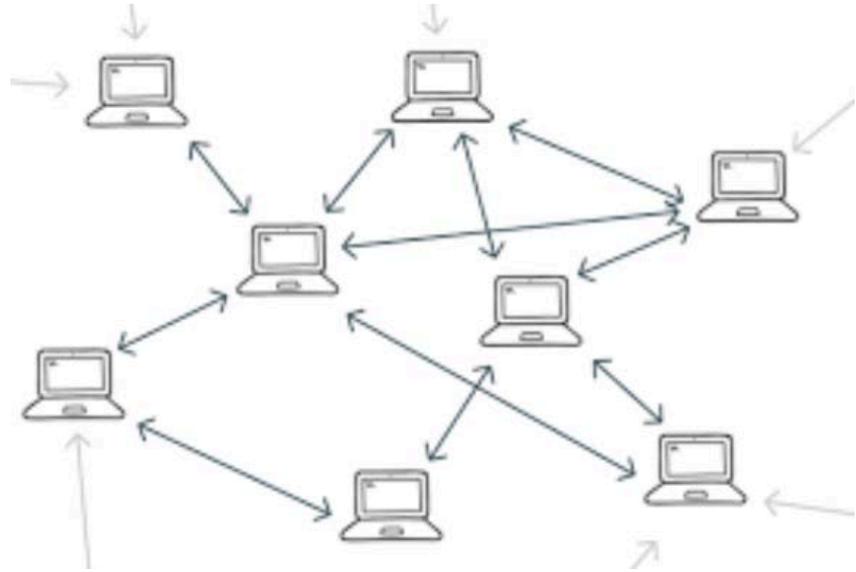
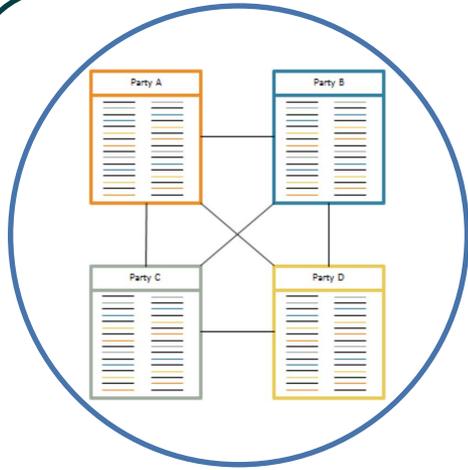


Source: Bitcoin : Peer-to-Peer Electronic Cash System,  
Nakamoto

## Blockchain Ledger

- A transaction ledger where each transaction is tied to all of the previous transactions using cryptography, making the ledger tamper-proof

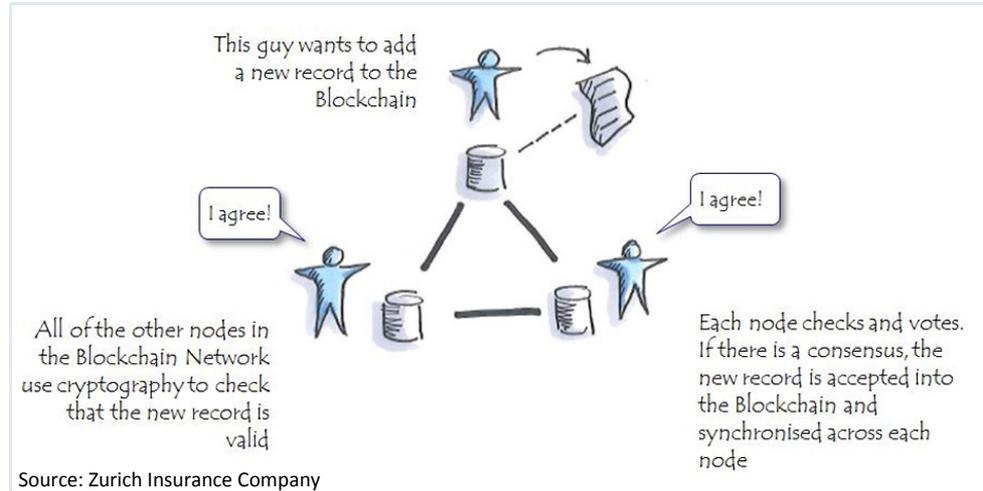
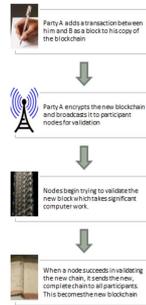
# Components of a Blockchain



## Blockchain Distribution

- A system wherein all participants in the consensus model have a complete copy of the entire ledger
- Distribution can be public, or partial with security roles

# Components of a Blockchain



## Blockchain Consensus

- A process used with distributed ledgers that ensures that all parties can agree on the validity of transactions and of the entire ledger

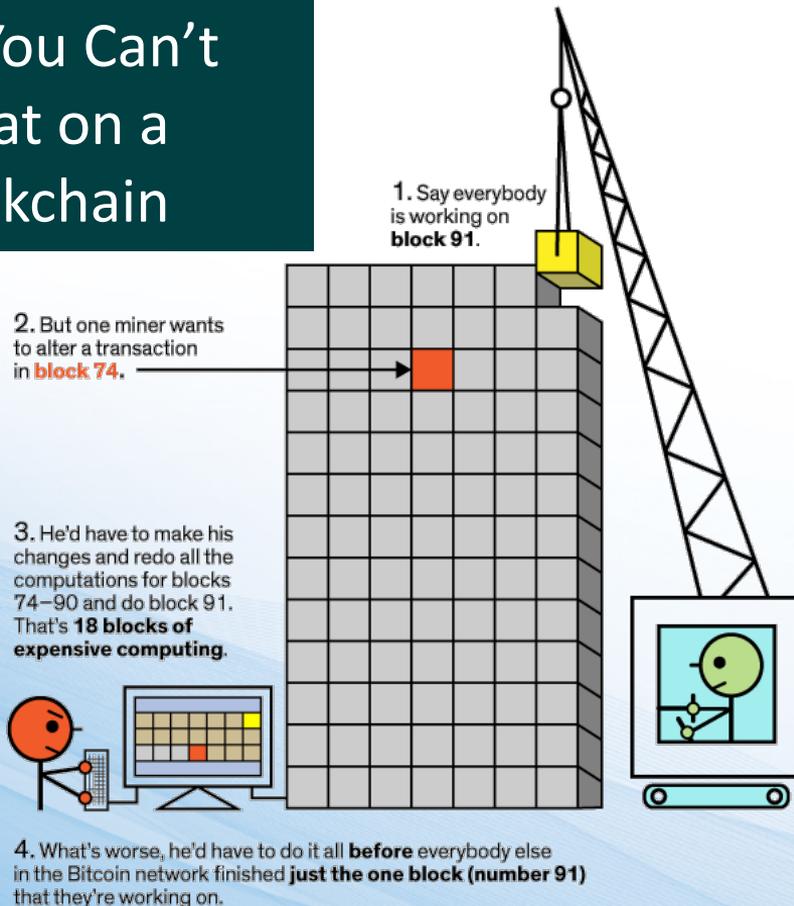
# Components of a Blockchain



- A computer protocol intended to facilitate, verify, or enforce the performance of a contract
- Smart contracts allow the performance of transactions without third parties, often with “if...then...” type programming
- Transactions are trackable and irreversible

# Cryptography = Immutable

## Why You Can't Cheat on a Blockchain



- Each block's crypto signature is based off of the previous block
- To replace a block you would need to rebuild and resign each block following it, before the next block is produced
- Would still need to have that copy on 51% of the network

Note: Some exchanges and smart contracts have experienced security issues (not the blockchain)

# Potential Benefits

- Cheaper, relatively faster value/ownership transfer
  - Enables faster dissemination of information
- Faster settlement
  - DLs promise faster settlement, without the need for a central agency to act as a controlling authority
- Improved data auditability and governance
  - Transactions records are easily kept and logs can be accessed by clients, control functions, and regulators
- Provides greater resiliency by minimizing centralized points of failure
- Transparency and immediacy
  - Transactions can independently be verified at any point in time

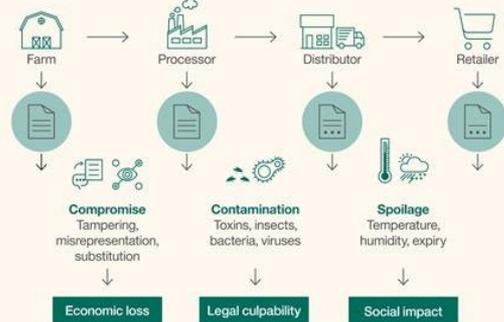
**Note: Many of the “potentials” are unrealized to date, as experiments continue**

# Promising Supply Chain Use Cases

IBM is tapping blockchain for a more transparent, authentic and trustworthy global food supply chain.



Disparate ledgers and lack of transparency in the supply chain put food at risk.



Blockchain can help digitally trace and authenticate food products from an ecosystem of suppliers to store shelves and ultimately to consumers.

Graphic source: IBM

Walmart 

Tyson 

Unilever 

Driscoll's 

McCormick 

Nestlé 

Kroger 

McLANE 

Dole 

gsf golden state foods 

IBM brings Walmart, Tyson Foods into blockchain fold

This summer, IBM announced a consortium with 10 major food suppliers to apply blockchain to the food supply chain to improve food safety and ingredient transparency.

Blockchain can help brands track sources of contamination far more quickly, reducing the impact of compromised foods.

# Now a Word on Cryptocurrencies...

They can vary according to:

- Technology
  - Hash algorithms used
  - Process for agreeing to the “truth”
    - Proof-of-Work, Proof-of-Stake, etc.
    - Things you have heard about Bitcoin might not apply to others
  - Rate of confirming new blocks of transactions
- Money Supply
- Use Cases

# Bitcoin...

Tulips???



Tesla???



# Cryptocurrency Protocols: Bitcoin



What is a “bitcoin?”

- A peer-to-peer virtual currency
- A unit of value created and held electronically
- Allows decentralized transfers of value
- No central bank or a single administrator (no single entity controls the currency or the network)
- Motivation:
  - Distrust of FIs: In traditional payments, any noncash transaction requires a trusted third-party administrator—commonly a bank or financial service provide
- Primary concerns of Bitcoin:
  - Transaction security
  - Preventing double spends

# Bitcoin Price Volatility



1h 12h 1d 1w 1m 3m 1y All

\$19,343 on Dec 16, 2017

Agustin Carstens, the general manager of the Bank for International Settlements (BIS) said on February 6 that bitcoin "has become a combination of a bubble, a Ponzi scheme and an environmental disaster."

\$1,090 on April 1, 2017



\$9,190 on  
May 8, 2018

May '17

Sep '17

Jan '18

NONCONFIDENTIAL

# Cryptocurrency Protocols: Ethereum

*The World Computer*



- Public ledger, decentralized, P2P, and open source just like Bitcoin
- Native token/currency is Ether
- More robust programming/scripting language than Bitcoin; can run smart contracts
  - Smart contracts are programs that run autonomously on the blockchain; can store data and send/receive transactions
  - Turing complete virtual machine (EMV); able to run any computation a normal computer can
- Can be used to develop, decentralize, secure, and trade just about anything including company governance, voting, and intellectual property

# Fed Views on Blockchain and Cryptocurrencies

## **Blockchain and DLT Generally**

**Cautiously optimistic**

## **Cryptocurrencies like Bitcoin**

**Concerned if broadly adopted by public**

## **Central Bank Digital Currency**

**Under evaluation, but no plans to introduce**

# Fed Views on Blockchain and Cryptocurrencies

## Blockchain and DLT Generally

### Cautiously optimistic

- In the context of payments, DLT has the potential to provide new ways to transfer and record the ownership of digital assets; immutably and securely store information; provide for identity management; and other evolving operations through peer-to-peer networking, access to a distributed but common ledger among participants, and cryptography
- Potential use cases in payments, clearing, and settlement include cross-border payments and the post-trade clearing and settlement of securities
- As the technologies and experimentation with these technologies continue to develop, it will be important to thoroughly understand how these changes apply broadly; understanding the potential range of DLT adoption and its link to changing the financial market structure is an area for future research

# Fed Views on Blockchain and Cryptocurrencies

## Cryptocurrencies like Bitcoin

### Concerned if broadly adopted by public

- The “currency” or asset at the center of some of these systems is not backed by other secure assets, has no intrinsic value, is not the liability of a regulated banking institution, and in leading cases, is not the liability of any institution at all
- While these digital currencies may not pose major financial stability concerns at their current levels of use, more serious financial stability issues may result if they achieve wide-scale usage

# Fed Views on Blockchain and Cryptocurrencies

## Central Bank Digital Currency

### Under evaluation, but no plans to introduce

- Consideration of a central-bank-issued digital currency to the general public would require extensive reviews and consultations about legal issues, as well as a long list of risk issues, including the potential deployment of unproven technology, money laundering, cybersecurity, and privacy to name a few
- The prospect of a government-sponsored digital currency might derail private-sector plans to enhance the payment services provided to their customers, thereby disrupting the financial networks that exist today in ways that could create instability

# Resources for Further Reading

## “Federal Reserve Next Steps in the Payments Improvement Journey”

Federal Reserve System (September 2017)

<https://www.federalreserve.gov/newsevents/pressreleases/files/other20170906a1.pdf>

## “The 2016 Diary of Consumer Payment Choice”

Claire Greene and Scott Schuh (December 2017)

<https://www.bostonfed.org/publications/research-data-report/2017/the-2016-diary-of-consumer-payment-choice.aspx>

## “Thoughts on Prudent Innovation in the Payment System”

Federal Reserve Board, Governor Randal Quarles (November 2017)

[www.federalreserve.gov/newsevents/speech/files/quarles20171130a.pdf](http://www.federalreserve.gov/newsevents/speech/files/quarles20171130a.pdf)

## “Central Bank Digital Currencies”

BIS, Committee on Payments and Market Infrastructures and Markets Committee (March 2018)

<https://www.bis.org/cpmi/publ/d174.pdf>