Can eCash & Virtual Currency Compete with Other Electronic Payments?

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All Committees Meetings

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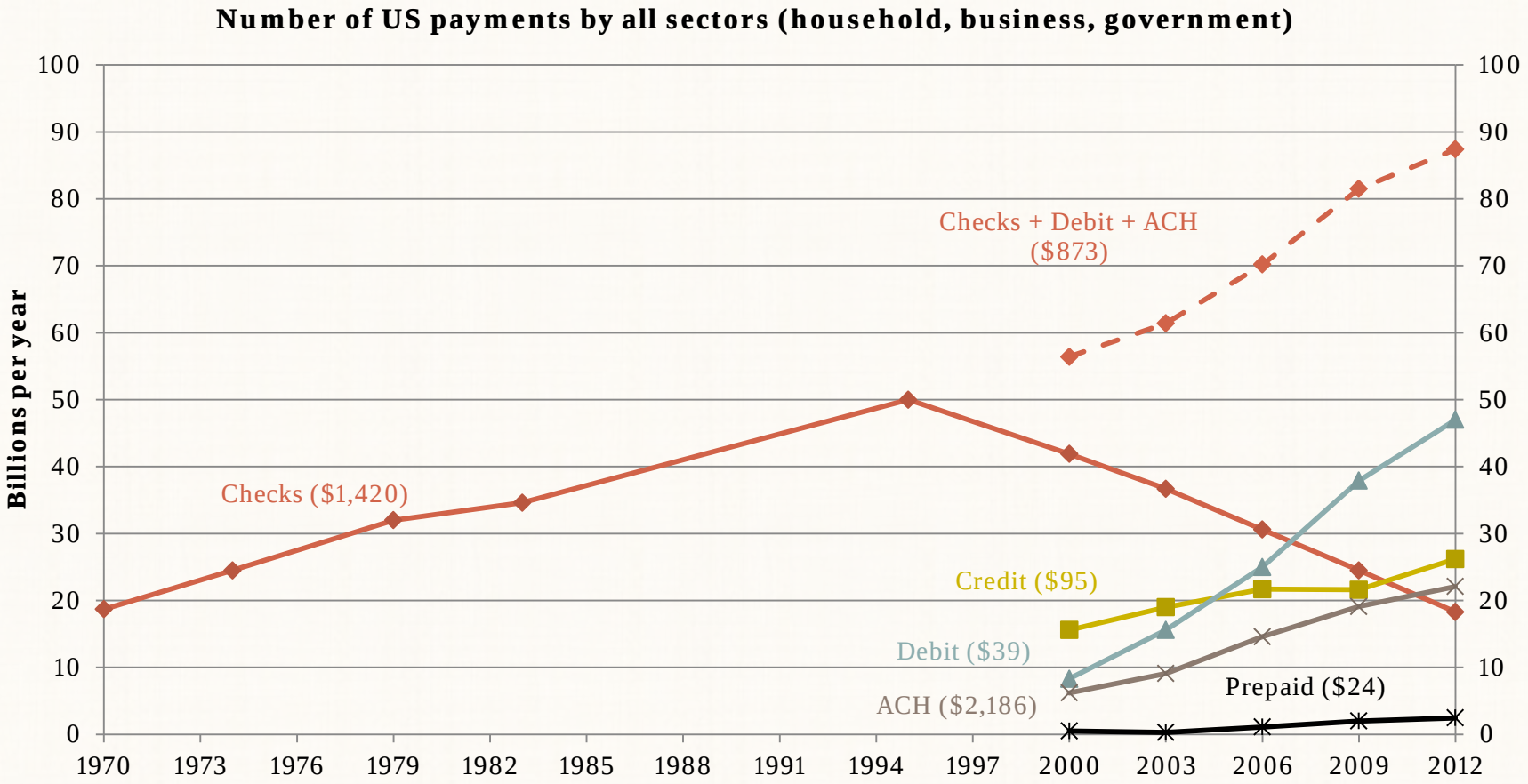
Outline of my talk

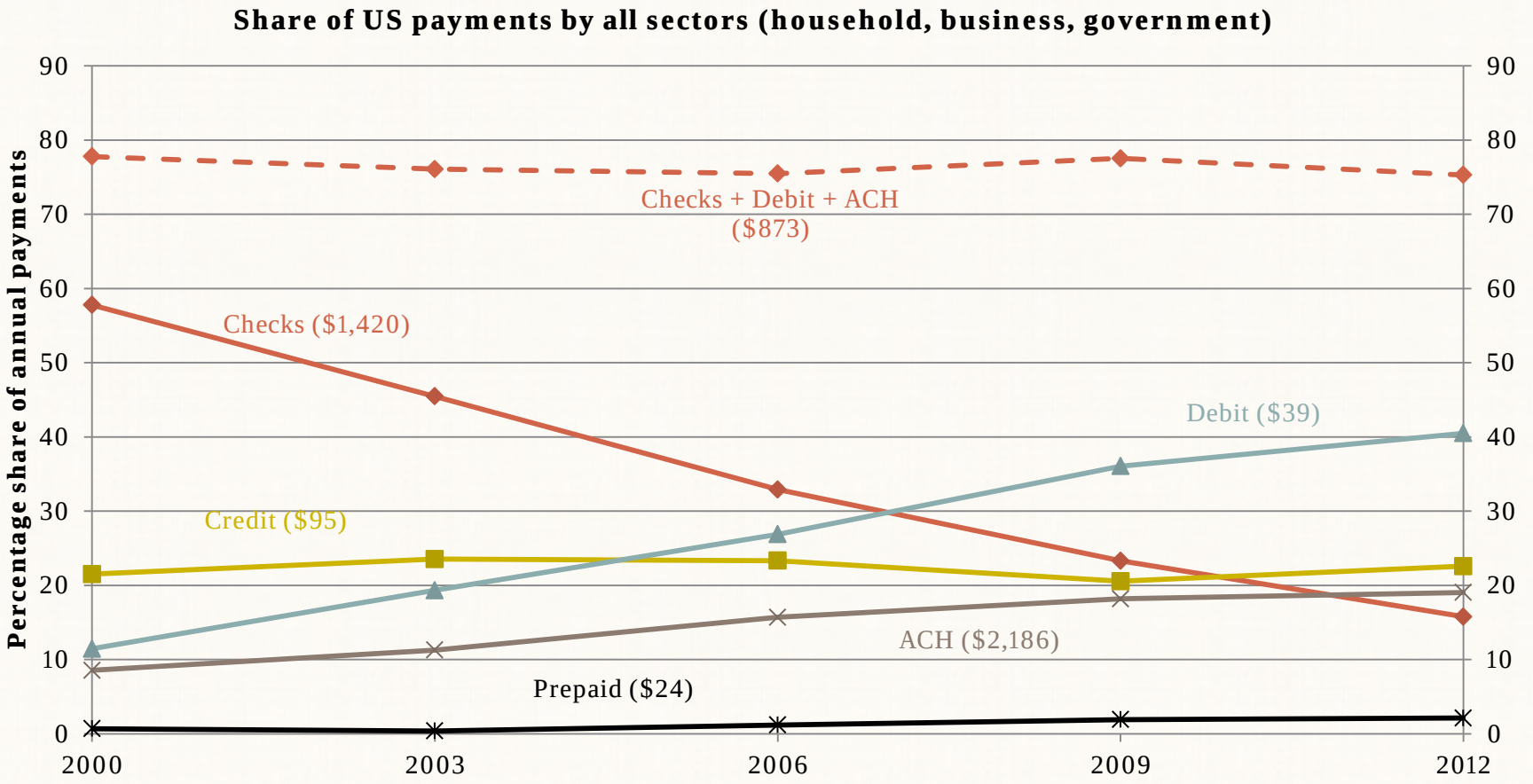
1. Data on use of “traditional” electronic payment instruments.
2. Why is there so much interest in e-cash, virtual currency, and faster payments?
3. Economics of medium of exchange, commodity money, fiat money, and cash.
4. The differences between e-cash and virtual currency.
5. E-cash cards.
6. Virtual currencies: Bitcoin and alternatives.
7. Faster payments service and account-to-account transfers.

Transformation of U.S. noncash payments: From paper to (traditional) electronics (volume)



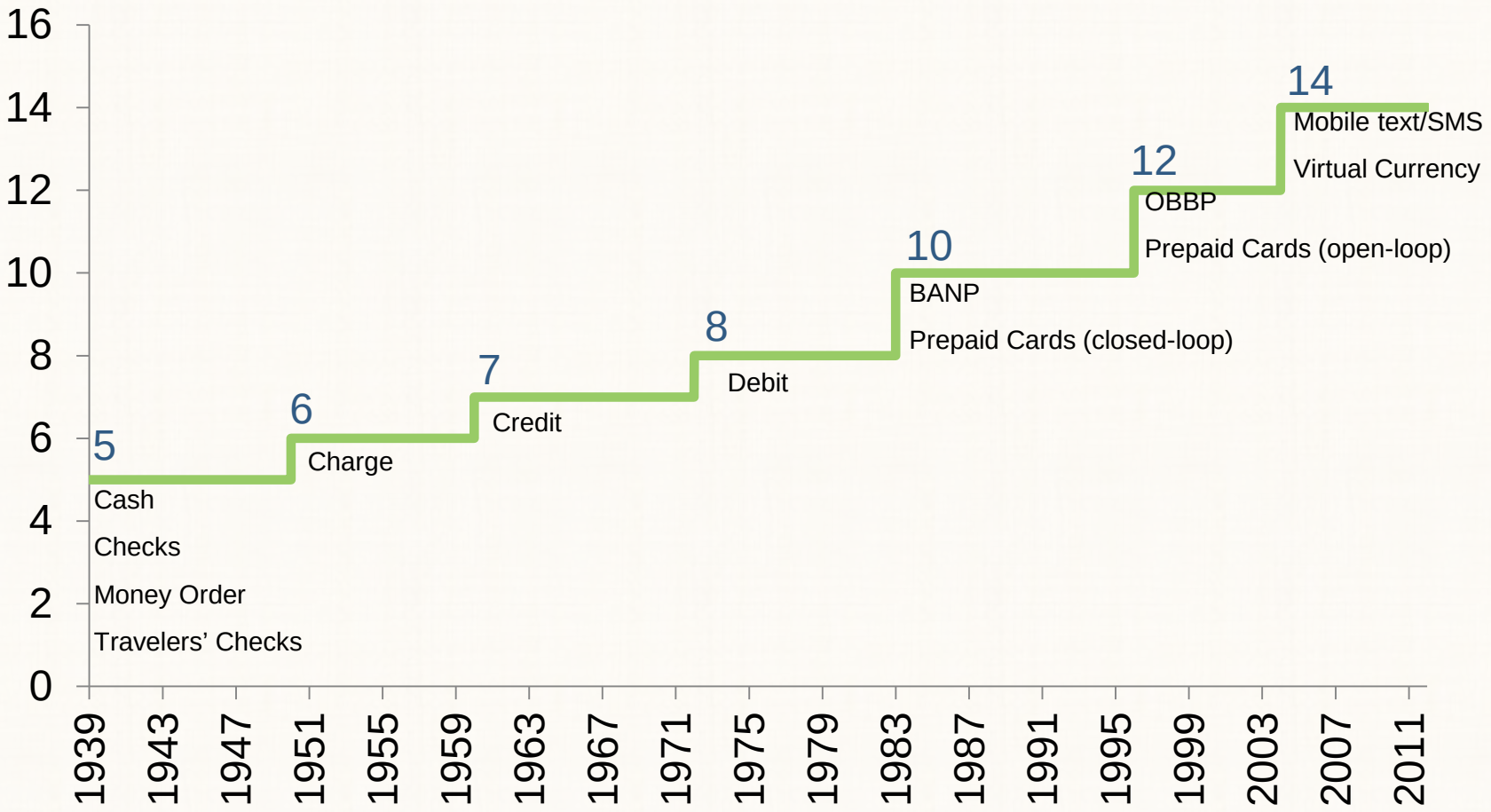
Source: Federal Reserve Payment Study (FRPS); (indicate average payment value in 2012).

Transformation of U.S. noncash payments: From paper to (traditional) electronics (shares of vol.)



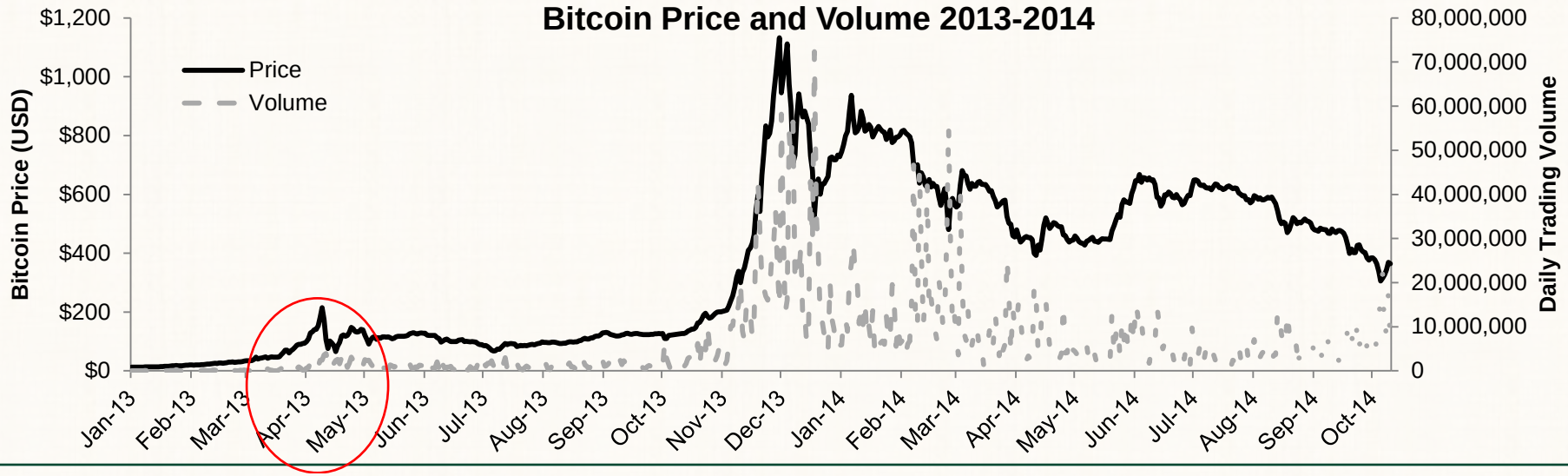
Source: Federal Reserve Payment Study (FRPS); (indicate average payment value in 2012)

U.S. consumers have more payment instruments to choose from:



Why is there so much interest in e-cash and virtual currency?

- Most alternatives to notes and coins are costly (interchange fees on debit and credit cards; usage fees on prepaid cards)
- Notes and coins have unique characteristics that consumers desire (anonymity, accessibility, no direct transaction fees, immediate settlement, no debt):
  Are there virtual or portable electronic devices that also have these properties?
- Internet access, reliability, and speeds are rising; encryption improvements
- The explosion of mobile devices with significant processing power
- Bailout (or non-bailout) of failing banks during crises (March 2013 Cyprus crisis)



What is cash?

Cash may have several characteristics such as:

- Physical aspect (notes and coins versus digital)
- Liability and backing:
  Sovereign government (outside money) versus private money (inside money, e.g. BerkShares)
- Asset value

Purposes and functions of cash (the commonly-used textbook explanations):

- Medium of exchange (our primary focus today)
- Store of value
- Unit of account

Medium of exchange

- Trading parties must agree on a common medium of exchange
- An increase in a medium's popularity is referred to as "network effects"
- Radford (*Economica*, 1945) describes how cigarettes (commodity money) served as a medium of exchange in a POW camp during WW2
- Radford noted that even after the Red Cross distributed dollars, cigarettes (commodity money) remained the dominating medium of exchange
- So, how would you like to trade today?

With

Or

?

Why do people hold a particular (or any) *Fiat* currency ? (the most difficult question in monetary economics)

Why is it such a difficult question?

- In 1971, President Richard Nixon officially took the U.S. off the gold standard:
  $1 today can buy only 1/6 of the gold it could buy in 1971
- We use *fiat* ("it shall be" in Latin) money
- "Legal tender" does not guarantee that a currency can maintain its value relative to goods, services, or other currencies (may even not guarantee trade)

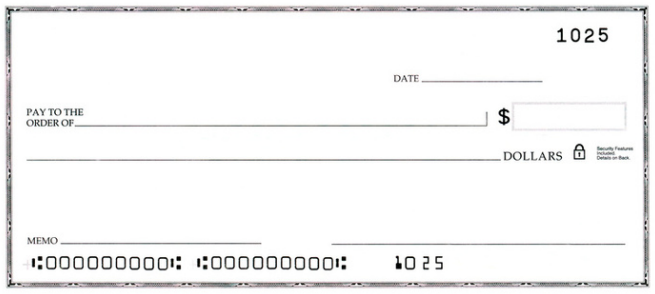
Four (out of many) common incomplete explanations include:

- Governments accept tax payments only in that country's fiat currency
  For example: Form 1040 must be filed in $ (not Euro and not Bitcoin)
- Implicit or explicit (legal tender) social norm (but could be unstable), i.e., both parties accept it
- Hedge against other currencies (exchange-rate fluctuations)
- Hedge against alternative payment options not being accepted / available

Elaborating on: “Alternative Payment Options Not Acceptable” (We re-entered an era of “barter” with so many instruments!)

Economic theory suggests that

the introduction of *fiat* money could be welfare improving because it solves the “double coincidence of wants” problem (avoid missing trading opportunities because the parties *cannot agree* on a common medium of exchange)



Will e-cash and virtual cash replace physical cash? (It's partly a chicken and egg question)

- To replace physical cash, would-be alternatives must replicate (ideally, improve on) the features that make it attractive to users, including, particularly, its ubiquity
- Ubiquity is the result of what economists call "network effects"; here are a few formal definitions:
  - Technologies are said to be *compatible* if they can "work together," in which case we say that they adhere to the same *standard*
  - Network effects are the benefits users derive from an increase in the number of other consumers and/or merchants who adopt the same (or a compatible) standard
- Of course, this begs the question of what gives rise to positive network effects and a successful alternative to cash…

Two types of digital money: E-cash vs. virtual currency*

E-cash

- Denominated in fiat currency
- Fully exchangeable for fiat currency on 1:1 basis
- Examples: Mondex-Visa, MintChip

Virtual currencies (VC)

- Denominated in their own unit of account
- May or may not be exchangeable to fiat currency; if exchangeable, typically at variable exchange rates
- Examples: Bitcoin, Facebook Credits, Linden Dollars, Amazon Coins

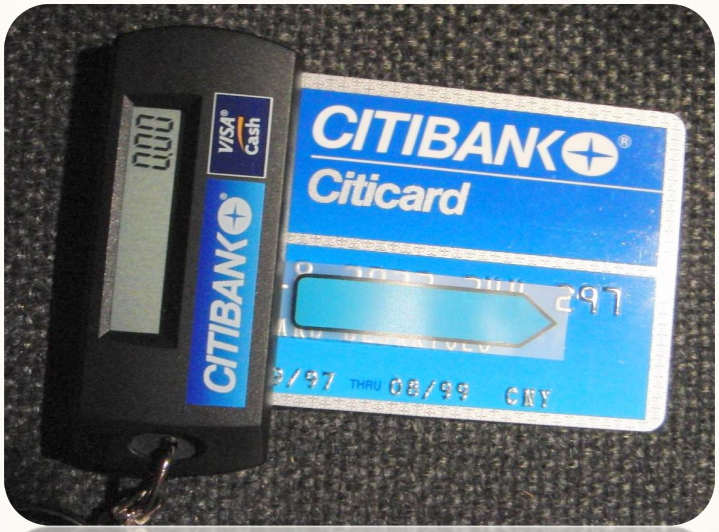
Summary of money types:

	Physical (notes & coins)	Digital
Not government backed	**Private money**	**Virtual currency**
Government backed	**Cash**	**E-cash**

* *Note*: There is no agreement on how to define "e-cash" and "virtual currency"; these classifications are mine and for this presentation

E-cash: the Mondex and Visa Cash experiments in the 1990s

- In the late 1990s developers envisioned anonymous e-cash
- Dec. 31, 1998: End of a 15-month experiment in NYC by Mondex & Visa Cash
- Chase and Citi distributed the cards with a loading capacity of up to $500 at ATMs
- 675 merchants received free terminals, 96,000 cards were issued (Upper W. Side)
- Some foreign cities participated. Swindon, UK was chosen as “typical” city
- The experiment ended because of below-expectation adoption rates



Incomplete sample of worldwide adoptions of e-cash cards (multiple standards).

Netherlands

Germany

Belgium

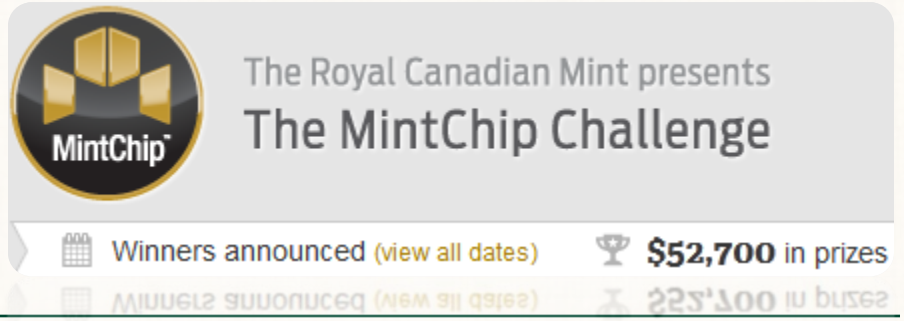
Hong Kong

US military (closed loop)

Denmark

E-cash and government initiatives: the Royal Canadian Mint Project

- MintChip was initiated in 2012 by the Royal Canadian Mint
- The private sector was invited to develop all forms of apps
- The MintChip could be attached SD cards and other mobile formats
- The balance (dollars) is on the card (therefore, “true” e-cash)
- The card contains a private key signed by the Mint
- E-cash properties: theft-proof (but not loss-proof, just like notes and coins)
- Next, to be auctioned to the private sector



Virtual Currency: bitcoin

- "Open source" money: Anyone (governments included) can copy and use the software to create her/his own virtual currency (since 2009)
- Security is also open source and openly discussed
- The value used to fluctuate sharply probably because of the low trading volume
- "Mining" designed to reward individuals for connecting high-performance servers
- International as the Internet (like a social network)
- Long-term cap on the money supply: 21 million bitcoins
- Currently, about 14 million "in circulation"
- Divisible to the 8th digit (for small transactions)
- 2013/11: First ATM (Canada)

BTC/USD - Bitcoin US Dollar BTC-e

385.97 -12.33 (-3.10%)

19:23:55 GMT - Real-time Data. (Disclaimer)

Volume: 8,010 | Bid/Ask: 385.31 / 386.20 | Day's Range: 380.00 - 405.60

General Chart Technical News & Analysis Forum

Overview | Historical Data | Currency Converter

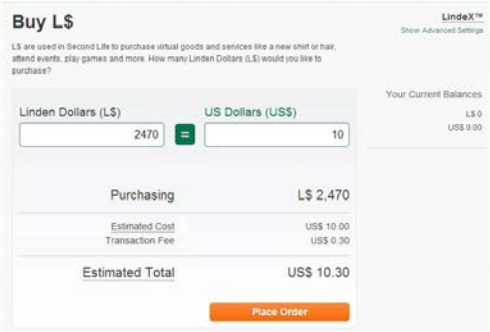
BTC/USD Historical Data

Time Frame: Daily

Date	Last	Open	High
Oct 15, 2014	386.18	397.39	397.89
Oct 14, 2014	397.39	385.00	408.20
Oct 13, 2014	385.00	375.01	392.61

More on virtual currencies (VC)

- There are at least 150 virtual currencies, not backed by any government, including, for example, social networks (Facebook credit), games (Linden dollars in Second Life), Shopping (Amazon Coins)
- Some are exchangeable to dollars (one- or two-way), some are not
- FinCEN may require registration as a Money Service Business (MSB) for convertible VC (in addition to state-by-state money transmitter registration)
- ECB concluded that VC will not impact price stability (still too small)
- Less regulation in Europe and the UK than in the US



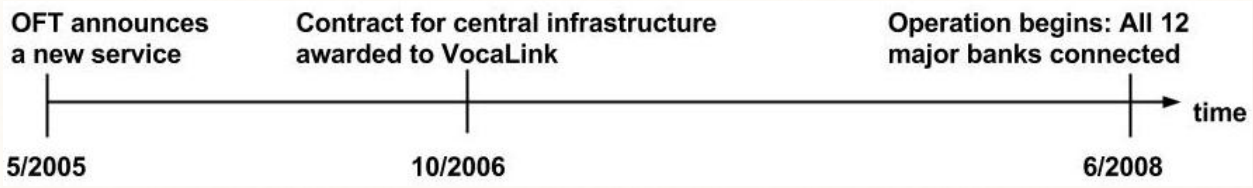
Assessing the likelihood of positive network effects: a few considerations

How well do the e-cash and virtual currency options replicate / improve on some of cash's attributes?

- Anonymity:
  - Bitcoin designed to be decentralized and anonymous
  - E-cash options can be designed without reference to central account
- Confidence in maintenance of value (credit risk):
  - Bitcoin designed to limit supply
  - Other models depend on creditworthiness of issuer
- Ease of use / acceptance:
  - May depend on convertibility to fiat currency, as well as technology that must be deployed by users
  - Typically better than cash for digital transactions
  - Regulation / taxation (or lack of clarity about regulation / taxation) can affect acceptance (warning issued by the CFPB about Bitcoin)

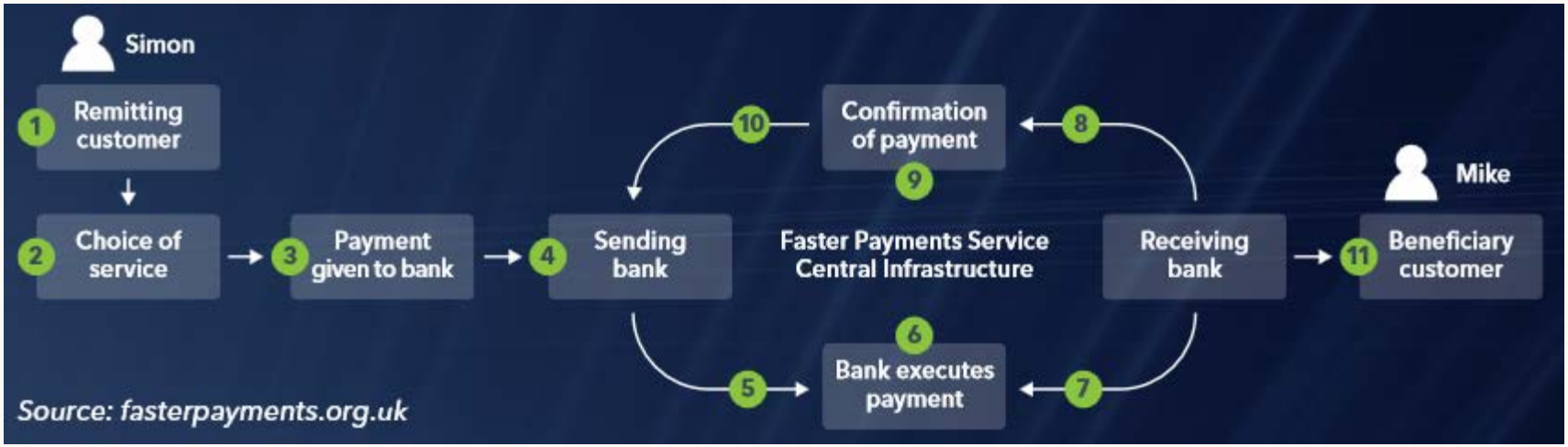
Faster payment service (FPS): Account-to-account (A2A)

- US consumers are not used to A2A transfers to other bank accounts (under different account ownership)
- People are not eager to exchange their bank account numbers (although people tend to write checks to anyone)
- This is not the case in countries with Giro tradition (no checkbooks)
- Most US banks either don't allow it, or charge high fees
- In 2005, the Office of Fair Trading (UK) "asked" banks to shorten the float period of payments
- In 2008, the UK FPS started operating by 12 banks. Timeline:



Faster payment service: Protocol: 1-2 seconds

- Simon (bank A) sends £1, or £10,000, or £100,000 (limits vary)
- Mike (bank B) is credited within 1-2 seconds
  (15s maximum or sender is notified to redo it)



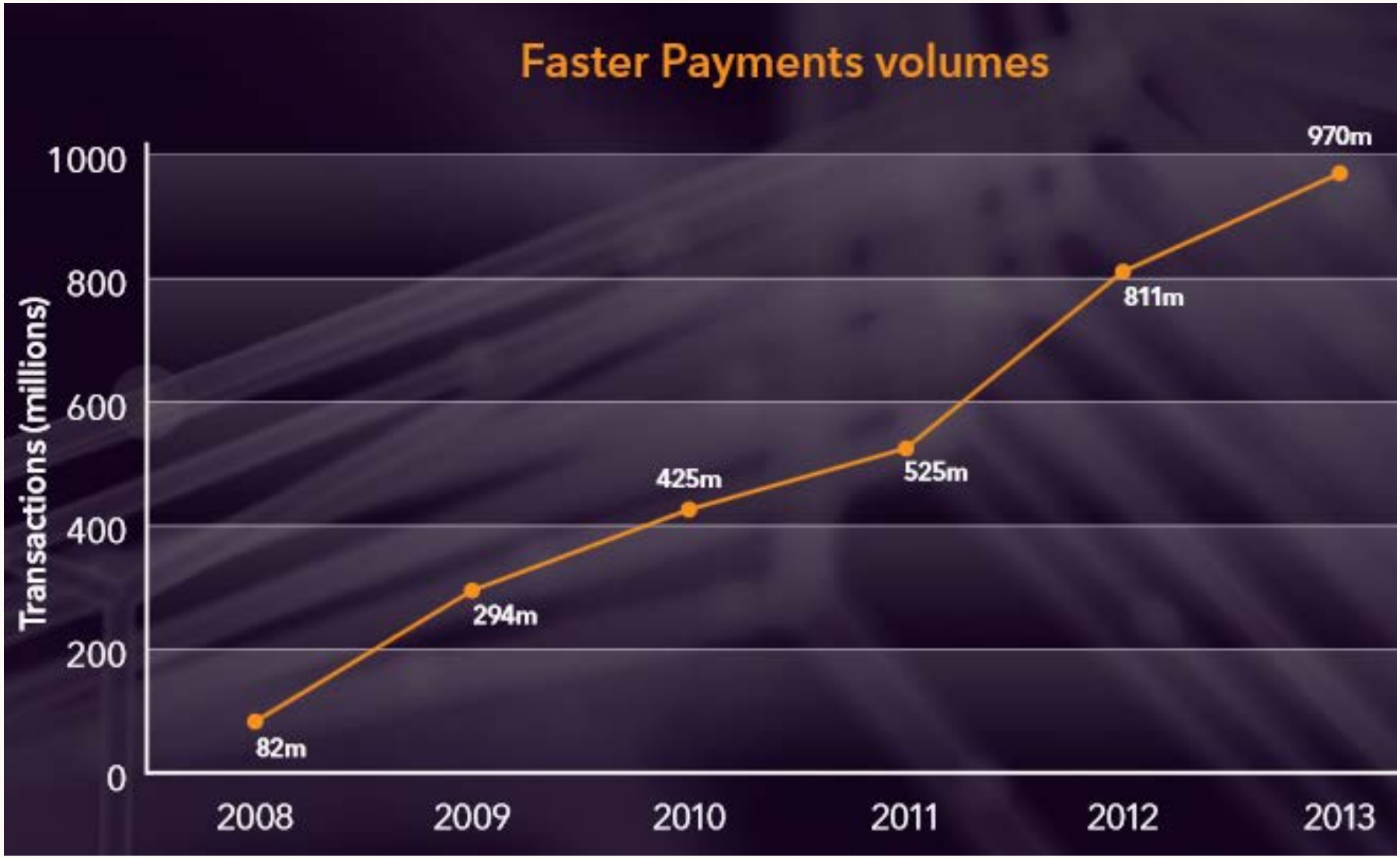
- Sending bank checks for “good funds” and accepts/rejects
- FPS infrastructure checks the validity of the “sort” code
- Receiving bank confirms recipient's account and credits Mike’s account

Faster payments service: Method

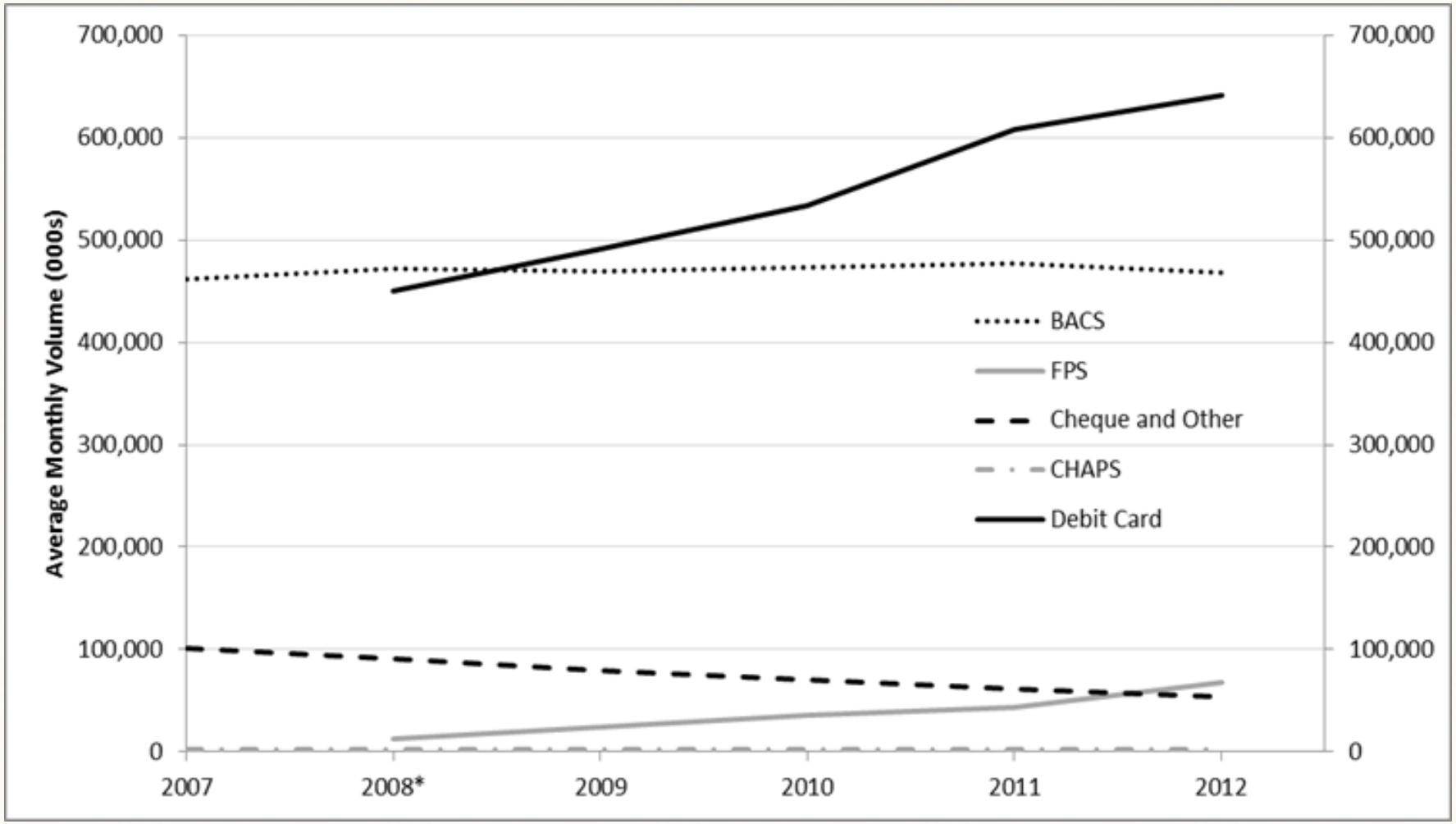
- Settlement (3 times daily, via Bank of England) was separated from clearing (immediate)
- Banks provide instantaneous credit to fund recipients
- Mobile applications (Paym) began in 2014. ISO 20022 compatible

- So far, not used very much at the point-of-sale. Free for users, so no revenues are made as of now (5 years)
- In the US: Sept. 2013, the Fed published a consultation paper asking for comments on how to reform the US payment system, see http://fedpaymentsimprovement.org/

The UK FPS: How it is used

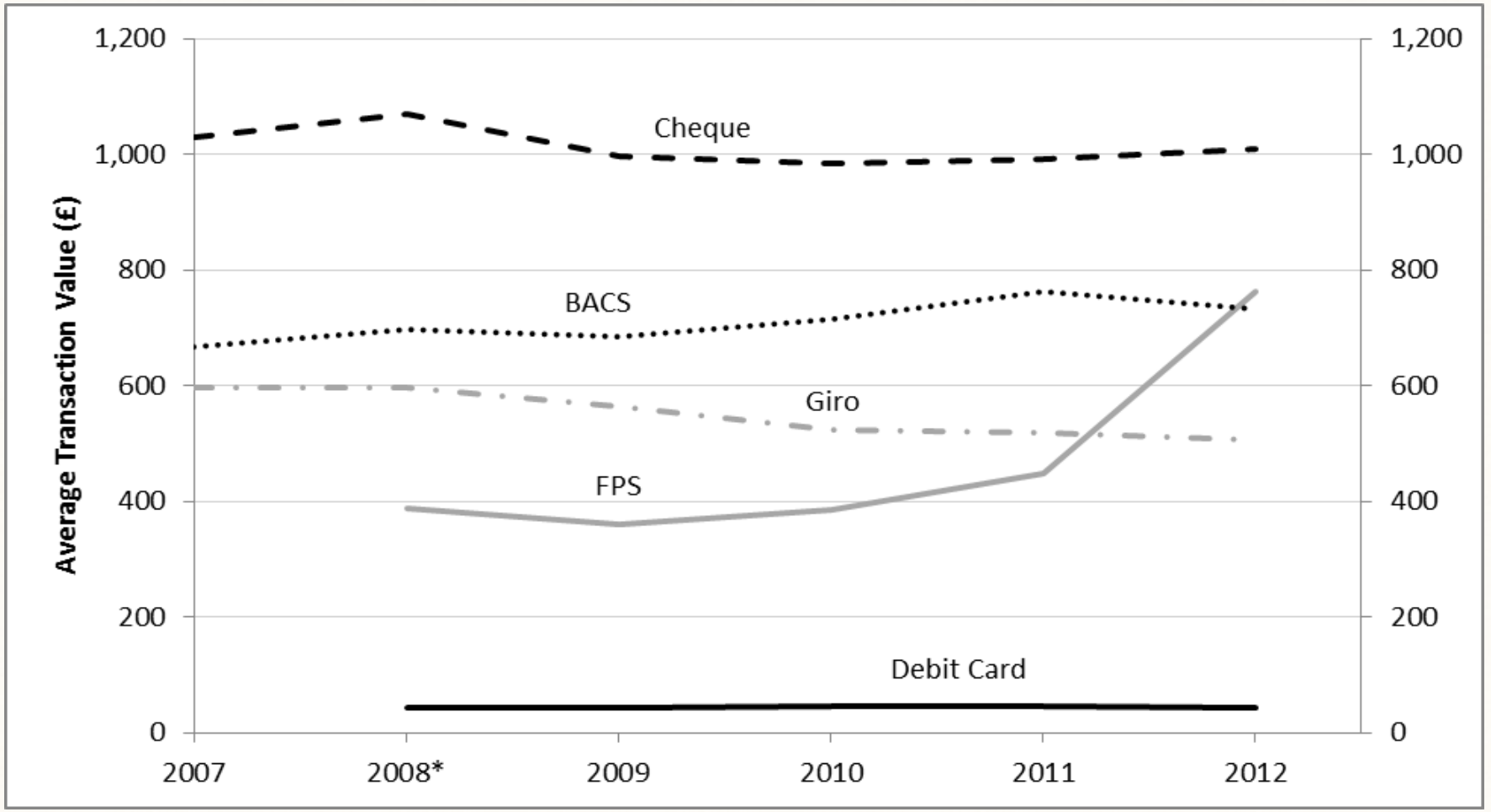


The UK FPS: How it is used (number of transactions)



Note: Debit card volume continued to climb

The UK FPS: How it is used (avg. transaction value)



Note: FPS average transaction value has increased sharply

The UK FPS: Some additional (anecdotal) benefits

- Renters who are late paying rent
- Taxpayers missing a deadline
- Parties to a one-time transaction (unlikely to meet again and need an immediate confirmation)
- Small business: A car mechanic needs a new carburetor today! Supplier won't ship the part until payment is received
- Small business: Paying workers for overtime on the same day
- Government: Weekly unemployment compensation to part time workers who can report how much time they actually worked only at the end of the week
- Individuals: Person-to-person in 2 seconds

Thanks for listening !!!

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