



UNIVERSITY *of* NICOSIA

MSc in Digital Currency

Digital Currency and Financial Institutions

DFIN-511

Introduction to Digital Currencies

Session 9: Digital Currency and Financial Institutions



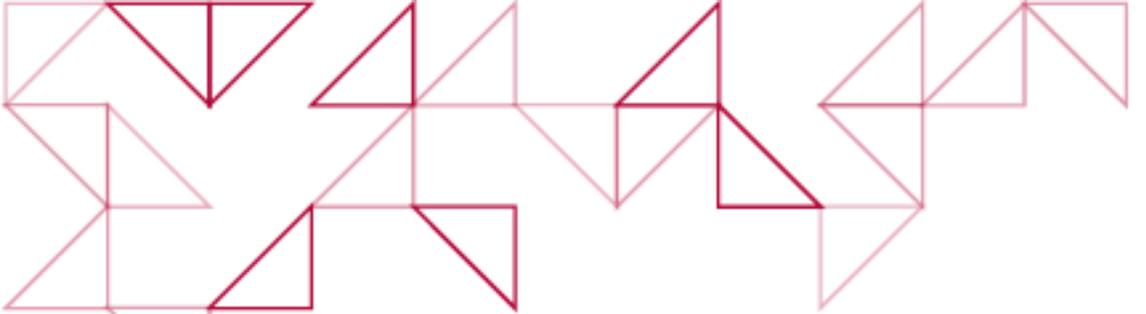
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Session Objectives

- ▼ Briefly summarize existing financial services as an introduction
- ▼ Explore cryptocurrency financial services as they are at the moment, i.e. exchange centers, merchants and wallets for cryptocurrencies
- ▼ Understand the opportunities behind payment as a process with the use of cryptocurrencies

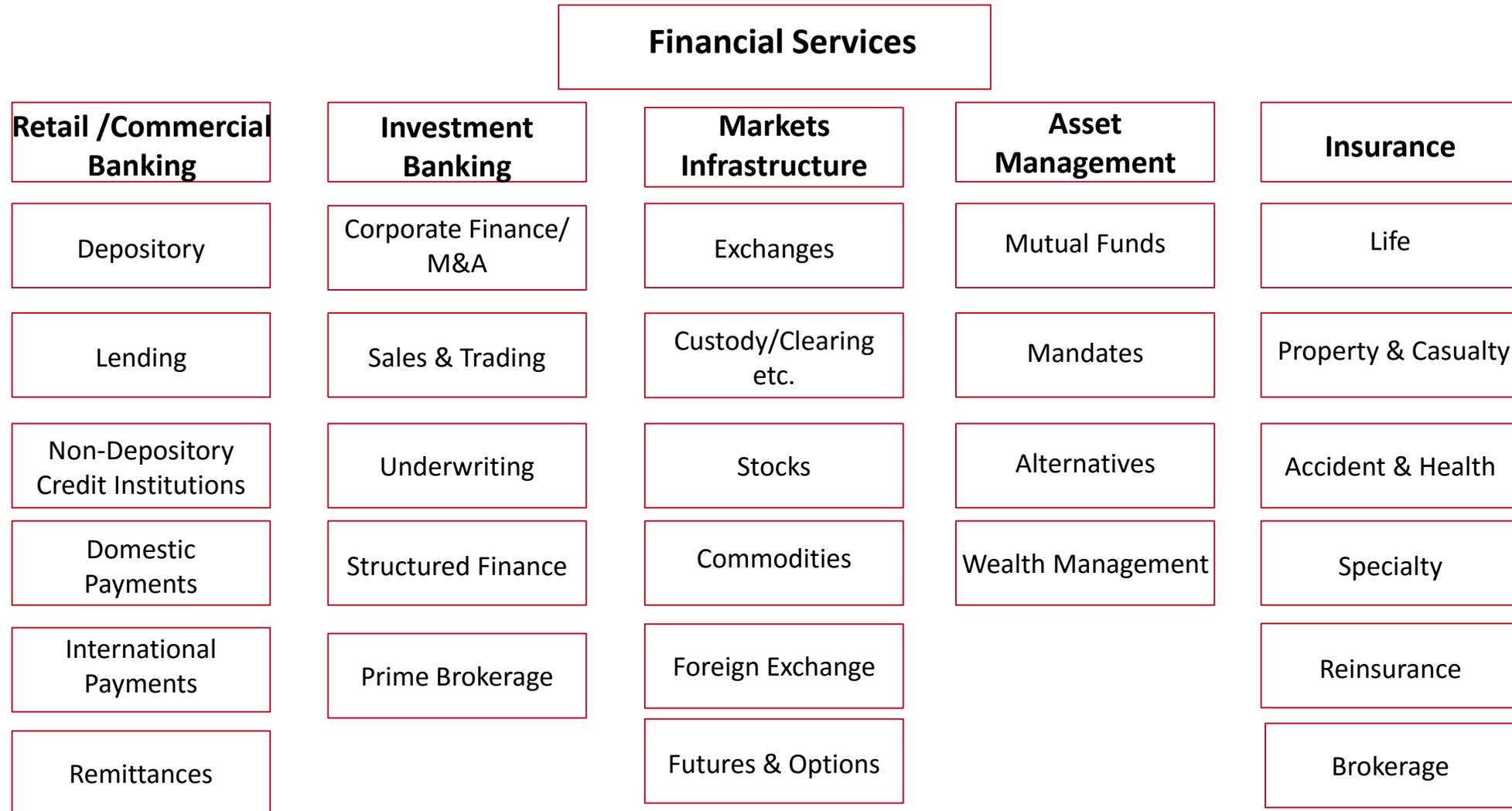
Agenda Session 9

- ▼ Existing Financial Services: Some Brief Notes
- ▼ Early areas of cryptocurrency financial services
 - ▼ Exchanges
 - ▼ Wallets
 - ▼ Merchant Processing
 - ▼ Asset Management
- ▼ Payments Opportunities?
- ▼ The lower levels of Financial Systems and the future
- ▼ Conclusions
- ▼ Further Reading



Existing Financial Services: Some Brief Notes

What is Financial Services?



Financial Services are well developed...

Financial services: Strengths

- ▼ Hundreds of years of financial systems development has lead to a very developed and sophisticated field, serving many different needs
- ▼ Most consumers in developed countries have a friendly consumer environment:
 - ▼ Generally, taxpayer protection for deposits <\$100K or so
 - ▼ Generally, consumer protection for misuse or fraudulent use of payment systems
 - ▼ Makes use of financial system low-risk for an individual user
- ▼ Regulation and taxation is quite clear
- ▼ Significant trust in financial institutions
- ▼ Costs well hidden from consumer and mutualized. Fraud and customer reward costs (aka airline points) are embedded in merchant processing fees and not directly seen by consumer (instead they enter the cost of products)

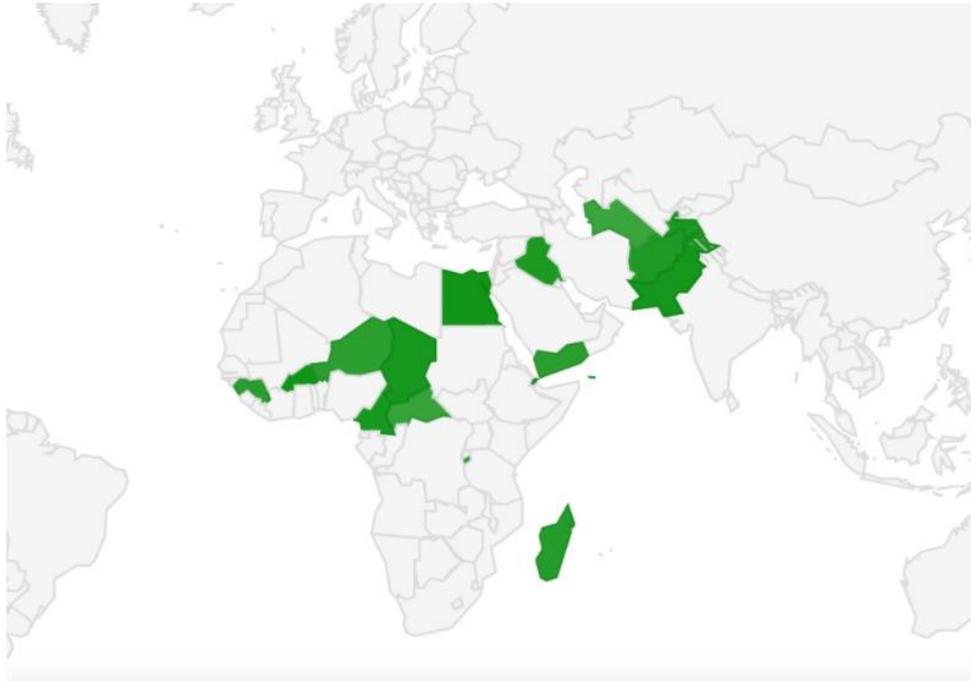
..but have significant gaps

Financial Services: Areas for Improvement

- ▼ Large number of people still unbanked, even though the proportion of people with bank accounts worldwide grew from 51% to 62% between 2011 and 2014 according to World Bank Data.
- ▼ Unbanked: 60M in high income OECD countries, 2B worldwide
- ▼ India is home to about 21% of the world's unbanked population and China to about 12%.
- ▼ Mixed performance of payment systems. Certain countries have near real-time payment systems (aka Faster Payments in UK) but the United States lags substantially (ACH payments take 1-3 days)
- ▼ Major security and fraud costs: Credit card security model not well suited for the electronic age (equivalent of "private key" on card in basic model). Tens of billions of losses annually mutualized and ultimately paid by the consumer
- ▼ Mixed performance on remittances. Some country pairs are very competitive and low cost. Others cost 10-12% of transaction. No viable method for small international remittances
- ▼ Cyprus "bail-in" in 2013 was the first bail-in of national systemic banks. A one-time occurrence or an ongoing risk?
- ▼ The financial sector in the US, Europe since 2008 has required massive taxpayer support to avoid collapse

Areas for Improvement

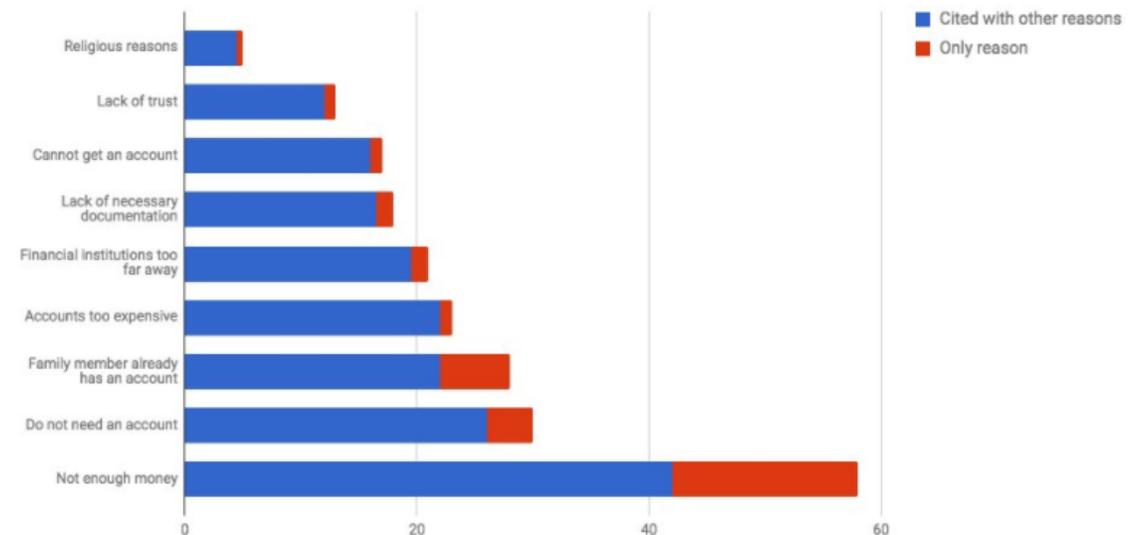
This map shows the countries where less than 15% of the population has a bank account.



Data from World Bank

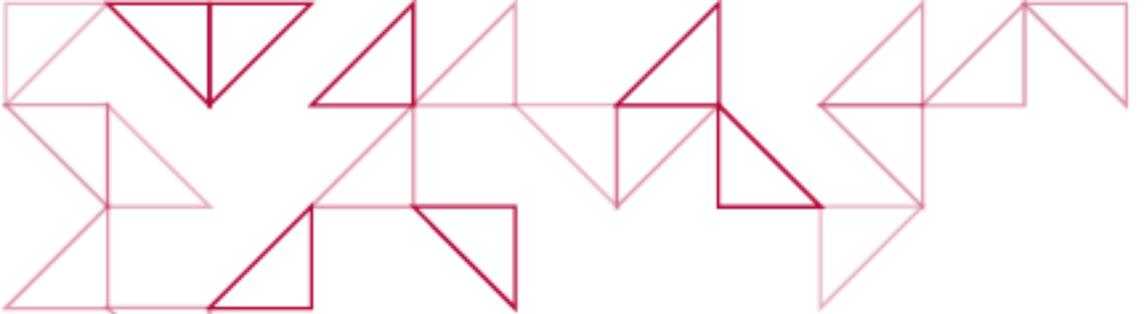
Finally, the most common reason people cited for not having a bank account was they did not have enough money, with only 4% of people saying the only reason they didn't have one was because they didn't need one.

Adults without an account reporting barrier as a reason for not having one (%), 2014.



Data from World Bank

Source: <http://www.businessinsider.com/the-worlds-unbanked-population-in-6-charts-2017-8/#finally-the-most-common-reason-people-cited-for-not-having-a-bank-account-was-they-did-not-have-enough-money-with-only-4-of-people-saying-the-only-reason-they-didnt-have-one-was-because-they-didnt-need-one-6>



Early areas of
cryptocurrency financial services



Financial Services: Representative Figures

- ▼ Financial Services is the most profitable industry in the United States (US Department of Commerce):
 - ▼ In 2016, finance and insurance represented 7.3 percent (or \$1.4 trillion) of U.S. gross domestic product. This makes the U.S finance market the largest and most liquid in the world.
 - ▼ <https://www.selectusa.gov/financial-services-industry-united-states>
 - ▼ 6.2 million people were employed in the financial services and insurance sectors in 2016
 - ▼ It generates between 30-40% of all US industry profits. This likely reflects some level of barriers to entry in the system
 - ▼ Total Global Assets Under Management: \$63T rising to \$102T by 2020 ([PwC 2020 Asset Management Report](#))
 - ▼ Currency Trading: \$5.3T per day, \$220 billion per hour (Bank for International Settlements)

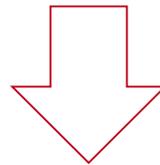


This is why some investors are excited about cryptocurrencies – even a small penetration of financial services is a huge opportunity

Cryptocurrency financial services

Cryptocurrency Industry: Representative Figures

- ▼ Total Industry Revenue: Less than \$10B per year, the large majority in mining, exchanges
- ▼ Total value of all cryptocurrencies: ~ \$170B
- ▼ Total Daily Trading Volume in cryptocurrencies is less than \$6B per day
- ▼ Source: www.coinmarketcap.com



Tiny in traditional terms, but still rather remarkable given that Bitcoin was just a white paper about 8 years ago. Last years the figures were much lower e.g. approximately \$27B total value of all cryptocurrencies and total daily trading volume less than \$1B

This is due to the open nature of cryptocurrency – in traditional financial services access to “payment rails” is strictly controlled

Cryptocurrency financial services

First wave of cryptocurrency financial services startups focused on four areas:

Cryptocurrency Institutions

Existing Equivalent

Cryptocurrency Exchanges



Global FX Market

Wallets



Depository Accounts
(storage and payments functions)

Merchant Processing Services



Money Transmitters

Merchant Processing Services

Cryptocurrency Funds

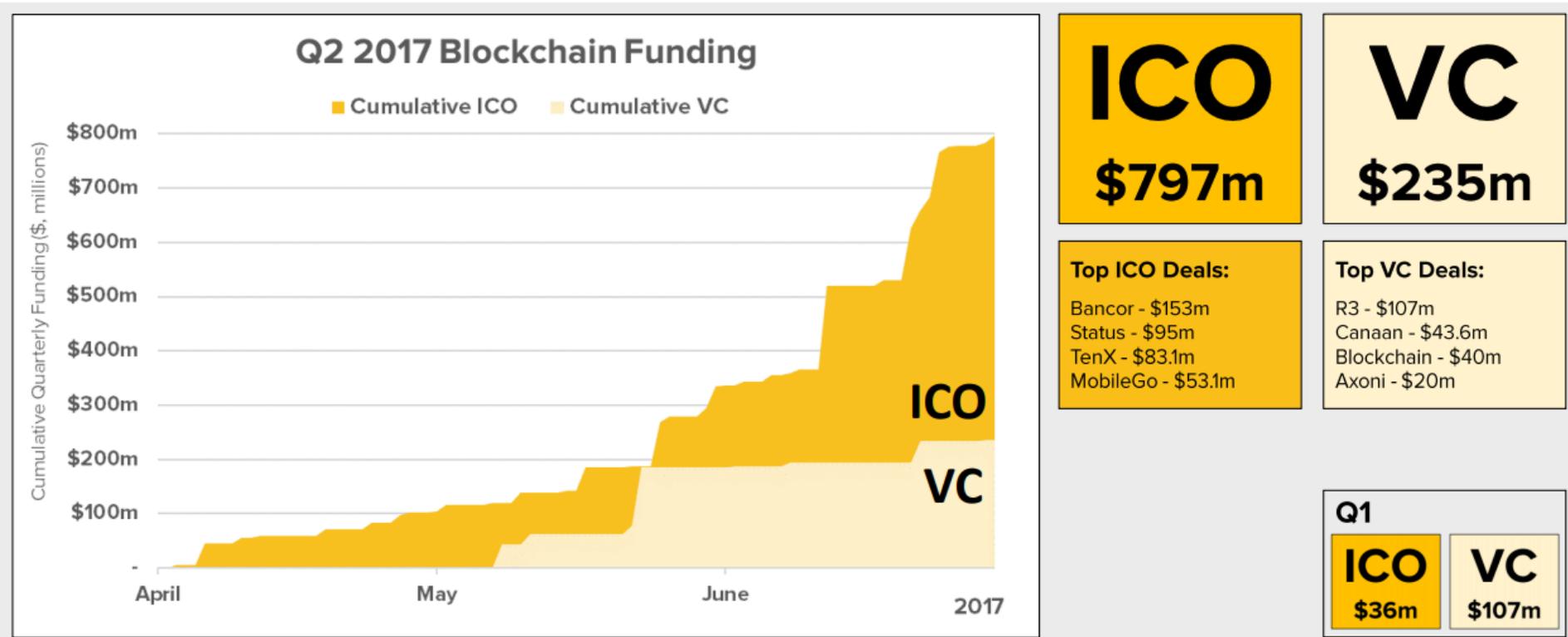


Investment Funds

Investments



Blockchain Funding Grew Dramatically in Q2, ICOs Exceeded VC by Over 3x

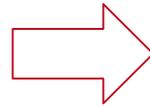


Source: https://media.coindesk.com/uploads/2017/09/state_of_blockchain_q2_2017.pdf

Foundational services in Bitcoin

Wallets

Exchanges



Merchant Tools
(for processing payments)

▼ These three technologies are the fundamental building blocks of cryptocurrency financial services.

▼ Once they exist in a mature format, they will be the backbone of the payments system and will allow higher order applications. All more advanced financial products will benefit from greater underlying liquidity, superior security and better user experiences.

▼ As such and in aggregate, they will serve as the payments infrastructure for cryptocurrency, taking on the role of the following areas in the traditional sector:

Cash		Checks		Debit Cards		Payment/Clearing House
Networks		Wire Transfers		International remittances		
Merchant Processors				Foreign Exchange		

Foundational metrics in Bitcoin

October 24, 2017

BITCOIN

- Market Capitalization \$95,847,667,046
- Price \$5758.96
- Supply 16,643,225 BTC

TRANSACTION METRICS

- Confirmed BTC Transactions the past 24 hours 339,991
- Exchange Traded Volume \$633,277,065
- Transaction Fees per Block 1.14355317 BTC
- Average Number of Transactions Per Block 1849

NETWORK GROWTH METRICS

- Blockchain Size (GB) 138,192
- Reachable Nodes 10,317
- Unique Address Count 640,545
- Wallet User Count 17,910,984

MINING METRICS

- Network Hash Rate (TH/sec) 10,173,284
- Difficulty 1,123,863,285,133
- Average Mempool Transaction Count 16,170
- Average Mempool Size Growth (Bytes/sec) 3,714

Wallets

Exchanges

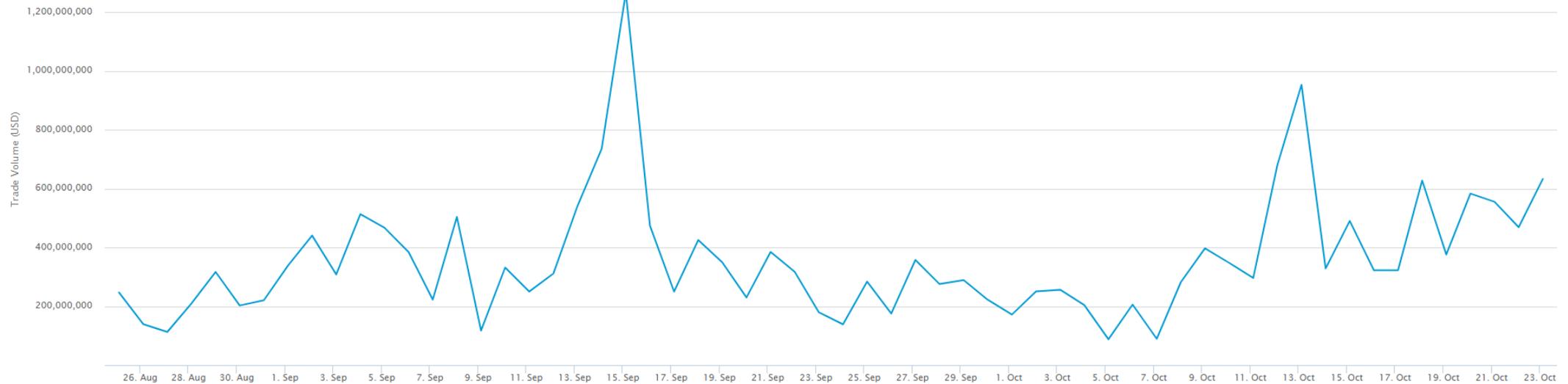
Merchant Tools

(for processing payments)



Foundational services in Bitcoin

EXCHANGES



Source: <https://blockchain.info/charts/trade-volume?timespan=1year>

Merchants – BitPay Use Case

- BitPay's merchants are receiving \$110M+ in bitcoin payments per month.
- BitPay merchant [NewEgg](#) has more than doubled its bitcoin sales from last year. Many other merchants are receiving over a \$1M a month in payments from customers. Precious metals broker [JM Bullion](#) gained nearly \$4M in bitcoin sales in the month of June alone
- When BitPay merchants announce that they are accepting bitcoin payments, they often see an increase in new customers from the bitcoin world. BitPay is charging 1% compared to 2-3% fees charged for credit card transactions.
- **BitPay Merchants**



- Source: <https://blog.bitpay.com/bitpay-growth-2017/>

Cryptocurrency Exchanges

Representative Firms

BITFINEX

kraken

BITSTAMP

BTCChina
比特币中国

GEMINI

POLONIEX
CRYPTOCURRENCY EXCHANGE

bitFlyer
ビットコイン、世界とつながる。

itBit

GDAX

Overview

- ▼ Cryptocurrency exchanges allow users to buy or sell cryptocurrencies in exchange for one or more sovereign currencies. They are essentially the gateways in/out of the cryptocurrency world from the existing financial system.
- ▼ To date, they have had a checkered history, as many of the early exchanges, have suffered attacks and bankruptcy, including the well known case of Mt. Gox, resulting in several millions in lost customer funds.
- ▼ Exchanges only exist for few currency pairs, primarily USD, EUR, JPY and Yuan. Many of the large remittances markets are just beginning to develop exchange services (India, Philippines, Indonesia, etc. More on this on session 12). In most other cases, users often use LocalBitcoins, another ad hoc exchange service that connects local demand to local supply.

Cryptocurrency Exchanges: Issues/Areas for Development

- ▼ **Liquidity:** There is low liquidity in cryptocurrency markets relative to the traditional foreign exchange markets (about 3-4 orders of magnitude compared to traditional Forex Trading). This means it is hard to transact institutionally significant amounts of bitcoins. It also makes the markets more subject to manipulation.
- ▼ **Security:** Exchanges have been plagued with security breaches / loss of customer funds, a notable of them being [Bitfinex](#). Future developments will either model themselves on existing custodial models in traditional exchanges (see reading by Richard Brown), multi signature private key management and/or cryptographic proof of funds (like [Bisq](#) is doing).
- ▼ **Futures:** There is interest increasing in futures market in cryptocurrency, and some exchanges offer pairs in this direction. Futures provide the ability to lock in currency rates for future transactions and play an important role in reducing volatility in any asset class.
 - ▼ <https://www.bitmex.com/>

Cryptocurrency Exchanges: Issues/Areas for Development

- ▼ **More currency pairs:** For cryptocurrencies, there are very few currency pairs that are even marginally liquid – each currency area will need at least 1 liquid exchange for cryptocurrency to reach its potential.
- ▼ **Regulatory Environment:** There is still significant lack of clarity (globally and regionally) on exactly what requirements cryptocurrency exchanges need to comply with. New York State has produced a “Bit License” which we will discuss in the next session.
 - ▼ Legality of Bitcoin by country/region: https://en.wikipedia.org/wiki/Legality_of_bitcoin_by_country_or_territory

Bisq

- ▼ [Bisq](#) claims to be a next generation decentralized trading platform, including both cryptocurrency and fiat currencies. In the same avenue as LocalBitcoins they aim to connect the buyers and sellers in as much a P2P as possible, without exclusive control over coins, funds or privacy credentials.
- ▼ In a manner not unlike [Open Bazaar](#), arbitrators are being used to ensure receipt of funds and the release of coins through multi-signature transactions. Arbitrators are incentivized to remain truthful as they have security deposits which far exceed the amounts traded (trades are capped at 1BTC). This still opens up chargeback concerns on the fiat side, therefore the most final ways of transferring fiat are preferable (and PayPal not used at all). Further decentralizing the arbitration system is in the works and should provide a complementary method of security together with a robust decentralized reputation system.
- ▼ Bear in mind, that using Bisq mandates already having some small amount of bitcoins to be able to lock as a security deposit (so that there's a so called "skin in the game") before you can engage in transactions. This makes it a useless way to buy your first bitcoins, but it provides with a more secure alternative to conventional exchanges once you have even small amounts of it.

More information on Bisq can be found [here](#), [here](#) and [here](#)

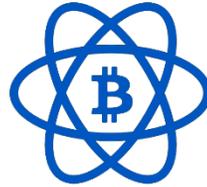
Cryptocurrency Exchanges: Decentralized or distributed

- ▼ Although a number of well-known exchanges have suffered or gone bankrupt, a new decentralized and distributed platform named [Coinffeine](#) emerged in November 2014.
- ▼ Coinffeine's innovation is that it is designed to work in a fully decentralized P2P manner, thus ensuring anonymity and increased efficiency, and without requiring a trusted third party.
- ▼ Coinffeine theoretically offers the same experience as a traditional exchange but in a fully P2P manner.

A fully decentralized exchange has been considered by many in the community as the holy grail of exchanges. Even if a transaction of exchanging bitcoins can be secured against counterparty risk effectively, the main hurdle might still remain: the exchange of fiat currencies for those bitcoins.

Wallets

Representative Firms



Overview

- ▼ Wallets provide users with a system to hold their cryptocurrency and to make / receive payments with their wallet. These wallets provide features or ease of access that the standard Bitcoin client wallet does not. Wallets are divided into three types, broadly speaking:
 - ▼ **User Hosted:** These are solutions (like Electrum and Mycelium) where the users exclusively hold the private keys (with or without a full copy of the blockchain). That means that the wallet developer cannot access or lose the users' coins or provide information to authorities about account activity. On the other hand, if the user loses his/her password or their wallet is otherwise compromised, there is no recourse and the coins are lost.
 - ▼ **Web Hosted:** Services like [Blockchain.info](https://blockchain.info) and [GreenAddress](https://greenaddress.com) provide encrypted wallet hosting on the web. The user takes advantage of their infrastructure to host locally encrypted private keys which the service cannot access. The user still runs a risk of a compromised computer or forgotten password.
 - ▼ **Fully Hosted:** These are solutions where the wallet provider holds the private key to a wallet. That means they can recover from password losses, but also means the user must trust the wallet provider not to lose the coins or share data with authorities. It is not clear in this situation if a user owns coins or just a claim against the company, but as a rule of thumb, coins you don't control the private keys of, are not yours! Multi-signature wallets (like Bitpay's [Copay](https://copay.io)) are an attempt to mitigate the former problem by creating multiple points of failure.

Wallets: Issues/Areas for Development

- ▼ **Exchange w/Sovereign Currencies:** Some online wallets offer a linkage back and forth to sovereign currencies without being full-blown exchanges themselves. The user experience of the current implementations of this concept is still quite slow and could use improvement.
- ▼ **Security/Insurance:** Consumers in traditional banking system have earned, over time, significant consumer protections, from FDIC insurance to the ability to not pay for fraudulent charges on credit cards. Certain wallet providers have started offering private insurance to start to replicate this protection, at least partially.
- ▼ **AML/KYC:** Many exchange/wallet services are implementing homegrown AML/KYC approaches. In time, one should expect practices in this regard to standardize.

Wallets: Issues/Areas for Development

- ▼ **Merchant Acceptance:** To date, while merchant acceptance is increasing in percentage terms, it is still small in absolute numbers. The two largest payment processors (Coinbase and Bitpay) were serving about 100,000 merchants that accept Bitcoin a year ago, compared to 29M merchants that accept Visa. After the latest classification of Bitcoin as a payment method in Japan, and further adoption of the concept this number has grown significantly since then.
- ▼ **Tax Reporting:** No wallets yet support the latest tax reporting requirements though that is expected to change rapidly. Payment processors like Bitpay offer a level of accounting system integration to businesses accepting Bitcoin.

Merchant Processors

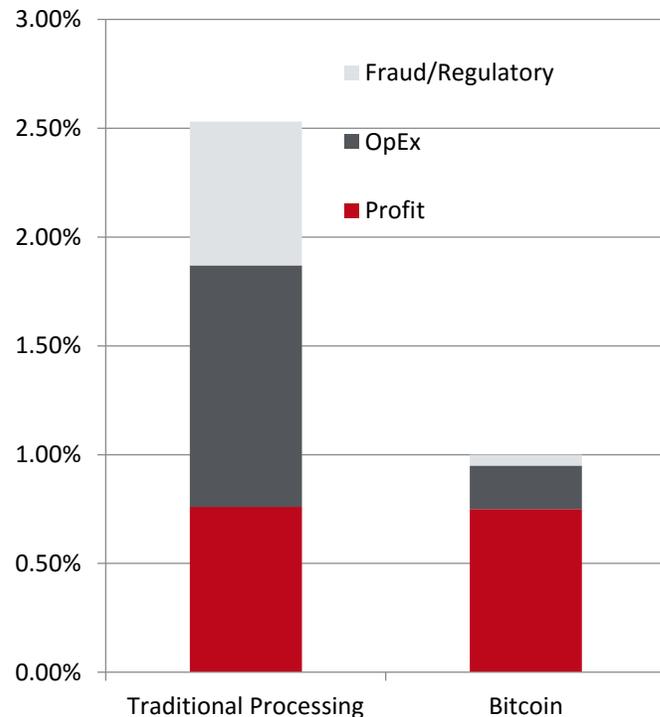
Representative Firms



Overview

- ▼ Merchant processors provide tools to merchants to accept payments in cryptocurrencies.
- ▼ They are almost directly analogous to the current merchant processors (First Pay, WorldPay, Elavon, Authorize.net, Square, etc) for current payment networks (Visa, Mastercard, American Express, Discover).
- ▼ These tools typically include integration with the merchant's website and shopping cart and then the option to convert the digital currency back to sovereign currency (with no exchange rate risk to the merchant).
- ▼ Current market prices are about 1% in processing fees (as opposed to 2-3% for credit card processing) or a monthly subscription model. These lower costs plus the publicity boost that accepting digital currency may entail have been driving merchant adoption.
- ▼ It is not clear exactly how much transparency there is about FX spreads to the consumer in these firms (a situation with some parallels to spending in foreign currency with a traditional credit card)

Today, Bitcoin merchant processing appears to have a cost advantage



Source: Goldman Sachs, "All About Bitcoin" report

- ▶ Bitcoin payment processing has a tremendous cost advantage on cost side.
- ▶ Fraud costs should be permanently lower in cryptocurrency as it has better security and is irreversible (no charge backs).
- ▶ It remains to be seen if compliance/regulatory costs rise over time.
- ▶ Some of the profit margins might be coming from opacity in bitcoin/sovereign currency exchange rates, allowing the merchant processors to arbitrage the consumer. It will be seen if that survives in a more liquid world.

Merchant Processors: Likely Initial Areas For Adoption

- ▼ **Online Products:** The major value proposition of digital currency merchant processing to date is lower costs. Online firms, particularly in categories like electronics, have notoriously low margins (< 5%). In that context, saving even 1% in merchant processing fees would have a significant impact on profitability.
 - ▼ The best-known example to date has been Overstock.com. It estimated that in 2014 (the first year it accepted Bitcoin), that \$20-\$30M of its \$1B in annual sales will be in Bitcoin. Projections were missed by a wide margin, and Overstock reported about \$3M in Bitcoin sales in 2014.
 - ▼ The fact that online products need to be shipped also means that transaction confirmation times are not relevant.
- ▼ **Sensitive Products:** Sensitive areas like medical spending (HIV tests, pregnancy tests), pornography, or political speech might be areas where consumers feel more comfortable transacting in cryptocurrency. Consumers might not want these transactions recorded along with the rest of their payment records and banking history.

Merchant Processors: Likely Initial Areas For Adoption

- ▼ **High-Risk Vendors:** Consumers concerned about giving access to their credit card/credit line to “risky” vendors can use cryptocurrency that uses a “push” model rather than a “pull” model. In other words, the customer's exposure is limited to the amount the customer proactively sends.
- ▼ **International Customers:** Many websites turn away customers from higher risk locations due to fear of chargebacks due to fraudulent card use. Given that cryptocurrency is irreversible, merchants can accept customers from any location without fear of fraud chargebacks.
- ▼ **Open Bazaar :** Should OB gain traction and adoption, we can expect several merchants will open stores in it. OB customers can now pay with more than 50 cryptocurrencies while the seller receives payment in Bitcoin.

Merchant Processors: Likely Initial Areas For Adoption

- ▼ Sberbank, a state-owned Russian banking and financial services company has indicated that it sees potential in Bitcoin's blockchain technology, with regards to replacing the existing funds transfer technology e.g. between banks.
- ▼ They noted that, *"The current system where 10,000 banks are used to transfer funds can be replaced by the blockchain"*
- ▼ In a similar light, the Estonian Bank LHV has also made further links in the digital currency space, by partnering with Coinfloor, a UK-based Bitcoin Exchange, to handle customers' deposits. LHV have said that, *"For fiat deposits, Coinfloor undertakes a number of measures, including proper due diligence (KYC) on each customer. The company goes to great lengths to make sure all client funds are kept with European banks that understand Bitcoin and Coinfloor's business model"*.
- ▼ *Several more banks have jumped in either their own ventures or as part of R3, Hyperledger, Ethereum Enterprise Alliance, or a multitude of other initiatives which have sprung up since last year.*

Asset Managers

Representative Firms



Winklevoss ETF, Winkdex, (Gemini)

Overview

The cryptocurrency investment trusts or ETFs are vehicles to buy cryptocurrency. Given that anyone can invest in cryptocurrency by buying it directly, these vehicles are more geared towards:

- ▼ the convenience of customers who might not want to have to learn how to manage cryptocurrency directly and the ease of distribution into traditional investment channels (brokerages, IRA managers and so on)
- ▼ [Grayscale](#) hosts both [Bitcoin Investment Trust](#) and [Ethereum Classic Investment Trust](#)
- ▼ Other cryptocurrency “hedge funds” claim that they can earn returns by trading cryptocurrencies (buying and selling them). This would be a direct equivalent to funds that trade in foreign currency and would be something only open to institutional investors.
- ▼ This area is only now starting to develop because institutional investors will require larger, more regulated, more secure exchanges in order to be able to trade on them.
- ▼ These asset managers are the most straightforward cryptocurrency financial services firms. They are not trying to displace or disrupt any part of the existing system and will fit in naturally among the wide range of other existing investment options
- ▼ The Winklevoss ETF was [rejected](#) in March 2017, citing among other things, lack of surveillance sharing agreements with significant markets, and that these markets must be regulated.

More Financial services in Bitcoin

Forex

Equities

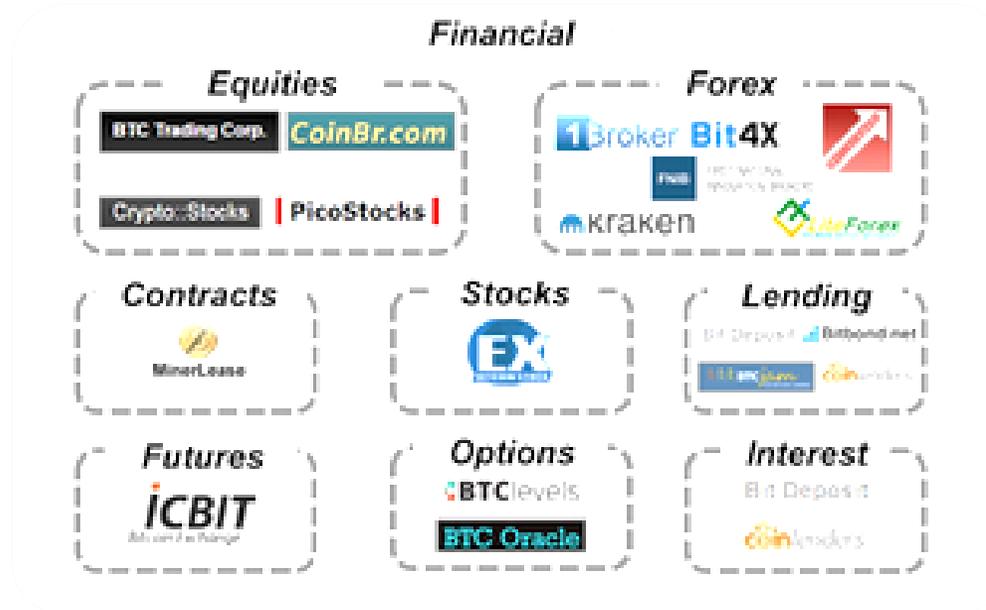
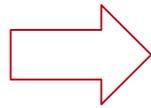
Lending

Stocks

Contracts

Futures / Options

Insurance



Most of these services try to emulate highly regulated conventional instruments but take advantage of the legal uncertainty that exists in this (at best) uncertain regulatory environment. New regulatory rulings by relevant authorities may impact the operation of these services significantly as we'll see in the next session on Regulation.

Source : <http://thefinanser.co.uk/fsclub/2014/07/the-most-irritating-and-most-wonderful-thing-called-bitcoin.html>

More Financial services in Bitcoin

Forex

Equities

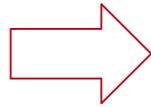
Lending

Stocks

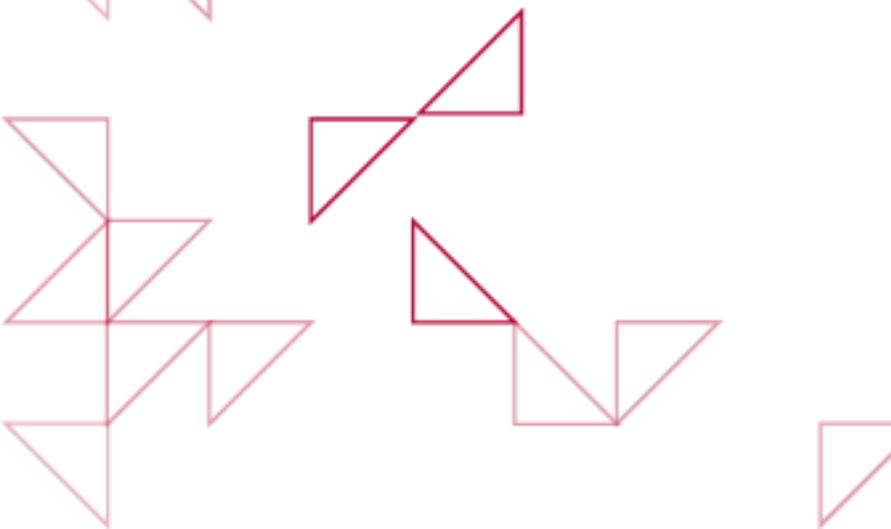
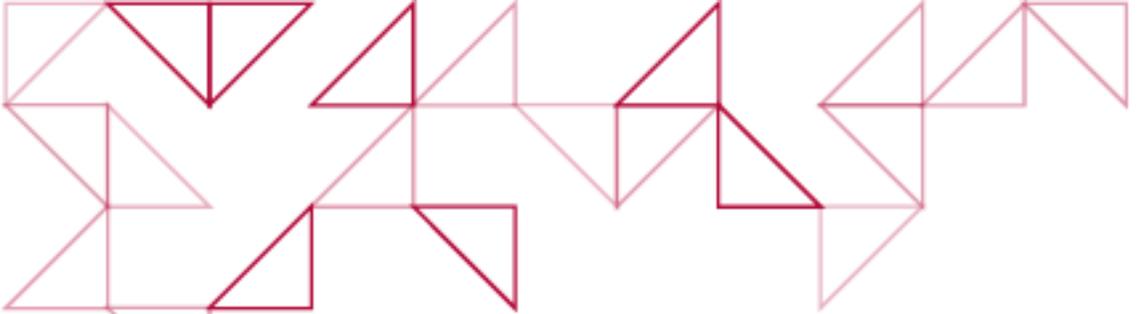
Contracts

Futures / Options

Insurance



- ▼ Overstock.com has launched T0 (TeeZero) a regulated yet decentralized stock market which integrates cryptographically secure distributed ledgers with existing market processes to reduce settlement time and costs, increase transparency, efficiency and auditability.
- ▼ Nasdaq's OMX Group Inc. has been testing a new use of Bitcoin's blockchain technology, to transform the trading of shares in private companies. According to Nasdaq Chief Executive Robert Greifeld, *"Utilizing the blockchain is a natural digital evolution for managing physical securities"*.
- ▼ Nasdaq's Private Market platform has more than 75 private companies signed up, and it aims to revolutionize the systems that have facilitated the trading of financial assets for decades.
- ▼ The Depository Trust & Clearing Corporation (DTCC) announced that it has selected IBM, in partnership with Axoni and R3, to provide a distributed ledger technology framework for post-trade derivatives processing, including credit default swaps.



Payments Opportunities



Payments: The Opportunity?

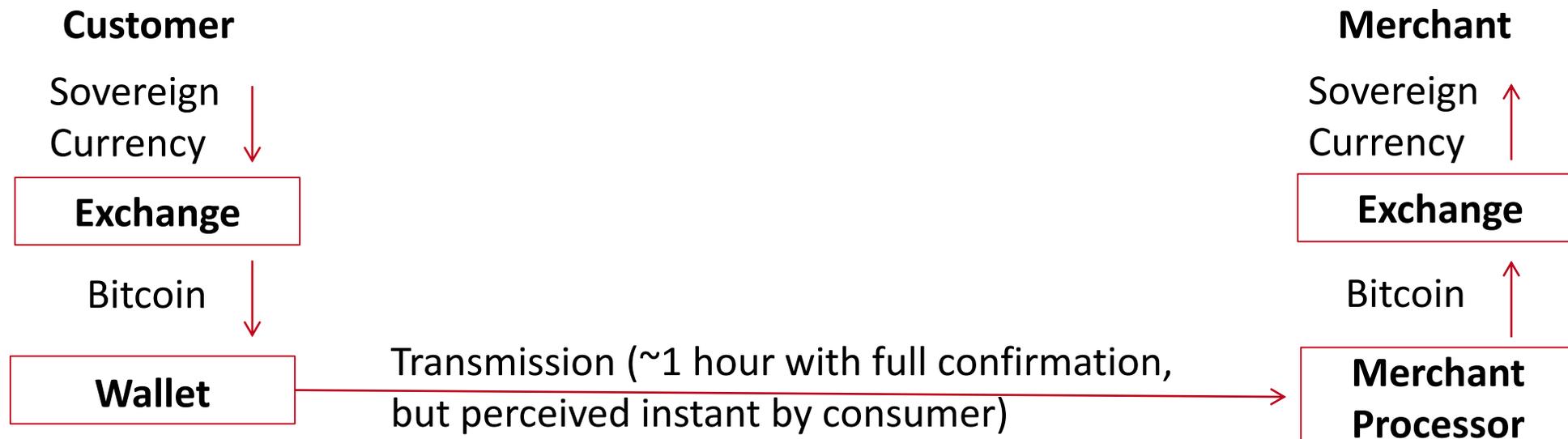
- ▼ Estimates of the cost of processing global payments are in the range of \$500 billion per year.
- ▼ The market capitalization of firms or operating divisions in payments is probably close to \$1T.
- ▼ Wedbush Securities and CoinDesk estimate the market capitalization of standalone firms in payments to be \$458B but that ignores the large payments divisions located inside money center banks and privately held firms (aka First Data, owned by KKR) so the value of this sector is significantly understated.
- ▼ Naively, this presents a gigantic opportunity for cryptocurrency based payment systems. However, for them to succeed at scale, they need to solve several distinct items(that would work together in a virtuous cycle if solved):
 - ▼ Reduce Bitcoin volatility.
 - ▼ Build institutional grade exchanges, wallets and payments processors.
 - ▼ Provide clear value to consumers, a task made more difficult given that the key costs of the current system are cleverly mutualized and hidden from consumers.
 - ▼ Build trust with consumers and merchants.

Payments: The Opportunity?

- ▼ It is important to also keep in mind that consumer behavior changes very slowly even in the developed world and basic non-cash transactions (credit cards, cheques, credit transfers, direct debit) have barely penetrated large parts of the world. That might change though with increasing access to the Internet and more options to connect the global market faster.
 - ▼ In 2010, the number of cashless transactions of all types per year, per inhabitant was only 5% in China and 6% in India (BIS).
 - ▼ In 2012, nearly twenty years after launch of consumer internet, only 5.7% of retail transactions in the US were transacted online (US Department of Commerce). This figure has now increased to almost 9%.
 - ▼ Even a superb success story for cryptocurrencies would only see them gaining a very small percentage of payments transactions over the next few years. Taking a meaningful share of global transactions will be a shift with a 10 to 20 year timeframe.

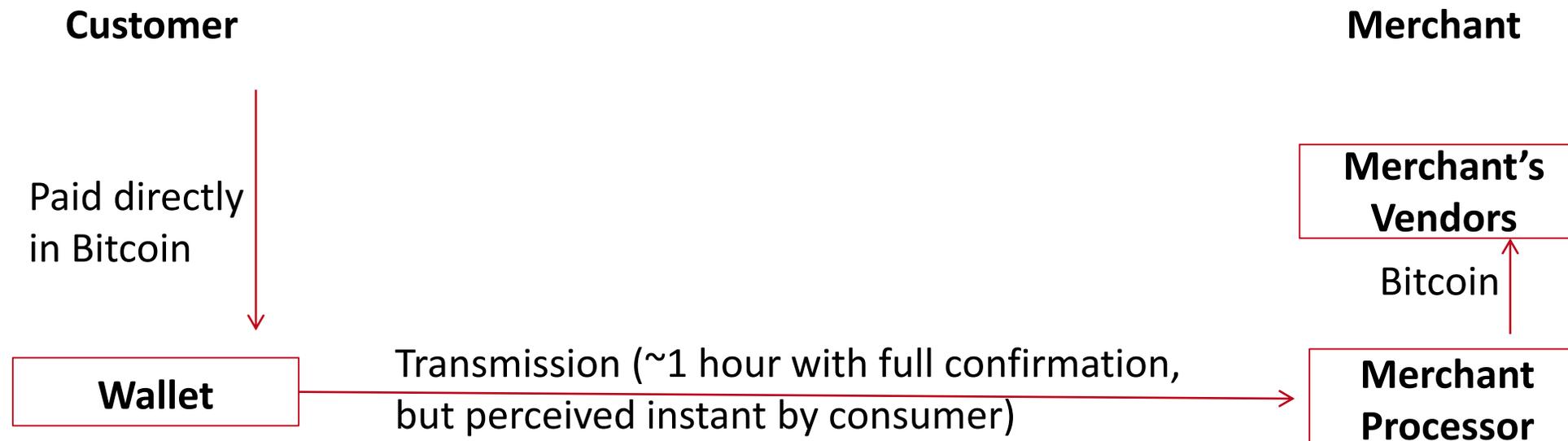
Payments – Consumer Transactions : The Medium Term Outcome?

Today, some, if not all, of the cost savings of cryptocurrency merchant processing are being taken up by the spreads/fees to translate back and forth from sovereign currency. Merchants are receiving most of the savings and might consider rewarding the consumer directly (via lower prices, loyalty points, rewards, etc.) to encourage use.



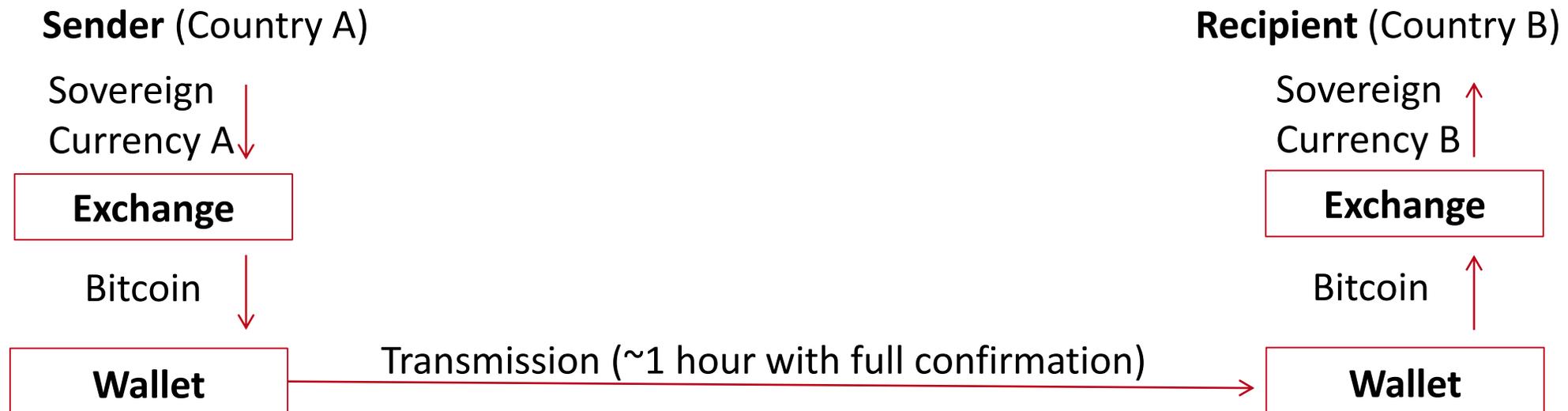
Payments – Consumer Transactions: The Long-Term Outcome?

In a future world where there would be broad merchant acceptance of, say Bitcoin, and sufficient price stability for people to be comfortable holding Bitcoins, payments could then operate in a closed-loop within Bitcoin. This would represent the desired outcome for Bitcoin enthusiasts.



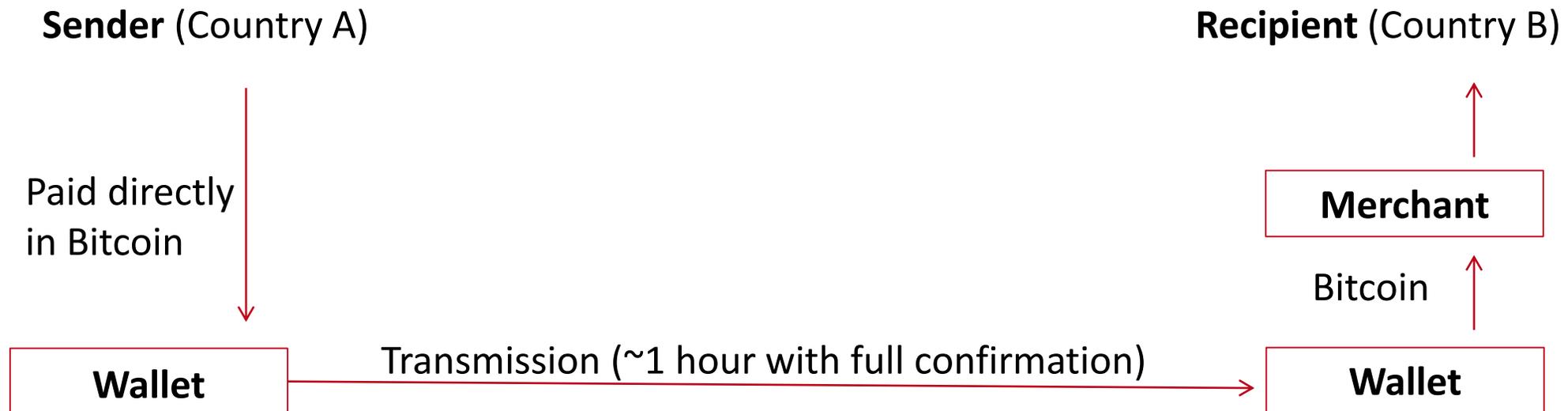
Payments - Remittances: The Medium Term Outcome?

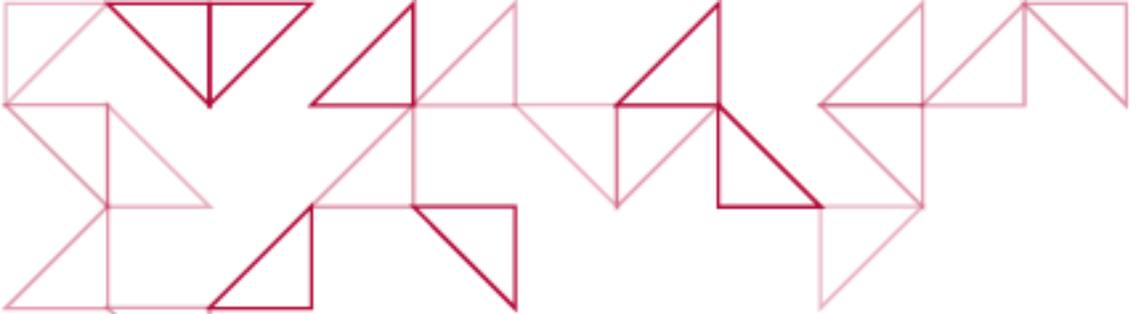
With a fully developed global network of exchanges and easy-to-use wallets, remittances could be done without dedicated remittance providers. Hurdles to overcome will include: (1) Exchange spreads on both sides (the “fees”), (2) other KYC/AML costs, and (3) technological savvy of sender/recipient.



Payments - Remittances: The Long Term Outcome?

In a future world where there would be a broad merchant acceptance of, say Bitcoin, and sufficient price stability for people to be comfortable holding bitcoins, the remittances could happen without exchanges at all. This would represent the desired outcome for Bitcoin enthusiasts.





The lower levels of Financial Systems and
the future

But wait... there's (far) more ...

- ▼ We've only scratched the surface of financial systems and the functions they perform in the global economy. Bitcoin and blockchain technology, has perhaps, the profound potential to transform several of the functions that take place in the lower levels of our financial systems' operation. These are the, so called, "plumbing" of how financial systems interconnect, and how they operate.
 - ▼ These involve how **Settlement** and **Clearing** takes place (How banks and other organizations convey financial information and transfer funds between each other and account holders)
 - ▼ **Cards** and **Payment** systems, that operate in quite a different manner than we see in Bitcoin.
 - ▼ **Asset Issuance, Trading, Clearing and Settlement** through which all shares, bonds and stocks are traded
 - ▼ **Insurance, Financial Derivatives** and **Prediction markets** which act to stabilize risk in financial activities
 - ▼ **Auditing, Accounting** and **Financial Controls**, which act as the planning and security mechanisms of financial activity worldwide

Settlement and Clearing

Unless the two accounts are under the same bank, the settlement is inefficient and credit/counterparty risk is introduced even when the accounts are under two banks with a correspondent relationship i.e. maintain accounts with each other

Three basic Systems :

- ▼ Gross Settlement Systems(GSS) and Real-time Gross Settlement Systems (RTGS)
 - ▼ Each transaction is processed as it happens (not bundled or netted or batched with others) with reduced intraday credit risk. However it increases liquidity needs (you need to fund each transaction at a time) and, subsequently, cost of liquidity (more reserves or interest charges)
- ▼ Net Settlement Systems
 - ▼ Transactions are netted out at the end of the day, so only the 'net' amount is settled but with an increase in intra-day credit risk. Reduces liquidity needs as only the net amount has to be available from a liquidity perspective
- ▼ Hybrid Systems
 - ▼ Systems that are effectively near real-time systems but look for opportunities to reduce liquidity needs, such as netting of queued orders, or the prioritization of orders, or delaying orders above certain liquidity limits.

There's far more similarities to how Bitcoin already operates in this regard, but also stark differences. We examine these in depth in the DFIN 513 course of the Msc, Open Financial Systems.

Payment Systems

Payment systems like VISA, Mastercard, Paypal (and cash) have been the backbone of consumer and merchant payments for decades. They use “**pull**” systems to draw funds from an account and channel these instructions through a wide and complex network, in which costs are largely hidden from end consumers, and costs and risks are mutualized through to them.

- ▼ While an accepted and normal part of everyday life, it is rather staggering if one thinks about it too carefully. A large array of parties may potentially have access to this information including the merchant, the acquirer, the payment processor, the gateway, the network and all of its employees, contractors and vendors.
- ▼ **Push** payments like Bitcoin and MPesa, theoretically are more secure in that:
 - ▼ only two parties have access to the payment information, the payment provider and the consumer device
 - ▼ only the transaction at hand is at risk (not the whole account)

Push payments open up a new set of challenges in that they make consumer end-points (browsers, phones, etc) the most important point to protect, and they make the user ultimately responsible. This in itself presents complexity but significant opportunity as well, as we examine in depth, in the DFIN 513 course of the Msc, Open Financial Systems.

Assets

The basic function of how Real Assets and Financial Assets are traded is split into three functions and this is inevitable, given the much faster cycles required by trading (now down to the milliseconds) vs. settlement (still measured in multiple days).

- ▼ Trading: Matching bid/ask orders among traders
- ▼ Clearing: Everything that has to be done between trade and settlement
 - ▼ Order reconciliation
 - ▼ Risk/credit management
 - ▼ Handling failure states
 - ▼ Etc
- ▼ Settlement: Actual transfer of the securities, cash to execute the trading promise

While development of platforms to provide for the decentralized issuance, trading and settlement of assets on the blockchain, has progressed significantly in the last 3 years since it was introduced, the linkage to the physical world, actual delivery or underlying assets is still far from perfected and NASDAQ's experiment is ongoing. What role could new constructs like sidechains or the lightning network, on top of the blockchain, play in transforming this important market function?

Financial Derivatives, Insurance and others

- ▼ Insurance is chiefly, a practice of “pooling” or aggregating risks, while financial derivatives aim to anticipate or foresee the outcome of one event. The nuances between Insurance, Derivatives and Gambling are subtle and often not too hard to confuse.
- ▼ Whether to hedge the risk of a potential future event or generate a gain from it, these industries are important pieces of the global financial system, highly regulated and hugely impactful in the global business environment.
- ▼ Several challenges still exist, for the insurance industry to harvest the potential advantages that blockchain solutions might provide :
 - ▼ Underwriting
 - ▼ Claims management
 - ▼ Solvency reporting
 - ▼ Regulatory oversight
 - ▼ Regulation is often inflexible in terms of capital reserves, investment allocations of the insurance premiums and pricing guidelines

In DFI513, we examine how close and how far an application for these markets is, and what elements it would need to exist.

Auditing, Accounting and Fin. Controls

- ▼ Accounting has been an integral part of how businesses and countries operate globally, how tax systems operate and function, and how financial planning and budgets takes place. Moreover, it additionally provides a system of authority and accountability in financial decision making and corporate governance globally.
- ▼ How could an immutable ledger with global, or local, transparency and specific transaction rights help us improve existing systems, accounting standards, taxation and financial planning and controls ? Probably, more ways than one.
- ▼ For a company, it could algorithmically provide transparency and internal corporate governance controls and accountability by using multi-signature transactions to ensure everyone involved is participating, specifically structured HD wallets for intra-department spending, etc.
- ▼ Could such systems scale to work on a government level ? Could tax authorities use such systems to easily account for customer purchases and directly correlate them with business earnings ? Would such a structure allow citizens to audit their governments and how would that impact political processes?

We examine these (and more) further in DFIN 513, Open Financial Systems, in the Msc in Digital Currency.



Conclusions



Conclusions

- ▼ Financial services is an extremely complex, extremely large and extremely profitable industry, protected by significant barriers to entry. It serves the needs of developed world consumers reasonably well, but leaves a large percentage of the population unbanked and imposes significant mutualized losses on customers and taxpayers
- ▼ Early investment to date in cryptocurrency-based financial services has focused on “building block” technologies like exchanges, wallets and merchant processors.
- ▼ This is a logical starting point as this infrastructure is needed for higher-order financial services to emerge. Asset management (aka Bitcoin funds) are also under development but they fit in more comfortably into the existing financial system

Conclusions

- ▼ Cryptocurrencies have to trigger a virtuous cycle of market liquidity, consumer acceptance and merchant acceptance in order to reach their full potential as a payments system. Theoretically and at scale, they should represent a more cost-effective and more integrated system. They only reach their full promise however if they can start serving in a closed-loop capacity without constant exchanges with the existing financial system and sovereign currencies.
- ▼ Many businesses will need to be rebuilt and duplicated across national borders or currency zones. This means that the overall globalization of financial infrastructure will require significant time and investment.
- ▼ More firms are starting to see potential in Bitcoin's blockchain technology e.g. in terms of interbank funds transfer or settlements, including [r3cev](#).



Further Reading



Further Reading 1/3

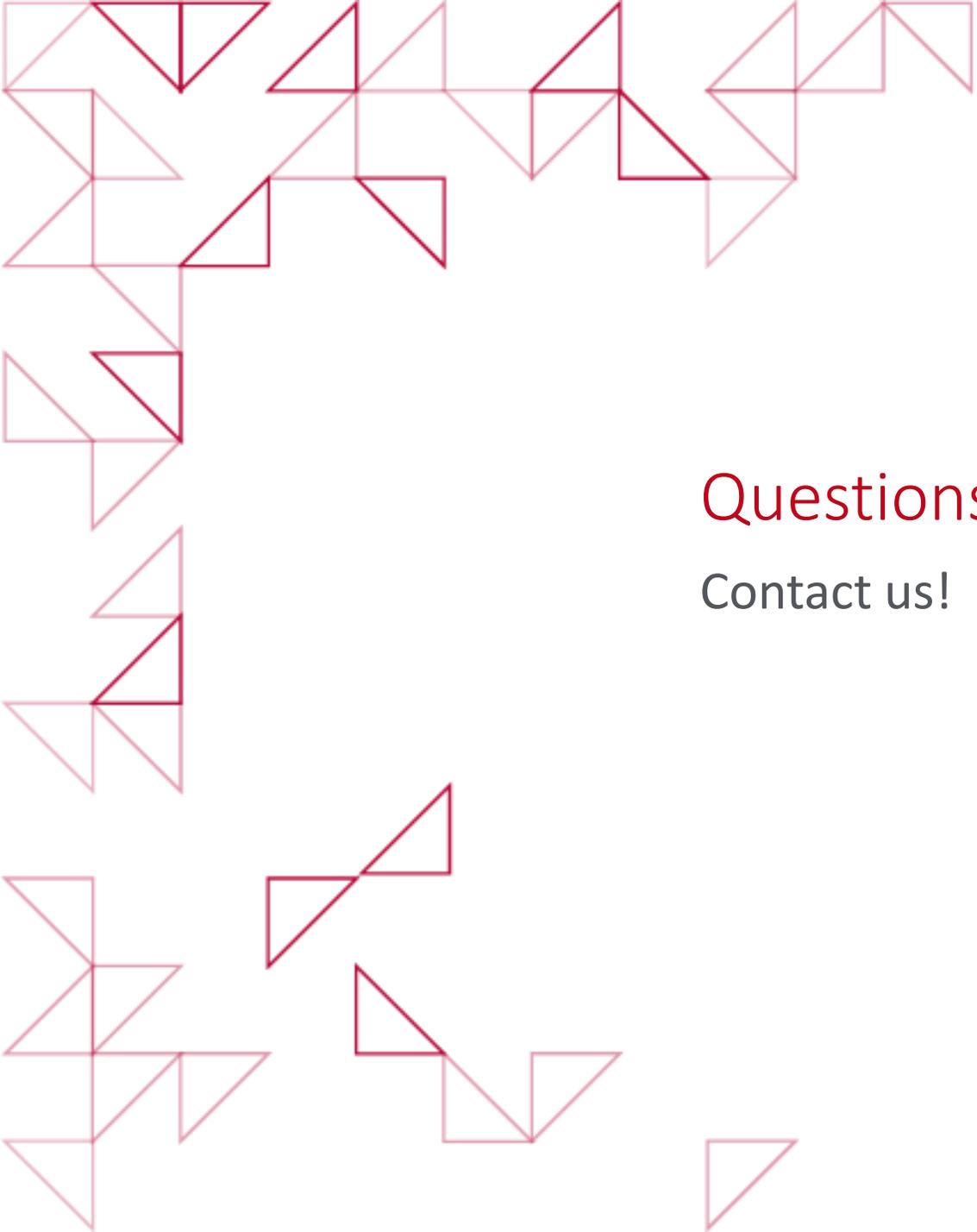
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Questions?

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