

US Digital Banking

Could The Bitcoin Blockchain Disrupt Payments?



- **What is the potential for a decentralized payment system?** – Our prior Blockchain reports focused on [securities settlement](#) and [global transaction banking](#). Given the disruptive impact the internet has had on other industries, one key concern for investors is whether Bitcoin could disrupt the status quo in payments. The Bitcoin Blockchain has a market cap of ~\$10 billion, so the market is clearly ascribing value to this payment network. The key question we address is whether a decentralized payments system like Bitcoin overcomes security, throughput, and other potential hurdles and presents a meaningful challenge to the incumbents?
- **We do not view cryptocurrencies as a disruptive threat to the banks or card networks (Visa/MasterCard)...** – Domestic payment systems today are centralized (i.e. ledger controlled by a central party such as the banks), and provides the customer a relatively good experience. Bitcoin is a successful proof of concept for a decentralized peer to peer transfer of electronic cash without the need of a trusted intermediary. Unlike other industries (e.g. newspaper) disrupted by distributed solutions, the benefit to the consumer from a decentralized system seems at best marginal with the only exception being anonymity. There are also questions around the feasibility of scaling the Bitcoin network for increased throughput and the inevitability of rising transaction costs necessary to provide an incentive to run the network. While we do not see potential for disruption from cryptocurrencies, we do view a central-bank issued digital currency as a significant disruptive threat to the banks' central role in payments...but this seems to be a very long tail risk.
- **...or the MTO model (e.g. Western Union) for cross border remittances** – One commonly cited use case for Bitcoin is cross-border remittance – the view of Bitcoin as an alternative global payment rail is prevalent. We found that while leveraging the Bitcoin network can be more efficient in terms of moving money across different centralized payment systems, this relative advantage dissipates when “last mile” costs to actually convert to fiat currency are considered. Money transfer operator (MTO) models benefit from pools of liquidity around the world and are superior on settlement in terms of total cost and speed. While we are not big fans of the pure-play MTO business (and have a Sell on WU), the perceived threat from the Bitcoin Blockchain is not one of the reasons for our negative view.
- **Cryptocurrencies potential impact will likely be more from its ability to open up new markets and reach new customers** – The power behind an open network like Bitcoin is the possibility of incorporating it with other technologies to bring about true innovation, such as applications that support the Internet of Things (e.g. machine to machine payments). Another use case could be a combination with mobile telephony to provide the unbanked with low-cost digital banking products.
- **Some interesting models to watch develop include: BitPesa, Circle and Abra** – Bitcoin allows Circle (social payments), Abra (financial inclusion), and BitPesa (B2B payments) to build a business on an open and global payments utility. We see Circle as well positioned to become a global payments app, and BitPesa as profiting from a truly inefficient market for African small businesses. Abra's model for financial inclusion is creative, but regulatory compliance seems to be a significant hurdle.

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Executive Summary

“We live in the 21st century but are still using command and control organizational structures from the 16th century. Bitcoin is one of the best examples of how a decentralized, peer-to-peer organization can solve problems that these dated organizations cannot. Like the Internet, Bitcoin is not owned or controlled by any one entity, so it presents incredible opportunities for new levels of efficiency and transparency in financial transactions.” – Dee Ward Hock, founder and former CEO of Visa, Xapo Blog, May 26, 2015

Bitcoin is a very successful proof of concept for a peer to peer electronic cash system, which allows for the transfer of value over the internet without the need for a trusted third party. In this report we analyze whether a technology like Bitcoin has the potential to offer a superior alternative to the financial system today, which relies on the banks as a trusted intermediary to store value and facilitate payments. We began our research by thinking about how and where a decentralized payment system would make sense in today's payment landscape. We rapidly realized that a decentralized network would have limited benefits as an alternative domestic payment network in developed countries due to the limited advantages in terms of cost and speed vs the current infrastructure.

We then turned our attention to cross border payments, as pricing there is relatively higher, which we thought could be due to inefficiencies inherent to transferring value across multiple central bank systems. We specifically looked at cross border remittance, as it is a commonly cited use-case for Bitcoin due to the ability to serve as a global payment rail. However, we found that again, many of the frictions (cost, speed, transparency, and user experience) were not truly resolved by Bitcoin.

Having written three reports on the topic of blockchain, one common theme we have observed is the limited use-cases for the peer-to-peer transfer of value due to a number of issues including scalability, network adoption and lack of a legal/regulatory framework for dispute resolution. In our view, the best use for blockchain technology is where multiple parties need to trust and share information. Specifically, the ability to avoid third party intermediaries thanks to a trusted distributed ledger with an immutable transaction history can offer cost savings for financial institutions who currently must expend a lot of effort to reconcile data. The best use-cases seem to be where the data is relatively static (such as supply chain management, identity, and mortgage title), since we believe there are limitations on scalability for blockchain solutions.

Our framework for thinking about payments is they are made up of two key components: messaging and settlement; and are highly regulated.

- **Messaging** is the process of sending an instruction that states the identity of the payer and payee, as well as the amount of the payment.
- **Settlement** is the process of debiting the payer and crediting the payee, thereby updating each party's balances on a ledger of record. This can be thought of as the conclusion of the transaction.
- **Regulation** involves 1) licensing (which addresses consumer protection issues), 2) onboarding of customers (Know Your Customer), and 3) ongoing monitoring (Anti-Money Laundering, suspicious activity reports).

Today's centralized payment systems are generally efficient...

Payment systems in developed countries are centralized, meaning that a central entity controls the ledger of record. This effectively ensures that money cannot be double spent. Examples of centralized payment systems include organizations such as banks, card networks, clearing houses and mobile/online wallets. One advantage that a decentralized payment system like Bitcoin can bring would be from improving the speed and/or cost of transactions, but as we explain below we see limited ability for significant improvement for developed countries...which are also satisfying current regulatory requirements.

“We’re going to have a real-time P2P system up and running. We have it today but we’re adding banks now where you can do it real-time between six major banks that will go all the banks free to add it just to service that we give these millennials. And then we got to build the software that other people have to make it easy split restaurant bills and stuff like that. We’re going to be coming out with this.” – Jamie Dimon, CEO and Chairman of JP Morgan Chase, Sanford C. Bernstein & Co. Strategic Decisions Conference, June 2, 2016

- **We have seen new players take share thanks to innovation on the front end...–** While banks have traditionally controlled the settlement rails and the customer base, there has been an influx of new non-bank players into P2P payments such as Venmo (PayPal). The competitive advantage is on the messaging side where they have is a superior user interface/experience (UI/UX).
- **...although their long-term sustainable advantage is a matter of debate...–** In our view, a more attractive messaging platform is clearly a competitive advantage, but we are not convinced it provides a long term sustainable advantage. The top banks have built a platform called ClearXchange, which allows for real-time P2P payments, but there is clearly some work to be done on improving the customer experience...but we believe they can be fast followers and can close the gap as far as transacting is concerned. Additionally, since banks have the customer base already, they could leverage new technology such as artificial intelligence (AI) to further improve on the customer experience by offering tailored services to their customers based on their past behavior.
- **...and a move to faster payments could further reduce the business case for decentralized networks like Bitcoin in the US, though the prospects in EM may be better –** As the US moves towards ushering in faster payments capabilities, through initiatives like the Fed Faster Payments Task Force, The Clearinghouse’s Real-Time Payments, and NACHA’s Same-day ACH, the business case for a network like Bitcoin becomes less clear. Once the core payment infrastructure supports real-time payments, along with the associated regulation, we believe the system will exhibit low friction and provide high interconnectedness between banks, which means consumers will have a better user experience through trusted and familiar channels. We therefore do not see a great risk of disruption from Bitcoin to the US’s payment system. However, in countries where there is no quality payments infrastructure, we do think there could be some opportunity for an open decentralized network like Bitcoin.

...but the question is whether a decentralized payment system could have value in certain applications

The innovation brought about by Bitcoin is the ability to securely process and validate peer-to-peer payments over a distributed network, without the need for a trusted third party to prevent double-spending. Because Bitcoin works thanks to a unique shared ledger, both the messaging and the settlement can happen at the same time (or “atomically”). Immutability is a key feature of Bitcoin, but it remains to be seen if this characteristic is compatible with payments, where in certain instances changes to the ledger need to be made (e.g. chargebacks).

1) We do not believe Bitcoin is superior to existing centralized payment systems – When we compare Bitcoin to centralized systems on messaging, settlement and regulation, we believe that overall centralized systems come out on top, and consequently we do not believe that banks and the card networks (Visa/MasterCard) are at risk from disruption. Unlike other industries that have been disrupted thanks to technology taking away massive inefficiencies (such as newspaper), we do not see the large incremental benefit derived by substituting the current payment system with a decentralized system.

- **Messaging –** We do not believe that the messaging function has significant room to improve, given that the transmission of information is already real-time today (e.g. apps like Venmo or Chase Quickpay immediately notify the user when someone has sent them a payment).

- **Settlement** – On the settlement side, we consider centralized systems to be superior in terms of cost, speed and scalability, and resiliency.
 - **Cost** – There is a misperception that Bitcoin is frictionless. Even though transaction costs for sending bitcoins are at the moment negligible, there are costs associated with converting bitcoins to fiat. In the long run, the Bitcoin network is designed to progressively shift from rewarding the miners that support the network through newly minted bitcoins to transaction fees. Since the network incurs substantial energy-related costs due to proof-of-work, we believe that these costs will eventually be borne by the users through high transaction fees, which will make it more expensive than centralized networks. Today, domestic payment transactions do have some cost, but we do not believe it is significant enough for consumers to warrant adoption of a new payment rail, especially since some of the higher costs from credit card interchange are offset by rewards programs.
 - **Speed** – We believe that settlement speeds could potentially be improved by digital currencies, but that would require widespread acceptance which we do not believe is likely. Using the currency as a bridge asset slows down settlement since it requires re-entering the fiat rails. Additionally, most developed countries are working on solutions for real-time payments which will further reduce the gap.
 - **Scalability** – Scalability is a major issue for cryptocurrencies, as they can only process a fraction of what conventional networks are capable of (ACH/card networks). Efforts to improve the scalability of Bitcoin may jeopardize some of the security features that prevent double-spending.
 - **Resiliency** – Payment systems need to be resilient, and the current centralized systems are time-tested and well-understood. Bitcoin has only been in existence since 2009, and although it has never been hacked, there are questions as to how the worst-case scenarios would play out (e.g. 51% attack, unknown miners in China, etc.).
- **Governance/Regulatory** – The centralized payments systems we have today are well understood and regulated. Using a new system would require substantial efforts to verify that current regulations suitably protect consumers. Card networks benefit from a defined set of rules (for disputed payments, chargebacks, holds, etc.) and the members of the network agree to the rules. If Bitcoin is to mount a challenge, it will need to address these issues (e.g. Bitcoin does not support chargebacks, as all transactions are final). Additionally, any change would likely have to be driven by the merchants, who for the most part bear the brunt of the costs, through interchange fees.

2) Cross-border consumer to consumer remittance does not seem to be a great use case for cryptocurrencies – One of the often cited use cases for Bitcoin is that it can create a global payment rail and be a potential disruptive threat to cross border remittance where the fees are generally viewed as high. Our work found that while leveraging a network such as Bitcoin can be more efficient in terms of moving money across different payment systems, the “last mile” costs to actually convert to fiat currency are larger than money transfer operator (MTO) models which benefit from having pools of liquidity around the world, which we found to be superior on settlement in terms of cost and speed. Using the local liquidity to prefund transactions means that customers can get money immediately, and the MTO uses the normal correspondent banking rails to settle later, leveraging their scale and higher transaction amounts. Additionally, for an MTO like Western

Union, >75% of revenues come from cash-to-cash transactions, which require an extensive (and costly) agent network, a multitude of government licenses, in addition to substantial regulatory and compliance practices.

While we are not big fans of the pure-play MTO business (and have a Sell on WU), the perceived threat from the Bitcoin Blockchain is not one of the reasons for the negative view. However, while our analysis shows that while the MTO business should be safe from the blockchain threat in the interim, it also highlights the regulatory risks and price competition that we believe limit the top- and bottom-line growth prospects of the market and supports our negative view.

- **TransferWise is cheaper and more user-friendly, but the underlying business model does not seem that differentiated from other MTOs –** TransferWise provides consumers with a user-friendly online-only service that is much cheaper than the competition. TransferWise operates on the existing banking rails through pools of liquidity in the countries in which they operate, as well as providing a high quality front-end to consumers. Although the UI/UX may be better, the underlying business model seems in reality quite similar to the MTOs.
 - **BitPesa demonstrates the value of alternate rails in countries with poor infrastructure for cross border payments –** BitPesa initially started as a bitcoin exchange and remittance service, where users could send bitcoins and have them converted to Kenyan shillings, which could be deposited through bank accounts as well as M-Pesa. However, due to the challenges presented by the consumer remittance business (last mile, KYC/AML, gaining scale and brand awareness), BitPesa pivoted their business towards serving Kenyan small businesses, who were significantly underserved when it came to making cross-border payments. By providing businesses with an alternative rail to the banks, BitPesa is able to add value through predictable payment times, as well as transparency, and access to global currencies at favorable rates. Using an open network like Bitcoin has allowed BitPesa to set up a business and reach scale with little capital, in addition to being able to deliver superior services than what is possible with the legacy infrastructure.
- 3) Financial inclusion could be promising for decentralized systems –** One potential application for a decentralized payments platform is to address markets with limited access to traditional financial services due to cost and reach.
- **Mobile money has been effective in certain unique instances, but has limitations –** Mobile money is an example of a centralized system where users exchange cash for a virtual balance on a central ledger administered by a telco, which holds fiat funds in a central account. Messaging and settlement is easy because every user is on the same system. This model was especially successful in countries where there were no good settlement rails. This is where the likes of M-Pesa in Kenya and bKash in Bangladesh have fulfilled a need using mobile money.

Because mobile money is a centralized payment system, on the one hand wide acceptance creates a lot of utility since everyone is on the same system, but it also gives providers strong pricing power and the fees charged for using the network and for withdrawals can be quite high (we estimate in the 5% range).

Despite the success of M-Pesa in Kenya, adoption of mobile money in other countries has not always been as successful. One of the key issues is the fact that in many countries telecom companies compete with each other by releasing

their own versions of mobile money that are not interoperable (e.g. Nigeria), which reduces network effects and the utility of the mobile money. Competition also exists with the banking sector, which aims to retain control of payments by supplying its own mobile services. Finally, governments tend to look down upon mobile money since they lose the ability to control the system and therefore create unfavorable regulatory environments¹ to make it difficult for telcos to implement.

- **Abra business model could address the world's unbanked** – Abra is attempting to create an Uber-like system for digital currencies by creating a network of tellers to enable smartphone owners to purchase and redeem digital cash. The goal for Abra is to create a simple user-interface to drive user-adoption and mask the complexity of Bitcoin by creating digital cash denominated in the user's local currency through a complex hedging mechanism. This could potentially create a way for unbanked individuals with a smartphone to have access to a decentralized global payment network, thereby bringing them into the financial system. Abra positions itself as a software platform and not as an MTO, since the owners of digital cash use the Bitcoin network to process transactions. However, we believe that Abra's involvement underpins users' ability to send money, and we therefore question whether regulators will stand idly by especially if the business gains scale.
- **E-commerce is an opportunity down the line** – Ultimately, if user adoption grows, there could be a big opportunity in e-commerce where merchant acceptance could allow individuals in countries with less developed payment rails to make purchases in a much more efficient manner.

4) True innovation can be facilitated thanks to the combination of an open network with other emerging technologies – Groundbreaking innovations have often come from not one but many different technologies coming together. We believe an open network like Bitcoin combined with mobile, machine learning, big data and the Internet of Things has the potential to create radically new models. A decentralized payment system is likely a key technological innovation that will enable new ways for machines and computers to interact with each other. The possibilities offered by programmable money and the use of distributed networks to offer on-demand computer power have the potential to bring a boost in efficiency by reducing machine idleness in exchange for fees.

- **Internet of Things** – Enabling machine-to-machine payments is an important component of developing the Internet of Things. For the IoT concept to work efficiently it is important to have computing and processing distributed to edge devices rather than add to network traffic. A decentralized payments system like Bitcoin would allow programs to automatically make payments for things such as sensor data collection (e.g. Filament), or paying for calling payable APIs (e.g. 21.co). For example, blockchain could enable the creation of smart contracts to allow appliances to barter for power usage directly with the grid. These types of payments are currently not possible because the current payment infrastructure is not designed to handle frequent small value payments (micropayments). Another example could be in the automotive space. Today's cars can generate 25 GB of data per hour, a number expected to go up – clearly the network loads for this to flow back-and-forth are tremendous and any processing – including payments processing – that can be done locally helps. So “Connected Car” may be an IoT-related Bitcoin use-case.

¹ [Why Mobile Money transformed Kenya, but failed to take off in Nigeria](#), Laura Llewellyn-Jones, Institute of Economic Affairs

“We believe that holding money for someone which is just incrementing a number in a database, just debiting and crediting that database and making a payment, should just be free. In the same way as sending content over the internet is free” – Jeremy Allaire, Founder, Chairman and CEO of Circle, “Bitcoin graduate Circle launches free social payment app in UK with Barclays” by Ian Allison, International Business Times, April 6, 2016

- **Circle is a payment app that leverages Bitcoin, mobile, and machine learning with the goal of building what could be a new model for financial services** – Circle’s view is that payments will ultimately be free, whether domestic or cross border. The idea is to begin by building a global network of users, thanks to a high quality user-interface which makes payments frictionless regardless of the currency combined with a social aspect through in-app messaging. While the revenue model is not clearly defined at the moment, the opportunity to monetize in the future is likely through add-on services (e.g. lending, wealth management). Circle is agnostic on the rails, using both traditional bank settlement as well as Bitcoin functionality. At the moment, Circle is licensed and available in the US, UK and Spain (EU). Users can transact in USD, GBP, and EUR, as well as bitcoin. Circle has an e-money license in the UK (which allowed it to obtain a banking partnership with Barclays) and was the first company to obtain a BitLicense in NY (and is licensed in 47 other states), and has recently announced it will be offering cross border services in China. By combining a high quality app with an open payment network, as well as innovative risk management (through machine learning and artificial intelligence), a host of licenses, and attractive pricing, Circle is putting itself in a strong position to acquire customers in the three biggest economic regions in the world, and has the potential to be disruptive.
- **Circle’s use of Machine Learning and AI shows the capabilities of technology to enhance risk management and reduce cost** – One of the valuable components of Circle’s business is the development of machine learning and AI techniques to leverage the data they collect on their users and accurately predict instances where transactions may be fraudulent. This obviates the need for a large compliance workforce and can significantly cut down on costs.

Digital Money

Digital Money

Today's money is often characterized as being digital, but there are key differences between this and true digital currencies. Confusion can arise when the topic of digital money is raised. This is because money is often digital today, ranging from bank account balances to payment apps or gift cards, and increasingly digital currencies. However, there are some key differences, which we lay out below.

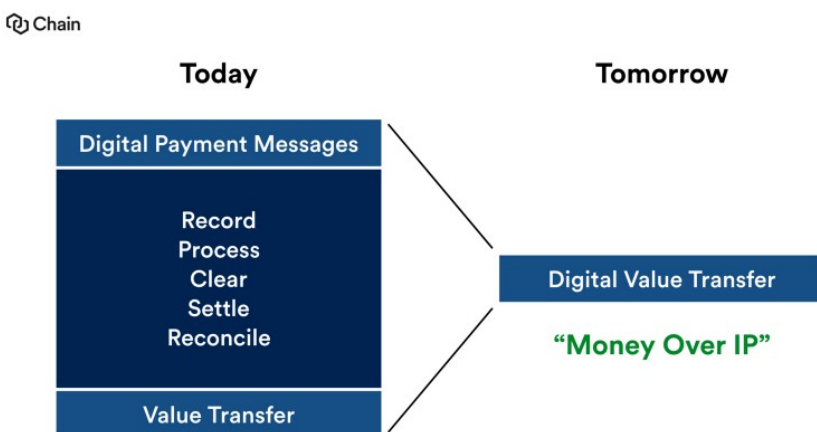
In this section we address:

- 1) Electronic Payments
- 2) Digital Currency such as Bitcoin (decentralized payment system)
- 3) Virtual Currency such as mobile money (centralized payment system)
- 4) Central Bank Issued Digital Currency

Electronic Payments

Money today is digital in the sense that records of it are digital, and it relies on digital messaging to move. Today money for the most part exists as a set of ledger entries on databases. Saying that money is digital really means that money moves thanks to digital messaging², as shown by Figure 1. Once the message is sent, clearing, settling and reconciliation of databases still needs to happen. Creating a messaging network is the key to electronic payments, as it enables a standardized and secure way for the concerned parties to make changes to their ledgers and actually settle the transaction. The most valuable networks count banks, consumers and merchants as members (e.g. card networks (Visa/Mastercard), or PayPal).

Figure 1. Today's Payments Rely on Digital Messaging, but Digital Value Transfer Collapses the Entire Process to One Step



Source: [Why Banks Will Issue Digital Currency](#), Adam Ludwin, Co-Founder and CEO of Chain

■ **Venmo is a superior messaging app, but settlement still happens over bank rails...** – In today's developed countries where the majority of the population is banked, making peer-to-peer electronic payments is relatively easy and for the most part free, as demonstrated by an app like Venmo. Venmo allows users to accomplish the messaging function through a simple user interface, but the

² [Why Central Banks Will Issue Digital Currency](#), Adam Ludwin, June 6th 2016

settlement happens through the banks³, which update the users' balances, and ultimately between the banks themselves through ACH (automated clearing house) or debit networks which takes 1-3 days. Venmo has no dispute mechanism, and therefore should not be used for commercial transactions, as the recipient is at risk if the sender cancels the payment.

■ **...while banks have developed individual products like Chase Quickpay...** –

Quickpay is a free P2P payments app that can be used by both Chase and non-Chase customers, but does not have the social aspect that apps like Venmo do. For payments between Chase customers, funds are available within minutes, since the transaction consists of a simple internal ledger update. For transactions between a Chase customer and a non-Chase customer, the funds are available within 1-2 business days if initiated by the Chase customer, and 4-5 if initiated by a non-Chase customer. Quickpay also makes use of ClearXchange (see below) for real-time payments between participating banks.

■ **...as well as a collective platform called ClearXchange** –

ClearXchange is a messaging platform owned by 7 top US Banks⁴ (originally formed by BAC, WFC and Chase in 2011), and links them to allow users to send a payment to a recipient using only a phone number or email address. Like Venmo, it is a centralized system that makes messaging easier but relies on banks for settlement. ClearXchange has recently released a real-time payment solution, where the receiver will receive the money in their account immediately. While ClearXchange's real-time account-to-account money transfer should be attractive to some users, it solves for a different use-case than the social engagement via Venmo. We believe it could be more competitive for other account-to-account money transfer solutions like Square, Western Union, etc. This being said, we do believe having the ability to instantly withdraw or spend received cash is a key advantage, but until now the only option was to use these other services

- **Real-Time Payments** – Real-time payments are technologically possible today (see ClearXchange above), but the difficulty for a national infrastructure lies in adopting standards and managing risks, as well as getting the stakeholders to agree on a system. In the US, the Fed has set up a Faster Payments Task Force which aims to improve the payments infrastructure for all use-cases (P2P, B2B, C2B, B2C and high/low value). While ClearXchange is focused on P2P, the outcome of the Fed's Faster Payments would potentially enable real-time payments, but this would require a significant concerted effort in the industry. As ACH payments become real-time this could pose a threat to debit card networks, and become a catalyst for a reduction in the use of physical cash (e.g. Sweden is a leader in this phenomenon).

“You've seen that seven of the largest banks in the country got together and bought EWS, merged it with clearXchange and basically are going to create – have created a ubiquitous product offering that will be on every bank's mobile banking app that allows you to do P2P through an e-mail address or phone number, importantly, in a very secure way without going into competitors.” – William Demchak, Chairman, President and CEO of PNC, Bernstein Strategic Decisions Conference, June 1, 2016

Digital Currency (Decentralized)

Bitcoin and native digital assets truly allow digital value transfer, thanks to the decentralized nature of the system. With a digital currency like Bitcoin, the money is entirely digital, and is native to the network on which it was issued. The value of the currency is tied to the value of the network, which means that its utility increases with the number of users. Giving someone a bitcoin is analogous to giving someone a dollar bill, and can therefore be considered as a bearer instrument, where the holder is the owner. Both of these transactions are atomic, meaning that clearing and settlement happen instantaneously and simultaneously. The cryptography

³ If the user's Venmo balance exceeds the amount of the outgoing payment, settlement in Venmo is instantaneous. However, settlement in fiat requires cashing out which takes at least a day (or more)

⁴ Bank of America, BB&T, Capital One, Chase, PNC, U.S. Bank, and Wells Fargo

wraparound ensures that only the holder of a private key can authorize a transaction, which is processed in a decentralized way. This differs from the above where an individual must request the custodian to move the funds for them (even if it happens digitally).

There are hundreds of digital currencies, but Bitcoin by far and away is the most used. Below we describe some other major ones.

- **Bitcoin is the original digital currency and enables transactions on a trustless basis** – Bitcoin is a digital currency that is issued based on a fixed network protocol, and allows decentralized P2P payments over the internet. The network is secured by miners who process transactions in exchange for a bitcoin reward. As shown in Figure 2, Bitcoin usage has been increasing quite dramatically in the last couple of years.

Figure 2. Bitcoin Usage Has Increased Significantly



Source: Citi Research

- **Ripple XRP focuses on making a more efficient and scalable network for value transfer** – Ripple XRP is a digital currency that aims to improve on Bitcoin by doing away with mining, which is energy-intensive and inefficient. Ripple does this through a technique called consensus, which is a way for the entire network to agree on the same ledger. Additionally, Ripple transaction confirmations are much faster than Bitcoin (few seconds for a confirmation). XRP was designed by Ripple to be used for real-time interbank settlement, and to avoid the use of the correspondent banking network (see our prior report on [global transaction banking](#)).
- **Ether powers Ethereum's distributed applications and smart contracts** – Ether is a digital currency with a specific use-case. It allows the Ethereum network to function by providing an incentive to the machines that process the smart contracts. Ether was issued in a fixed quantity when the network was launched (agreed to by the contributors), and currently operates through a mining mechanism similar to Bitcoin. However this is due to be changed to a more efficient mechanism in 2017, which is currently under development.

- **Ethereum fully enables embedded smart contracts unlike Bitcoin** –
Ethereum is a platform that builds on top of the innovations brought about by Bitcoin's decentralized payments by providing a Turing-complete programming language, which is a sophisticated type of language that allows users to submit entire programs with their transactions, which are then run and verified by the miners on the network in exchange for a reward in the form of Ether. This programming feature is why Ethereum is referred to as a smart contract platform. Because Ethereum has this sophisticated language, it can enable the creation of decentralized applications, which are programs that are run on the network, but are not controlled by a single party.
- **The DAO hack demonstrates Ethereum's teething problems** – The security of the platform is probably the foremost concern, which saw vulnerabilities exposed by a highly publicized hack of the first "Decentralized Autonomous Organization". The DAO is a vehicle that collects Ether from "investors" and allocates it for projects based on its owners' votes, but it is entirely written in code, which means that it should operate in a very transparent and independent way. The DAO hack is a setback for Ethereum, and exposes the unpredictability and vulnerability of smart contracts.

"Virtual currencies are owned and controlled by a counterparty (Facebook credits, American Airlines miles, American Express Points, etc) and you have to trust that counterparty since it is up to them to set the value and redemption rules. Digital currencies on the other hand are designed in a way in which, just like with gold, you do not need to trust anyone." – Wences Casares, founder and CEO of Xapo, PayPal Board Member, *Is Bitcoin a Digital Currency or a Virtual One?*, Coindesk March 19, 2014

Virtual Currencies (Centralized)

Virtual currencies are issued by central authorities and can be redeemed for real fiat. One of the most visible and widely used examples of a virtual currency is mobile money. Consequently there is potentially counterparty risk. Banks have explored the concept of issuing coins that are backed by fiat currency. This system amounts to what is known as "tokenization", which means using a blockchain-based token to leverage the P2P capabilities of a blockchain, but where the value is dependent on a non-digital asset which is held "off-chain", in a trust for example. This introduces the concept of counterparty risk with respect to the issuing bank. In a normal environment this is likely not an issue, but in times of stress these coins could trade at a discount if there are questions on the financial institution's solvency. The key difference between these types of coins and a cryptocurrency is the reliance on a centralized issuer, which means that these coins are effectively liabilities, as opposed to digital currencies which are assets issued by a decentralized network.

- **Mobile money enables the P2P transfer of value** – Mobile money is a virtual currency issued by telecom companies which allows mobile phone holders to send, receive, and store funds over the network in a P2P manner. Mobile money can be bought and sold for physical cash at agent locations, and as adoption increases, can also be used directly for paying for goods and services. Although mobile money has flourished in some countries (notably M-Pesa in Kenya and GCash in the Philippines), one of the key issues with this medium is the fact that they are often controlled by one telco. M-Pesa is often cited as having benefited from ideal conditions to succeed in Kenya (telco monopoly, significant investment to develop agent network, and favorable regulation). However, this centralized approach has not been as successful in other countries due to lack of interoperability and difficulty in getting a network of agents on a sufficient scale. (see [GPS Report on Digital Disruption](#) for further information). This limits its applicability in creating a seamless cross-border network, which is something that Bitcoin can facilitate given its decentralized nature.
- **Mitsubishi UFJ Financial Group is issuing a "digital currency", but in reality this is just a currency-backed token** – Bank of Tokyo MUFJ is working on issuing a coin that would operate using blockchain technology. This is an

example of what in reality amounts to prepaid money, given that it is a token backed by a fiat currency 1-for-1. As a result, this is not a true digital currency in the sense that Bitcoin is, for example. This is also similar to the way mobile money works, as we have described above.

- **Prepaid money cards** – There are many instances of prepaid money today, which functionally works the same way as a fiat-backed coin. Whether it is a gift card at a retail store (e.g. Starbucks or Amazon), or credit card reward points (e.g. Amex points or airline miles), the core concept is that a central issuer exchanges a token of value in exchange for fiat currency.

State-Backed Digital Currency

A government-backed digital currency could be highly disruptive because it would allow non-bank entities to hold central bank accounts. There is a lot of excitement around the potential held by a government-issued digital currency. A government-backed digital currency would enable P2P settlement finality, as users would be able to transact with each other using central bank money, as opposed to commercial bank money. This creates a lot of questions around a new model for money creation and holding deposits. Allowing non-bank entities to have central bank accounts would drastically increase competition in the banking industry, and would also remove the need to rely on commercial banks and fractional reserve banking to create new deposits. Central banks would simply issue native digital currency directly to the population. Because of the momentous changes represented by such a shift, we believe that it will take many years of study before central banks implement a transition to digital currency.

A few countries have broached the topic of state-backed digital currencies including the Bank of England, the People's Bank of China and the Royal Bank of Canada. The Bank of England in particular has been very active in releasing research reports for public consumption, as well as referencing the concept in various speeches.

- **The Federal Reserve has mentioned blockchain only in passing on the topic of faster payments** – To our knowledge the Federal Reserve has not made any specific announcements on the topic of a central bank-issued digital currency, but it has pointed to distributed ledger technology as being a potential way to enhance the payments infrastructure in the US as part of the Faster Payments Task Force.
- **The Bank of Canada is looking at blockchain, but for interbank payments** – The Bank of Canada recently announced that it was working with RBC, CIBC and TD Bank as well as the R3 consortium to develop a CAD-Coin proof-of-concept. This application would only focus on interbank payments, and the Bank of Canada has no current plans to issue any “e-money” to the general public.
- **The People's Bank of China will attempt to launch a digital currency as soon as possible, but the underlying technology that will power it remains to be determined.** The PBoC has been actively exploring ways to issue a digital currency, and highlighted that a key factor for digital currency would be striking a balance between privacy and allowing the government to prevent illegal activity. The bank also said that it would be crucial to retain control of monetary policy. There are also different possible technological implementations for digital currency; blockchain is one option, but the PBoC stated that at the moment there are still non-negligible issues with scalability and efficiency.

■ **The Bank of England has been active in the exploring blockchain and communicating developments through research reports and speeches –**

The Bank of England is quite focused on Fintech in general, and has been particularly active in the blockchain space. The BoE recently launched a Fintech accelerator, and as part of this is working with PwC on a distributed ledger proof of concept for payments settlement⁵. The Bank of England has also talked about the potential implications of a digital currency in a series of speeches and reports, and has separately taken steps to allow non-bank Payment Service Providers (PSPs) access to central bank settlement accounts, which is a first step to potentially transforming the model and paving the way to direct central bank access for the general public.

- **University researchers in the UK have put forward a framework for a central bank-issued coin** – This coin, dubbed RSCoin, would allow the central bank to retain control of the money supply, but rely on a distributed set of authorities (known as “mintettes”) to prevent double-spending. The benefits would include increased transparency and auditability, along with reduced wasted energy from proof-of-work, since there would be a degree of centralization from the central bank. This research was done independent of the Bank of England, although the BoE was a source of inspiration.

Ben Broadbent, Deputy Governor for Monetary Policy at the BoE summarized some of the key issues in a recent speech...

“Acting as a trusted third party is precisely what a central bank does. It performs that role only for one particular asset, central bank money (i.e. reserve deposits held largely by commercial banks at the central bank). But the function goes right to the heart of what central banks do and how they came about. And if a private-sector digital currency uses the technology to substitute for a third-party clearer, the central bank counterpart would do the opposite. The aim would be to widen access to the central bank’s balance sheet, beyond commercial banks [...] That might mean adding only a narrow set of counterparties – perhaps a wide range of non-bank financial companies, say. It might mean something more dramatic: in the limiting case, everyone – including individuals – would be able to hold such balances.”

– Ben Broadbent, Deputy Governor for Monetary Policy, Bank of England, [Central banks and digital currencies](#), March 2, 2016

...as did Mark Carney, Governor of the BoE:

“In the extreme, a DL for everyone could open the possibility of creating a central bank digital currency. On some levels this is appealing. For example it would mean people have direct access to the ultimate risk-free asset. In its extreme form, it could fundamentally and perhaps abruptly re-shape banking. However, were it to co-exist with the current banking model, it could exacerbate liquidity risk by lowering the frictions involved in running to central bank money. These questions and others are why these topics are being examined as part of the Bank’s research agenda, with the prospect of a central bank digital currency for the UK, in my view, still some way off. We will work to make payments easier, and though cash may no longer be king it once was, its reign will endure for some time.”

– Mark Carney, Governor, Bank of England, [Enabling the FinTech transformation: Revolution, Restoration, or Reformation?](#), June 16, 2016

⁵ [Bank of England Fintech Accelerator partners with PwC on distributed ledger Proof of Concept](#)

Remittance Today

Remittance Today

Global remittance, defined as international payments between consumers and typically migrant-originated, is a large market, with ~\$600 billion⁶ in annual payment dollar volume. Before one concludes just from the large market size that this is an efficient and liquid market, it is important to note that the market is fragmented and not homogenous. Because of this, one can observe corridor-specific differences based on the level and nature of remittance volume; competitive intensity; technological access and competence of the user base; bank penetration and entrenched remitter behavior. These conditions affect consumers as well as (existing and prospective) competitors. Consumer outcomes vary in terms of remittance fees, price transparency and payment delivery times. From a competitive standpoint, the ability of new entrants and technologies to exploit the (perceived) shortcomings of the current system can vary widely by corridor.

This section of our report focuses on the traditional remittance market. We discuss

- (1) Remittance Methods / Products;
- (2) Remittance Channels;
- (3) Remittance Pricing Analysis;
- (4) Regulatory Complexity;
- (5) Sources of Friction

⁶ The World Bank Remittance Database

Remittance Methods / Products

One way to analyze remittance trends is to consider the start- and end-points of the remittance transaction. What is the source of funds at the start of a transaction? The sender may use funds in their bank account; they may initiate the transaction with cash; or they may use digital means. The same choices are available at the receiving end.

Accordingly, the main remittance methods are as follows⁷.

- (1) Bank Account-based transfers (we estimate this is ~50%-60% of global remittance volume)
- (2) Cash-based transfers (~35%+)
- (3) Digital-led transfers (~<10%)

Hybrid combinations are also possible – for example Account-to-Cash where the sender has a bank account and the receiver picks up cash from an agent. In fact, most major remittance firms offer this kind of flexibility.

Bank Account-based Money Transfer

Both banks and MTOs (Money Transfer Operator) provide account-to-account services, where the funds are taken from the sender's bank account and delivered to the recipient's bank account. There are a couple of variants – bank wire transfers and online account-to-account transfers have different price/performance characteristics and they are suitable for very different end-consumers. In either case, this product is suitable for banked customers, i.e., having a bank account is a pre-requisite for the transaction.

- **Fragmented Market** – No single entity has a clear leadership position in this method. Banks' presence tends to be fragmented and dependent on specific corridors. The choice of corridors seems very dependent on the bank's client base. For example, there are Turkey-based banks that are leaders in the German-to-Turkey corridor and Bangladeshi banks that are leaders in the U.K.-to-Bangladesh corridor...however, one would obviously not expect a Turkish bank to compete in the U.S.-to-Mexico corridor.
- **Bank wire transfers** – They are usually the most expensive option for remittance even though they are not a fast option (it can take 2-6 days). In 1Q16, the average cost to send \$200 through a bank was ~11%. Banks routinely charge \$35-\$40 in fees for wire transfers, and as the payment makes its way through the correspondent banks, it is subject to additional lifting fees, as well as costly FX and taxes. Individuals who send remittances through banks tend to be wealthier (e.g. private banking clients) and benefit from higher daily/monthly limits vs. other payment channels. MTOs usually cannot serve the needs of these clients due to limits on how much can be sent.
- **Account-to-account⁸** – Account-to-account transfers are simple internal ledger updates debiting one customer and crediting another. These transfers are significantly cheaper than wire transfers to beneficiary banks since there are no associated correspondent banking fees. As of 1Q16, same-bank account-to-account on average cost consumers under 6%, which is comparable with what an MTO charges.

⁷ Citi Research, based on conversations with industry experts

⁸ Note that account-to-account has the above specific meaning for banks. For MTOs account-to-account simply means any transaction that is not cash.

- **Speed is slower than cash based method** – One can expect slower delivery times (between 1-5 days) than cash-based methods due to their reliance on local payment rails for the movement of money between the MTO's bank and the recipient's. Because the infrastructure in some countries is inefficient, it can take additional time for banks to process payments, and occasionally payments can be held up for compliance reasons.
- **Partnerships** - Banks can form direct partnerships with foreign banks, which can lead to reduced costs for customers as the payment bypasses the usual more expensive correspondent banking route (e.g. Bank of America partnership with HDFC Bank in India). But it requires significant KYC/AML due diligence and consequently cannot be replicated at a large scale in a cost effective manner.

Another option for a bank is to partner with a MTO. For example, U.S. Bank and Fifth Third Bank have a relationship with Western Union, whereby they offer their branch network to effectively be a walk-in agent of Western Union and Western Union brings them an already established global network and remittance engine.

Cash-based Money Transfer

Consumer- and Investor perception of money transfer is largely based on what one reads and hears about the cash-based money transfer choice. In a cash-to-cash transfer, customers go to agents (generally retailers or financial institutions) of a MTO to send and receive payments. Here, we just make a few quick points.

- **Market Share** – Western Union is the market leader for this choice and has ~16-17% of the overall remittance market, which equates to ~45-48% of the cash-based money transfer market. Other leading providers are MoneyGram and Euronet Worldwide. Every region and corridor does tend to have regional and local market participants who do well as well.
- **Speed** – Cash-to-cash are fast, with money often available to the receiver within minutes...with a slightly cheaper choice for a sender for remittances that are not time-sensitive and can arrive the next day.
- **Cost** – Fees for cash-to-cash services tend to exhibit a high level of variability. Consumers are willing to pay up for convenience (distance to agent; speed) and lack of choice if the sender or receiver is unbanked. MTOs also have higher cost since they must compensate agents via commissions, which can account for ~40-50% of MTOs revenues. However competition and fear of regulation work to limit fees. On average, fees for cash-based money transfers are higher than for online account-to-account transfer but lower than other bank-based means.

Digital-led Money Transfer

Digital includes any payment that was initiated online (e.g. desktop PC) or via mobile, and can use both bank accounts and credit/debit cards as the funding method. Most major traditional remittance companies offer digital-led money transfer (for example westernunion.com) and there is also a profusion of newer digital-only choices (for example, TransferWise, Xoom). Digital tends to cost less than traditional means because they eliminate agent commissions, at a minimum.

The underlying mechanism for most digital choices is still either the bank or the MTO network. So the front-end changes but not necessarily the rails. However, some of the digital-only choices have tried to adopt innovative practices to lower cost and/or risk.

Remittance Channels

The four main channels for sending remittances are as follows.

- (1) Bank Channel;
- (2) Money Transfer Operator (MTO) Channel;
- (3) Digital Channel;
- (4) Hawala (Informal Channel).

Each channel provides a variety of remittance products or methods, as described in the previous section. The above classification is not a strict one, since banks as well as MTOs offer digital (i.e., online/mobile) choices. However, separating out online enables us to analyze how online-only choices stack up against the other choices.

Bank Channel

Banks are major players in remittance (about 50-60% of the global remittance volume). They can leverage their broad correspondent networks to serve a wide range of corridors. However, banks rarely view remittance as a core business – rather, they provide remittance services mainly for the benefit of their existing clients, who may need to send money overseas for reasons such as children's education or foreign investments, and value having all their transactions in one place. Banks allow higher transfer limits and frequencies, and in certain cases, for high net worth clients, there are no monthly limits.

However banks have multiple disadvantages vs. MTOs which can be faster, cheaper, global and more convenient. Banks' disadvantaged position is because they do not control the remittance process end-to-end whereas MTOs control their network. Due to these factors, banks have steadily lost share to MTO industry leaders like Western Union and MoneyGram and more recently to online channels.

The combination of share loss and heightened regulatory (mostly AML compliance – described later) and technology costs in a non-core activity has led to banks questioning their involvement in this business. There are a range of outcomes.

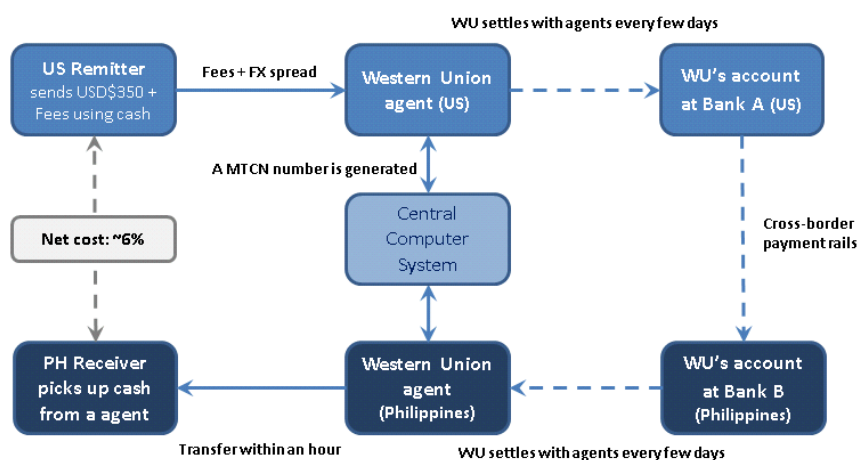
- **Several banks chose to exit the small-value remittance market** (where recipients could pick up cash and didn't necessarily have a bank account, which hindered adequate monitoring). BAC and JPM both exited their respective businesses in 2014 as a consequence of this. HSBC exited the remittance business in 2012 after receiving a \$1.9 billion fine from US authorities for poor money laundering controls associated with their remittance activities.
- **Some banks (U.S. Bank, Fifth Third) have chosen to partner with MTOs** like Western Union and act as agents. Also, some banks in major receive markets do view remittance as an important business, but they do so on a very corridor-specific basis, e.g., Turkey's Garanti Bank in the Germany-Turkey corridor.

Money Transfer Operator (MTO) Channel

MTOs are a major component of the overall remittance market. All MTOs have last-mile reach and the larger ones also possess a wide agent network. They have also invested in online and mobile choices, whose usage has grown rapidly (although it still remains a small part of the overall market). This provides them with a competitive advantage in the cash-to-cash segment (~35% of the market).

Figure 1 shows a typical cash-based transaction – for illustrative purposes we highlight a \$350 U.S.-to-Philippines transaction. A sender goes to a Western Union agent and hands over \$350 in cash plus applicable fees to an agent along with a completed form stating the name of the recipient. The agent quotes the exchange rate and the exact amount the recipient will get in local currency – since this is a U.S. transaction, there is some regulatory dependence on the exact procedure set under Dodd-Frank legislation. The agent logs in to the Western Union system and generates a unique Money Transfer Control Number (MTCN) that is given to the sender. The sender must share this number with the recipient, who must bring his ID to collect the cash from a local agent. The entire process takes a few minutes (depending on delivery speed selected). The local agent in the Philippines prefunds the transaction, and settlement with Western Union happens at a later time.

Figure 3. Illustration of Typical MTO-based Remittance – U.S.-to-Philippines via Western Union



Source: Citi Research

Agents are screened for their ability to provide pre-funding of transfers, which is crucial to maintaining liquidity in the system and for speed. The network of agents implies a global pool of liquidity. Following the transaction completion at the agent level, bank transfers are batch-processed and settled on a net basis, thereby reducing unit transaction cost. In addition, MTOs with high monthly transaction volumes can negotiate better pricing for payment transfers with banks or a third party on FX. As a result, FX revenues give MTOs flexibility in pricing for different corridors and contribute to covering the expenses associated with maintaining an agent network (while the majority of agent costs are variable and transaction-based, there are some fixed costs associated with the network, equipment, etc.).

MTOs possess several advantages that should be sustainable in the near-to-interim term. Firstly, they provide the only legitimate choice for most unbanked people. Second, the prefunding mechanism implies a faster choice and in high-traffic corridors, they can also provide a cost-effective alternative. Third, the network does represent a moat given MTOs' contractual relationships with agents can take a long time to build.

Digital Channel

The trend towards digital (i.e., online and mobile) remittances exploits the high level of phone penetration and growing internet penetration. Digital channels provide account-to-account services accomplished through local bank transfers, and

therefore customers avoid paying bank fees. The interesting angle here is the evolution of the native digital choices – for example, TransferWise is attempting to change the underlying process and Xoom is a digital choice that started as a digital-only choice (i.e. account to account only) which has started offering a physical-world delivery choice.

Digital entrants aim to lower operating cost relative to traditional MTOs by doing away with costs related to physical infrastructure and provide much lower pricing to gain market share. Over time, we look for the level of trust in the digital channel to build. Also, even though internet access and penetration rates are much lower than the global average of 46%⁹ in many “receive” countries due to a lack of underlying infrastructure, we look for this to grow over time. In our view, these trends should result in a multi-year decline in the traditional agent-based approach. One factor is that traditional MTOs can offer multiple payout options such as agents and prepaid cards, which can stem the tide as far as agent channel share loss is concerned.

Although newer digital-only remittance choices often hog the headlines, we note that most major traditional remittance providers now offer an online and/or mobile choice as well. In fact, Western Union’s digital revenues in 2015 were \$300 million and dwarfed those of its digital competitors like Xoom (\$177 million), worldremit (\$39 million), and TransferWise (\$14 million). Of course, Western Union’s digital business is growing at a much slower pace, partly due to its larger size. Having said this, the growth of the mobile channel helps digital growth – for example, Western Union reported 25% growth in 1Q16 for westernunion.com and stated that 55% of their US online transactions are initiated via mobile¹⁰. While this represents a deceleration year-over-year, it is much faster than the paltry growth of the traditional channel and Western Union has managed this transition well. Western Union has noted that many of its digital users are a different demographic (i.e., newer, younger consumers) and so do not cannibalize their core services.

Since the money transfer process is done similarly between digital providers and MTOs, we believe operating costs are similar, and this is broadly reflected in the pricing. We look for digital pricing to be similar to traditional MTO pricing, adjusted for the absence of agent commission(s). One exception is TransferWise, which offers significantly lower rates in most surveyed corridors. TransferWise is currently aggressively marketing their services and promoting their ultra-low rates. We believe they are squarely targeting market share growth and question the sustainability of this approach.

1) TransferWise

TransferWise is a London-based digital remittance service provider. It operates in more than 50 countries and has no physical locations or agents. TransferWise enables send-and-receive service between 18 major currencies (including USD, EUR, GBP, CHF) and a send-only service for a further 20¹¹.

The TransferWise business model seems similar to the MTO account-to-account payment model, where remittances are disbursed through local bank accounts with liquidity on hand. Settlement occurs later in batch-mode via a correspondent banking network or a third-party payment company. Although TransferWise says it uses a “matching engine” to net different payments in the same currency against one another, we believe that true matching is impossible in most corridors due to

⁹ The World Bank Data <http://data.worldbank.org/indicator/IT.NET.USER.P2>

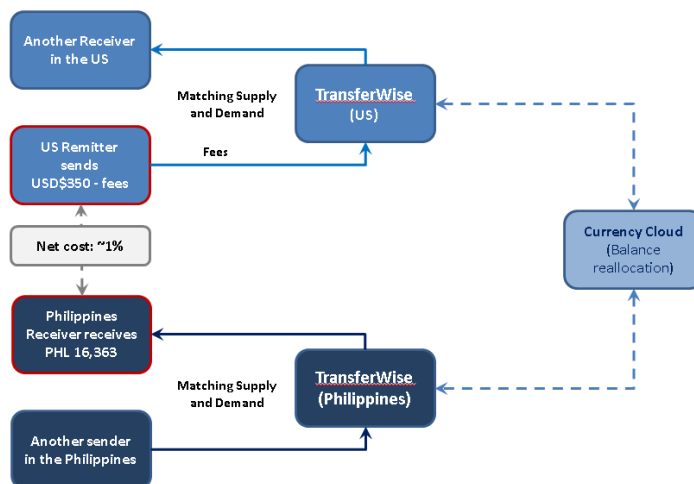
¹⁰ Western Union 1Q16 Earnings Call

¹¹ TransferWise [Supported Currencies](#)

the natural imbalance between the “send” and “receive” sides, i.e., most corridors are largely unidirectional for economic and/or demographic reasons. So, although theoretically TransferWise can use “matching” to reduce FX costs and translate this into lower fees (see Figure 3), it likely has to obtain currency in the traditional way through the open market in a large number of situations. This function is outsourced to a back-end payment system (Currency Cloud) which is a payment technology platform that specializes in FX, and facilitates high-volume cross-border payments for institutions. While the FX rates offered by Currency Cloud are attractive, TransferWise’s model relies on matching payments to avoid FX altogether. If significant imbalances occur, the matching model breaks down and starts to look a lot like regular remittance transfer. To optimize its business model, we believe TransferWise must cherry pick corridors with equivalent incoming and outgoing flows to maintain the economical matching system.

- TransferWise announced¹² that it would be placing restrictions due to exchange rate volatility on the day of the EU referendum, which may indicate it may be taking principal risk on the FX to complete transactions when it cannot find a match. Since If it were truly an agent model, the company would not actually bear any risk on the transaction.

Figure 4. TransferWise aims to lower costs by using a matching engine



Source: Citi Research

From a consumer standpoint, TransferWise’s two biggest selling points are its smooth user experience and its low prices. While our view is that the aggressive low prices are not based on its own low cost, the attractive front-end gives them an advantage over banks and MTOs whose platforms tend to be clunkier. TransferWise’s transaction volume has grown to ~\$8.5 billion¹³ within 5 years of the company’s inception, much faster than the pace exhibited by Xoom. On average, fees are 2% lower than other online players and MTOs’ account-to-account transfers (see Figure 5 in our Price Analysis section). In contrast to Western Union’s agent model, which often supplements a lower transaction fee with a higher FX spread, TransferWise has chosen to forgo FX revenues and uses lower fees to attract customers, coupled with effective referral plans and high-profile marketing.

¹² [GBP Transfers during the EU referendum](#), TransferWise website

¹³ [TransferWise Blog](#)

2) Xoom (PayPal) (Digital/Hybrid Model)

PayPal is in a strong position to provide worldwide P2P payment services. The company has massive scale, with (as of 1Q16) 184 million active accounts transacting in 26 currencies and 203 countries and a merchant base of ~14 million.

Xoom is an online money transfer service. Payments are initiated online only (mobile or web), but may be disbursed in cash or account deposit – hence the hybrid model. Xoom serves 51 countries. Xoom's gross transaction volume of ~\$7 billion is still relatively small (~1% market share) compared to Western Union and even TransferWise, which may be surprising considering Xoom is about a decade older than the latter. There are historical reasons for this, including a lack of market focus initially, the insistence on largely sticking with U.S.-outbound rather than expanding to other markets, and the resources needed to expand to new corridors.

PayPal's acquisition of Xoom should help it to expand faster than its recent past would indicate since it can leverage PayPal's global infrastructure (has already expanded to 13 additional countries in ~5 months of being owned by PayPal). Xoom's high revenue growth rate was historically supported by heavy marketing in referrals that new users get free credits for payments. Marketing expenses have accounted for >20% of Xoom's total revenues, significantly more than traditional MTOs, which shows the sticky nature of the traditional service. In addition, competition from MTOs' online promotions made client acquisition challenging in 2014-15 prior to its acquisition by PayPal, as the pricing gap narrowed to 1-2%.

Informal Channels (Hawala)

Informal channels are often referred to as Hawala, which comes from the word "transfer" in Arabic. Hawala is an ancient method of money transfer that has been used for centuries. Hawala is usually offered by small stores in migrant communities. The mechanism for sending money is actually very similar to how an MTO works. The sender goes to the "Hawaladar", the individual who executes the transaction. Money is exchanged, and the Hawaladar records the amount and who the transfer is destined for. The Hawaladar then simply contacts their partner in the receiving country and gives them instructions on who to give the money to and how much. The partners settle later. Often payments can be netted, because as mentioned above, hawaladars have stores which sell imported goods. As a result outgoing remittances are balanced by payments for incoming goods.

Hawala is often the cheapest option to remit money. Users of hawala benefit from anonymity which is often highly valued when there is distrust of governments and banking systems. Hawaladars often record transactions informally, which means that it is very difficult to trace transfers back to individuals. Hawala has been increasingly scrutinized due to links to terrorism funding, but in some cases it is truly the only way to send money back to a country. This is the case for Somalia, which has seen a massive exodus of banks and MTOs in recent years due to the risks of sending money there (low rule of law, terrorism, piracy).

Hawala, by its very nature, is difficult to measure - arguably the global push to root out money laundering initially resulted in a share shift to legal means like Banks and MTOs - however, more recently, some reports have suggested that banks exiting the remittance business due to stringent AML rules is likely to have an unintended consequence of greater use of hawala.

Remittance Pricing Analysis

We used public data to do an apples-to-apples pricing comparison between the different channels discussed above. The various corridors are segmented into high-volume, mid-volume, and low-volume. The data below do not include a cash-based option. However, we note that market leader Western Union charges ~6% on average for its transactions and maintains that it charges a modest premium due to its market position and brand recognition. We discuss our findings immediately after the illustration below.

Figure 5. TransferWise prices aggressively, while MTOs and Online price more closely to each other

Corridor	Bank Wire Transfer	MTO	Online	Transferwise
		Account-to-Account		
High volume (>\$10 bil)	12.50%	2.60%	3.31%	1.07%
US-Mexico	12.46%	3.24%	3.35%	0.94%
US-India	11.88%	0.39%	2.09%	0.87%
US-Philippines	14.03%	2.91%	3.54%	0.99%
US-China	13.48%	3.45%	3.86%	1.48%
Medium volume (\$2-10 bil)	11.53%	4.07%	2.67%	1.27%
UK-India	10.60%	3.01%	1.21%	0.81%
Canada-China	11.50%	6.04%	3.51%	1.50%
Australia-China	12.50%	3.16%	3.29%	1.50%
Low Volume (<\$2 bil)	11.17%	4.41%	2.86%	0.86%
UK-Poland	9.83%	3.09%	2.48%	0.50%
Germany-Turkey	10.28%	5.39%	3.77%	0.99%
US-New Zealand	13.39%	4.75%	2.32%	1.10%

Source: Citi Research. Wire Transfer fees include data from WFC and Citigroup; MTO fees include data from Western Union, MoneyGram, and Ria (except for non-US originated payments); Online includes data from WorldRemit, Xoom (except for non-US originated payments), and Azimo (for UK-India, UK-Poland, and Germany-Turkey corridors); TransferWise

Note: cost is calculated based on sending \$350; World Bank's database in 2014 for corridor volumes

- **Bank Wire Transfers are the most expensive option** – Our data supports the claim that banks are generally the most expensive option. We point out that pricing tends to be relatively uniform across most corridors, which lends credence to the idea that banks do not really attempt to compete for remittances.
- **High-volume corridors exhibit more competitive pricing....** This is likely due to the impact of heightened competition on pricing. We found that there is less opportunity for differentiation in these corridors, and scale plays an important role. An extreme example of this is the US-India corridor, which MTOs will serve for a mere 39 bps.
 - **Banked consumers can avail of multiple choices which shows why high volume corridors tends to be more competitive** – Even if the recipient needs to receive cash, the sender can lower their commission by avoiding the agent at their end. Also, a richer consumer likely has the means to compare multiple options and get the best price. A typical example of this type of consumer would be an Indian immigrant in the U.S. sending money to India. This corridor is very well served, and sending money is extremely cheap. These types of consumers also tend to remit larger amounts of money, which means that any flat fees have less of an impact, as they make up a small portion of the total amount sent. For this consumer, the friction in price is likely to occur when trying to send money to lower volume corridors, where there are fewer options.

- **... than lower volume corridors where the big MTOs control significant market share** – Lower volume corridors are more expensive due to the lower amount of options, and consequently consumers are price-takers. This is especially apparent in Africa where the options available are generally limited to Western Union or MoneyGram.
- **Africa is a prime example of limited competition leading to expensive remittances...** – World Bank data shows that remittances to Africa are the highest in the world on a regional basis. In many countries, two providers (MoneyGram and Western Union), make up a large majority of the market share. According to a report by the International Fund for Agricultural Development (IFAD), MoneyGram and Western Union controlled 65% of all payout locations. In addition, these two providers often have exclusive agreements with agents, which leads to even more limited choice. Regulation in Africa on remittances also contributes to the lack of competition. In many countries, only banks are allowed to pay remittances and this creates an artificial limitation on the number of payout locations.
- **...And even mobile money does seem to be the answer for lower costs due to lack of competition** – Kenya has been a unique model with the proliferation of mobile money usage through M-Pesa, a mobile wallet that allows users to store, send, and receive money using a cell phone. Users can load their phones with the assistance of an agent at a physical location. At first glance, this would appear to solve the last mile problem which is the largest source of costs in consumer remittances. However, because M-Pesa is a closed-loop network owned by Safaricom, the dominant telco in the country, fees for sending remittances remain high. Moreover, M-Pesa does not affect the process of remitting money into the country – that is still performed via traditional MTOs like Western Union.

Sources of Friction

Heightened regulatory and compliance requirements for money transfer are a source of friction that can increase the cost and lower the speed of a transaction.

How does regulatory complexity hurt consumers?

AML, KYC and other regulation was created with the best of intentions, with an objective to enforce consumer protection and hurt terrorist financing activities. However, banks are becoming much more risk-averse vis-à-vis the clients they serve, and because MTOs ultimately rely on banks to store and move funds, they have experienced the termination of their accounts in certain countries. This prevents them from serving clients in those countries, which can limit the options consumers have to send money. As a result consumers may be unwittingly pushed toward unregulated and expensive alternatives that afford little consumer protection. Notable cases where this has occurred include remittances to Somalia and also remittances from Australia to the Pacific Islands (e.g. Papua New Guinea.)¹⁴ From a social perspective, this can be severely damaging to populations in poorer receiving countries for whom remittances often constitute a material portion of their GDP.

There are two types of regulation that U.S.-based remittance companies face.

- **Licensing** – State Money Transmitter Licenses Are Required in the U.S. for Money Services Businesses. Obviously getting 50 separate state-level permits adds to cost. State licensing focuses primarily on consumer protection. Amongst other requirements, some money transmitters must carry a \$500,000 surety bond. In the EU, companies have the ability to passport licenses (one country's license is valid in the entire EU) which saves on costs related to bureaucracy.
- **The CFPB provides an added layer of consumer protection** – The Consumer Financial Protection Bureau (CFPB) has also issued new rules (Dodd Frank 1073 which amends Regulation E on Electronic Fund Transfers), which increases the protections afforded to consumers. This regulation includes provisions such as disclosures on exchange rates, fees/taxes, and final amount delivered to recipient, in addition to rules which grant consumers the ability to cancel a transfer within 30 minutes and get a refund. These types of rules tend to make it more costly to do business.
- **Customer onboarding (KYC) and monitoring (AML)** – In the U.S., at a federal level, money transmitters must register as Money Services Businesses (MSBs) with FinCEN under the Bank Secrecy Act. This entails requirements to file suspicious activity reports when warranted, the development of an AML program, and compliance with strict record-keeping requirements.

Compliance and the Speed of Transmission

A common refrain from potential technology-based disruptors is that they can speed up an existing process using technology – while this is always possible, it is important to realize that the existing process might be slower than desired due to the underlying regulatory complexity. We note the following points and while many of them seem like common-sense issues that should be easily resolved, they cause delays because an error or “kick out” starts up a manual process. There are also errors that are caused by consumers.

¹⁴ [Closing of bank accounts of money transfer operators \(MTOs\) is raising remittance costs](#), Sonia Plaza, World Bank, 10/22/14

- When initiating an account-to-account payment, compliance, fraud, and the involvement of banks and the interbank system can cause problems. A simple thing such as inaccurate receiver information can trip up a bank's system and necessitate a manual intervention and communication between multiple entities, which adds to the delay.
- In developing countries, banking systems are known to fail periodically, which prevents money from being transferred between banks. Clients often end up blaming the MTO, even though the true culprit is the banking system. Banks in receiving countries are also incentivized to hold on to the money longer because they benefit from the float. This misalignment of incentives can contribute to delays.
- Traditional MTOs are faster than bank-based methods since they avoid interbank payment rails. However, logistical factors can still slow the process. On the sender's side, cash-to-cash requires a visit to an agent, and may be a less pleasant customer experience (e.g. long lines on payday).
- Payments can be flagged for a variety of reasons, even if legitimate. Common examples include individuals having names similar to blacklisted individuals, or improperly filled out forms.
- Other factors MTOs have brought up in conversations include a sender miscommunicating the secret code to the recipient; relatives on the receiving side going to pick up the payment on behalf of someone else, not realizing that only the intended recipient is allowed to do so; recipients forgetting IDs or bringing expired IDs preventing an efficient pickup.

Bitcoin and the Remittance Market

“Bitcoin as a technology doesn’t solve any problems for us in the core of our business. Our challenge is the last mile. How do I get that money in the person’s hand, and meet all the regulatory compliance needs in that country? So, I don’t really need it for the minimum. Moving a bit from Point A to Point B isn’t hard. The last mile is really hard.”
– David Thompson, Chief Information Officer of Western Union¹⁵

Bitcoin and the Remittance Market

Due to the importance of the “last mile” and the costs associated with it, we believe Bitcoin-based remittance systems are unlikely to offer advantageous price/performance within a reasonable time-frame – particularly on a global scale.

Regardless of how the Bitcoin Remittance Market specifically evolves, it is important to discuss the growth of Bitcoin Exchanges, which we believe are one of the key building blocks (of a Bitcoin-based Remittance or Payments system).

In this section, we address the following:

- (1) Bitcoin’s Remittance Use-Case
- (2) Building a Network: Bitcoin Exchanges – A Necessary Building Block For Bitcoin-Based Payment / Remittance Systems
- (3) Analysis of Legal and Regulatory Hurdles
- (4) Existing Technology

Bitcoin’s Remittance Use-Case

The Remittance market currently relies on traditional centralized networks – primarily bank rails (including a network of correspondent banks) and MTOs. In the previous segment we discussed many of the attributes of these traditional systems and it was clear that these are far from optimal.

We note that in order to improve the remittance process, Bitcoin must (1) Enable an instantaneous end-to-end transfer beginning and ending in fiat, with the relevant comparison being the “few minutes” that an MTO takes for a cash-based transfer; (2) Provide the sender and receiver assurance and notification that the payment has been completed successfully; (3) Be no more expensive than what currently exists; and (4) Provide an intuitive user-experience. If it could satisfy these criteria as an online “peer-to-peer version of electronic cash”, Bitcoin would be a good alternative to traditional remittance. We analyze Bitcoin’s efficacy along the following lines – Speed; Cost; Transparency; Client experience. Further, we also discuss one of the points skeptics point to – the issue of Bitcoin Volatility.

We conclude that there are benefits for certain niche applications, but also flaws which make it unlikely to disrupt traditional players in the near-term.

¹⁵ <http://www.coindesk.com/western-union-cio-bitcoin-solution-todays-market/>

Building a Network – Bitcoin Exchanges

Bitcoin Exchanges are a necessary building block for the widespread adoption of Bitcoin for remittance / payments use-cases. They are useful to provide liquidity, tamp down volatility, promote standardization and set up a secure location for currency conversion (for local funds).

The Case for Bitcoin Exchanges

The source of remittance costs is not from the actual transfer of money, but rather from KYC/AML, customer acquisition, and paying commissions to brick and mortar agents. Large MTOs benefit from the scale of their network and moving vast amounts of money which results in efficiencies and low cost. Although sending bitcoins is intrinsically cheap, the on- and off-ramps will still be needed and will therefore place a floor on how low remitters can go in terms of charging fees, which limits potential profits. Furthermore, most individuals who use Bitcoin for remittance (freelancers, students, some tourists) do not really need a service provider to carry out the process for them since it is quite easy to send bitcoins with existing wallets. The only service that is useful for this type of user is an exchange in the country where they would like to obtain local funds.

Exchanges are required to enable users to go in and out of the currency. To expand Bitcoin's global reach, it is necessary for exchanges to be omnipresent and well connected with each other (see Figure 6 for an overview of exchanges around the world). The potential innovation that Bitcoin enables is only possible if the currency is highly liquid and the underlying infrastructure provided by the exchanges is solid.

Exchanges are the key to bridging the fiat and Bitcoin worlds. In the remittance use-case, Bitcoin exchanges allow users to obtain local currency at the conclusion of a transfer, by providing a market where they can sell bitcoin. Liquidity is an important factor for Bitcoin because the more liquid it is, the more utility it has, and the more stable the network is. Although the liquidity for Bitcoin and most major currency pairs is quite good, in countries with more thinly traded currencies there may be added costs due to the wider spreads. As Bitcoin grows and liquidity providers sprout up in more isolated regions, bid/ask spreads should eventually come down. Note that these smaller corridors are typically also the ones where conventional remittance providers charge the highest fees (as a percent of principal). While this is partly due to a similar cost of managing wider spreads, a lack of viable competition is also a factor, in our view. Therefore, we believe that new competition from Bitcoin services could affect traditional pricing over time.

Building (A Network Of) Exchanges

There are three steps to building a new exchange. The first step is obtaining a solid banking relationship, which provides the exchange with access to the local rails. Second, it is necessary to develop liquidity, which is done by providing consumers and traders with an easy way to buy/sell bitcoins. Finally, exchanges should spur developer interest to build apps that utilize bitcoins, for example software for merchants to accept Bitcoin payments (i.e. develop the currency's utility).

Building an exchange is not enough, however – for any super-regional or global system, interoperability is crucial. Today there are many Bitcoin exchanges, but they are quite fragmented. However, because they have been founded independently and are located in different countries, the market is still quite fragmented.

Exchanges use a variety of APIs to enable the building out of apps, but their underlying protocols are not standardized in any way at the moment. By creating a common set of standards and integrating the exchanges, it will be possible to improve price discovery of Bitcoin, as well as provide the necessary instruments to manage risk (forwards, options, swaps). These hedging instruments will contribute to stability in the currency.

Exchange-Related Risks

In the past few years, a number of Bitcoin exchanges have closed down due to data security or payment disputes, such as customer data leakage or payment fraud. Sudden closures can impact the liquidity of Bitcoin in a given country, and may put user funds in jeopardy (i.e. if private keys are stolen). It is therefore important for exchanges to be properly licensed and regulated in order to increase customer confidence.

Mt Gox was one of the largest Bitcoin exchanges by volume in the world. The firm ended up filing for bankruptcy due to a loss of roughly \$350 mil worth of bitcoins (744,400 bitcoins¹⁶) in 2014. There are several theories for the cause of Mt Gox's collapse, including a technical breach, a hack, and internal fraud. While the real reason remains unknown, it taught both consumers and other Bitcoin exchanges an important lesson.

To prevent similar events from repeating, one common solution is through "cold storage", which saves consumers' private keys offline to avoid breaches from an internet attack. Another way exchanges have sought to protect consumers is through insurance coverage, which can mitigate losses from fraud. For example, Coinbase insures the small percentage of keys they hold online (for liquidity purposes) against cyberattacks, employee theft, and loss¹⁷.

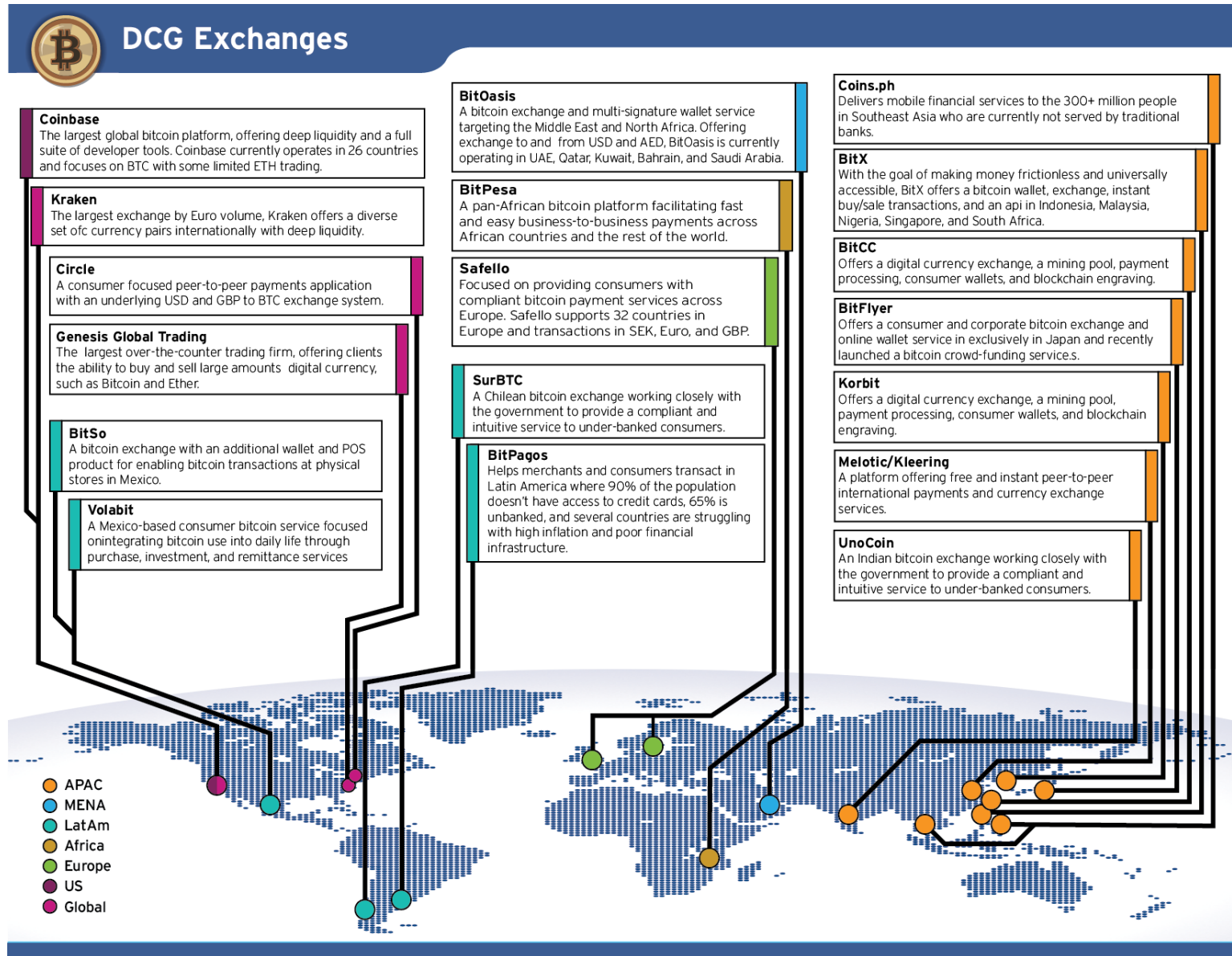
An Example – Mexico's Developed Exchange Market

Mexico is in a unique position to enable highly efficient Bitcoin remittance. Firstly, exchanges like Bitso offer ample liquidity for transactions up to ~\$10,000 and are highly integrated with the Mexican interbank system (SPEI) which allows near-instantaneous electronic transfers. It is therefore possible to seamlessly exchange bitcoins for pesos, and have the pesos immediately accessible. Additionally, the exchanges are regulated by the government, which has encouraged the development of technologies to bring modern financial services to the population. These factors all sum to competitive pricing for Bitcoin transfers

¹⁶ <http://www.coindesk.com/canada-mt-gox-class-action-dismissed/>

¹⁷ [How is Coinbase insured?](#), Coinbase website

Figure 6. Digital Currency Group Exchanges



Source: Citi Research, Digital Currency Group

Analysis of Bitcoin's Legal / Regulatory Status

We believe regulatory requirements are hurdles for new entrants in the remittance and money transmission industry, given that regulations on money laundering have become stricter, and different jurisdictions may have different degrees of oversight on digital currency. Below we walk through the major regulatory issues around Bitcoin money transfer.

Is Bitcoin a Currency or a Commodity?

The regulatory definition for Bitcoin is unclear and varies across countries. Depending on the use-case for Bitcoin, different regulations will apply. For the purposes of remittance and money transfer, it is likely for Bitcoin to be categorized as a currency, and therefore subject to AML. On the other hand, Bitcoin as a commodity would be subject to tax laws. In either case, service providers must understand local regulations and decide if the corridor is suitable for their business.

- **US states consider Bitcoin to be a currency** – The specific status determines which regulator has governing authority. Currently, states see it as a currency, and consequently it must be regulated under the umbrella of money transmission. However, in a recent case involving Coinflip, a company engaging in Bitcoin option transactions, the CFTC suggested that Bitcoin could qualify as commodity and therefore would be covered by the Commodity Exchange Act (CEA). While the CFTC does not have specific rules governing Bitcoin, the CFTC noted that it would oversee futures and swaps in any commodity, which is broadly defined to include derivatives linked to stock market indices and currencies, including Bitcoin.
- **Internationally, Bitcoin is still in a grey area** – Bitcoin regulations are unclear internationally, with some nations such as China, Russia and India having banned transacting in Bitcoin to varying degrees. These regulatory differences are problematic for the development of the technology because compliance with different rules could become overly burdensome.
 - **China** – In China, Bitcoin is not considered a currency and financial institutions and payment firms are forbidden from using Bitcoin for trading, clearing, settling, or other types of activities. However, individuals are not subject to such regulation and are allowed to trade or exchange bitcoins for non-business purposes. In addition, there are no specific regulations on Bitcoin exchanges or wallets. Chinese investors have enthusiastically put their money into Bitcoin in the search of higher returns, especially given recent difficulty in the markets, and the devaluation of the yuan¹⁸.
 - **India** – In India, there is no specific regulation on Bitcoin but rather on the underlying business, which may subject to Foreign Exchange Management Act rules. However, there have been incidents where Bitcoin-related businesses were forced to close down due to regulators' concerns on the underlying risk involved with Bitcoin.
 - **EU/UK** – The EU Court of Justice ruled in October 2015 that Bitcoin is a currency and is not subject to VAT. While the UK seems to be more Bitcoin friendly without any Bitcoin regulation in place, it actually creates more problems than in a regulated market. Many local banks are reluctant to open accounts for Bitcoin companies, partly due to fear of the potential risks resulting from the undefined regulatory regime. For example, Bitcoin wallet

¹⁸ [China Buying Sparks Bitcoin Surge](#), Wall Street Journal, May 30th 2016

providers are not subject to AML rules, but banks are under high scrutiny from regulators. Lack of local partnerships forces Bitcoin companies to seek bank partnerships somewhere else or move to another jurisdiction, and this reflects in higher costs associated with Bitcoin acquisition and sale in the U.K.

Licenses Are Required for Money Services Businesses to Protect Consumers...

- **In the US, companies must register at the state level and this licensing focuses primarily on consumer protection.** Similar to a regular MTO, a company dealing in virtual currencies must apply for a money transmission license in each State where they do business, which is a time-consuming and costly endeavor (amongst other requirements, some money transmitters must carry a \$500,000 surety bond).

States' varying responses to adapting their licensing procedures for cryptocurrencies create considerable regulatory uncertainty and complexity. This could push out startups to operate somewhere with a more Bitcoin friendly regulatory environment such as London, UK to avoid tedious state rules.

- **The New York Department of Financial Services created a new license called “BitLicense” specifically for cryptocurrencies.** The BitLicense will specifically regulate businesses dealing in virtual currencies. BitLicense is the first virtual currency regime proposed and enacted in the United States. This rule covers areas such as cyber-security, consumer protection, safeguarding assets and AML¹⁹. The rule has received criticism for being very onerous²⁰ (e.g non-refundable application fee of \$5,000, as well as duplicating existing federal and NY state AML obligations, which can make total costs for compliance run upwards of \$100,000²¹) and potentially stifling innovation.
- **This state-by-state effort could be a long and arduous process, and may lead to a fractured landscape.** While other states require licenses as well, it is unclear whether they will accept the BitLicense. The costs for registering in 50 states could lead to competition between states if reciprocity does not apply. California is also working to issue its own regulation, though a version of a bill similar to New York's was recently defeated within the state's legislature²². Federal regulation may be a more efficient way of creating rules around how blockchain should be used.
- **In contrast to the US, in the EU licenses obtained in one country are valid in all 28 countries (called “passporting”).** Bitstamp, a notable exchange based in Europe, recently obtained a Luxembourg license authorizing them to be a fully regulated exchange. This compares to the complexity of dealing with multiple states in the US, which is a major headache for Bitcoin companies (see following section).

¹⁹ New York's Final “BitLicense” Rule: Overview and Changes from July 2014 Proposal, Davis Polk, bitcoin-reg.com

²⁰ [The Real Cost of Applying for a New York BitLicense](http://coindesk.com), Coindesk, August 13, 2015

²¹ <https://blog.coinbase.com/2015/02/27/bitlicense-part-two/>

²² <http://cointelegraph.com/news/115284/californias-version-of-new-yorks-infamous-bitlicense-defeated-in-state-legislature>

Heightened Scrutiny from the CFPB

The Consumer Finance Protection Bureau (CFPB) has increased its oversight on the rising number of companies providing payment services, and this includes companies dealing with cryptocurrencies. In general, payment companies must follow a strict set of procedures to ensure consumers are protected in instances such as refunds, unauthorized use of accounts, and customer data for example. Failure to adhere to these regulations can result in hefty fines. For example, the CFPB found that from 2010-2014, Dwolla falsely claimed that its data exceeded or surpassed industry standards, as well as falsely claiming that its information was securely encrypted and stored.²³

...as are Onboarding (KYC) and Monitoring (AML) Practices

In the US, at a federal level, money transmitters must register as Money Services Businesses (MSBs) with FinCEN under the Bank Secrecy Act. This entails requirements to file suspicious activity reports when warranted, the development of an AML program, and compliance with strict record-keeping requirements²⁴.

FinCEN defines digital currency administrators or exchangers as MSBs²⁵. A person or entity that uses digital currency is not defined as an MSB, but an exchanger of fiat for a digital currency (or vice versa) is subject to MSB rules. The same rule applies to administrators, who issue digital currencies and have the ability to redeem them. This rule covers the majority of Bitcoin remittance providers as they exchange fiat for bitcoins directly or issue digital money for a payment transfer.

When a bank provides a financial partner access to the financial payments system, it must be careful that it is not adding to systemic risk. So, before a bank agrees to provide a Bitcoin company with commercial banking services, it must be sure that it has the means to monitor the company's activities so that if the Bitcoin business "pivots" to other activities, it can be tracked. It is the bank's responsibility to have a solid understanding of how the business model has changed, and what it means for a client's risk profile and to withdraw support if needed. As a result, some rather successful Bitcoin companies have faced this problem in the past (e.g. Xapo had a number of operational accounts shut down in 2014 despite having raised a sizeable amount of funds at time).

²³ [CFPB Takes Action Against Dwolla for Misrepresenting Data Security Practices](#), Press Release, 03/02/2016

²⁴ Bitcoin: Overview of US Legal Treatment, Reuben Grinberg, Davis Polk & Wardwell, 2/24/15

²⁵ FinCEN 2013 Guidance on Virtual Currency

Bitcoin vs Existing Providers

In this section we look at how Bitcoin compares with existing online providers in terms of cost, speed, transparency and user experience. All in, we do not believe Bitcoin provides a significant benefit when compared to conventional methods.

- **Cost** – We find that TransferWise is the cheapest option by far in most cases, although we question how sustainable their pricing is.
- **Speed** – Although Bitcoin transactions usually can be considered settled in <10 minutes, exchanging to fiat and transferring between the local banking rails does not save on speed since that is the same process employed by conventional providers. Additionally, payments are occasionally held up for compliance, which would be no different for Bitcoin
- **Transparency** – Bitcoin does make it easier to track the transaction since it is possible to view what the status is on the blockchain. However, when using other payment services like Western Union or Xoom (Paypal), the payment is sent through a centralized network. Consequently, the MTO can generally easily ensure that the payment has arrived since it is simply a matter of messaging the retail agent in the receiving country to authorize disbursement.
- **Customer experience** – Customer experience can be poor using Bitcoin, given the technological understanding required to use it properly, as well as the lack of “customer support” if something goes wrong.

Analyzing Bitcoin's Cost

Bitcoin's ability to make an international payment cheaper than the conventional alternatives is corridor-dependent. We calculated in Figure 7 what it would cost to do a fiat-to-fiat transfer using Bitcoin for the cross-border step. This includes fees charged by exchanges for buying and selling bitcoins, as well as any fees/taxes associated with bank transfers for deposits and withdrawals.

Figure 7. Bitcoin Costs Are Corridor Dependent, But Generally There Are Cheaper Options

Corridor	Online	Transferwise	Bitcoin Blockchain
	Account-to-Account		
High volume (>\$10 bil)	3.31%	1.07%	2.84%
US-Mexico	3.35%	0.94%	4.37%
US-India	2.09%	0.87%	6.23%
US-Philippines	3.54%	0.99%	1.15%
US-China	3.86%	1.48%	3.38%
Medium volume (\$2-10 bil)	2.67%	1.27%	5.39%
UK-India	1.21%	0.81%	10.91%
Canada-China	3.51%	1.50%	1.81%
Australia-China	3.29%	1.50%	3.45%
Low Volume (<\$2 bil)	2.86%	0.86%	3.27%
UK-Poland	2.48%	0.50%	7.74%
Germany-Turkey	3.77%	0.99%	1.07%
US-New Zealand	2.32%	1.10%	0.99%

Source: Citi Research, Xoom, WorldRemit, TransferWise

Bitcoin exchange: Coinbase (US), Volabit (MX), Unocoin (IN), Coins.ph (PH), BTCC (CN), btc Turk.com (TK), Coinfloor (UK), Kraken (CA, DE), Bitcurex (PL), Coinspot (AU), nzbcx (NZ)

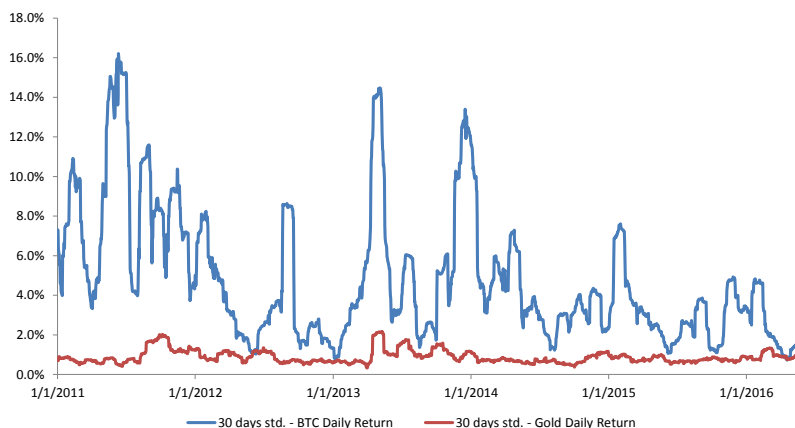
Low base cost, but several challenges exist – Bitcoin allows anyone with internet access to transfer value across the network at very low cost (fee of ~\$0.06 for median transaction size). Because the network is global and decentralized, there is no geographical limitation on where bitcoins can be sent, which is why the idea is powerful for remittances. Bitcoin allows users to bypass banks, MTOs, card and networks as well as those networks' associated costs.

■ **Challenge #1 – The Cost of Exchanging Bitcoin** – Exchanging fiat for bitcoins is generally done through an exchange, which brings buyers and sellers together. Just like any financial exchange, Bitcoin exchanges charge a fee for matching buyers and sellers together. When using Bitcoin as the medium for value transfer, usually the largest source of fees will occur when moving in and out of the currency, which can incur fees related to bank transfers, card network charges, and occasionally taxes.

■ **Challenge #2 – Bitcoin Exchange Liquidity** – Buying bitcoins in one country and selling them in another is cost-effective only where FX markets for BTC are liquid. In a perfect world, moving from the home fiat to BTC and BTC to the receiving fiat should be equal to the market rate for the home/receiving currency pair (not accounting for trading fees). However fragmented Bitcoin markets often lead to pricing inefficiencies and prevent this. Bitcoin volatility is generally not an issue when liquidity is good, but it makes holding the currency undesirable for the risk-averse. Figure 8 shows that holding Bitcoin can bring big swings in value, which hinders its adoption as a currency. This being said, the chart shows that volatility has been trending down in the last couple of years. Volatility depends on three main factors

- **Infrastructure** – A network of exchanges – discussed later – plugged into local banking rails creates a market, helps liquidity and reduces volatility;
- **Data integration** – Integration of Bitcoin trading venues with trusted data sources like Bloomberg helps price discovery and drives down volatility;
- **Regulatory clarity** – Legitimizing the activities around Bitcoin, reducing risk, and promoting trust among users lowers volatility.

Figure 8. Bitcoin Volatility Has Been Trending Down In Recent Years



Source: Citi Research, Coindesk, Factset

- **Challenge #3 – TransferWise is Cheaper** – For the most part, the non-Blockchain alternative TransferWise was cheaper.
- **Challenge #4 – Consider Physical Distribution Costs** – There is still a need for physical locations and the associated distribution costs. Building out a network would also require significant investments. There are a couple of possible solutions - (a) Promote financial inclusion which then promotes account-to-account transfers instead of agent-based transfers; (b) Promote digital use-cases so that a mobile transfer of value can be used locally, e.g., M-Pesa, however this subjects users to a high withdrawal fee, since M-Pesa seeks to incentivize users to keep money in the system.

Analyzing Bitcoin Speed

A Bitcoin transaction can be settled in less than an hour. Conventional remittance solutions exhibit extreme variability in terms of time taken but the cash-based options take just minutes (and sometimes seconds). Still, Bitcoin is certainly at the lower end of the "time taken" spectrum.

The key is that if fiat is required, the time can be substantially longer depending on the method of disbursement. In a majority of remittance cases, people need to send funds denominated in their local currency and have it delivered in the recipient's local currency. This brings up several issues often referred to as the "last mile" problem. The last mile problem is not trivial. It necessitates the existence of liquidity providers in the currencies that are being exchanged. While this is generally not a problem for major currencies (USD, GBP, CAD, JPY, etc), for smaller corridors there may not be sufficient liquidity in that market (i.e. you need a market maker willing to exchange BTC for whatever the local currency is). Furthermore, in many cases the recipient needs to be able to receive physical cash, especially for recipients who do not have bank accounts. This adds the complexity of needing a physical distribution network which adds cost. Although theoretically an end-to-end transfer is possible, there are many cases where it is not, simply due to the lack of a market for Bitcoin.

Analyzing Bitcoin Transparency

Using Bitcoin as a rail to move value from one country to another does bring improved visibility into the status of the payment, especially if compared with traditional wire methods which are difficult to track once they leave the sending bank and go through correspondents. However, when using other payment services like Western Union or Xoom (Paypal), the payment is sent through a centralized network. Consequently, the MTO can generally easily ensure that the payment has arrived since it is simply a matter of messaging the retail agent in the receiving country to authorize disbursement.

Analyzing Customer Experience with Bitcoin

From a consumer perspective, Bitcoin is a complicated concept. It requires tech savvy to understand and correctly execute a transaction. Users must understand concepts like wallets, private keys, exchanges, transaction confirmations and fees, and volatility. While this is not an insurmountable task given some time investment, most people who send remittances want a quick and painless process.

At the moment, the Bitcoin customer experience is decent for the significant minority of people who have some technical expertise and understand how the cryptocurrency and the network function. This makes the case for an app that removes this complexity for the average consumer. An app-based Bitcoin remittance company can provide a clear and relatively frictionless customer experience. However, this is not a differentiating factor by itself - other online and mobile alternatives like Xoom can also provide a relatively frictionless experience.

Current Developments

Incumbent Actions and Interesting Remittance Use-Case Variants

In this section, we review what incumbents are doing with Bitcoin / Blockchain in the context of the remittance / cross border payments market. We also look at three Bitcoin-linked remittance / payments companies – Abra, Circle, and BitPesa.

What Are Incumbents Doing?

Banks and MTOs have taken a variety of approaches to the perceived blockchain disruption...these approaches range from simply monitoring developments to actively testing the technology with the aim of deploying a live product.

“I think the public blockchain is difficult to do financial transactions with. If you take Western Union, JPMorgan Chase and Wells Fargo, we’re public companies, and if our transactions were all public, looking at them could potentially enable someone to produce our revenue projections before we can. I think you’ll see more closed-loop blockchain usages for financial services. That’s something we’re working with DCG and getting their perspective on.” – David Thompson, CIO of Western Union, *Is Western Union Ready for the Fintech Threat?*, *American Banker*, May 12th 2016

- **MTOs** – MTOs have publicly expressed that they are closely watching developments in the blockchain space, but are comfortable with the fact that they retain a significant advantage in the cash business which requires an extensive brick and mortar network. For example, Western Union has invested in the Digital Currency Group and partnered with Ripple.
- **Banks** – Many large banks have created internal groups devoted to studying blockchain technology for various use-cases, including cross-border payments. Banks are generally staying away from Bitcoin given the risks of the network from a compliance perspective, but they are considering options with permissioned networks.
- **Santander recently announced that they have rolled out an app that would leverage Ripple to enable cross-border payments.** The app is currently only available to Santander staff, and allows transfers between 10 and 10,000 GBP with GBP, EUR and USD currencies offered, making funds available on the following working day.²⁶ Note that Santander invested \$4m in the Ripple in an earlier funding round.

²⁶ [Santander Becomes the First U.K. Bank to Use Ripple for Cross-Border Payments](#)

Circle: P2P Social Payments

Circle Internet Financial is a consumer financial services company providing peer-to-peer payments. It also leverages blockchain technology, so can offer users the option of blockchain/Bitcoin. The core belief is that just like transmitting information over the Internet became free, so too will sending value. The founder has stated that eventually sending payments will be like sending an e-mail, and therefore consumers will not expect to have to pay for such a service.

Their approach is to design a high quality user-experience to acquire customers and build their network to enable payments to move seamlessly within and between countries. Circle uses conventional rails to move value between users of its app located in countries where it has banking relationships, and Bitcoin to allow users to send money to anyone on the Bitcoin network.

For consumers, Circle provides a clear value proposition. However, because Circle charges a minimal amount for these services, the revenue model is unclear. They plan to earn revenue through add-on financial products in the future which could be enhanced and monetized through the use of customer data.

The company raised \$50 million in 2015 (Goldman Sachs is an investor), and raised a further \$60 million in June 2016 partly to fund an expansion into China. Circle has taken inspiration from other social payment apps like Venmo in the US, and WeChatPay and Alipay in China.

How Circle Works – Key Differentiators

Circle is a hybrid fiat-digital currency wallet. It allows users to load their account via a bank transfer, debit or credit card. Users can decide whether to hold the balance in USD, GBP, EUR or BTC. All USD funds stored with Circle are FDIC insured, while BTC balances are insured through Marsh.

Due to its presence and banking relationships in both the US (primarily Silicon Valley Bank) and UK (Barclays), Circle customers can withdraw their balances using their respective domestic bank network. While there are other methods of seamlessly originating funds in USD and delivering GBP within the UK, Circle's app represents significant progress in the "social payments" space, where the leading app (Venmo) is a U.S. domestic-only app (although Venmo's parent PayPal offers multiple cross-border payment options). Note that for fiat to fiat transfers (e.g. USD to GBP), Circle uses conventional methods (i.e. works with banking providers primarily to facilitate users' withdrawals and deposits from their Circle accounts into/out of their bank accounts (typically via ACH), similar to PayPal) and this requires pools of liquidity in both the US and the UK.

Circle has also recently made efforts to expand to China (and is backed by large Chinese investors that include Baidu, CICC ALPHA, China Everbright Limited, Wanxiang and CreditEase). While the company does not yet support RMB transactions, and would find it difficult to compete with Chinese giants such as WeChat and Alipay, the strategy is to offer consumers a cross border payment option with a service that already has the requisite US and EU licenses. The app is also useful for Chinese individuals who work or study abroad, and can begin to raise brand awareness. The ultimate goal is to provide services in the US, EU and China, which effectively covers the world's largest economies and populations.

In our view, key differentiators for Circle are as follows.

- **Low Cost** – Circle instantaneously converts the funds in the background for free and usually at the mid-market price when the amount is under 5,000 USD.

- **Open System** – Sending money in fiat can only be done between Circle users, but bitcoins may be sent to anyone with a Bitcoin address, including users outside the Circle app. For example, even though Circle is not present in the Philippines, it is possible to send bitcoins to a non-Circle user in the Philippines which they can then convert to local currency. This differentiates them from other payment apps (e.g. Venmo) where both users need to be on the app.
- **Using Exchanges for Conversion** – For the money to be converted into fiat, Circle relies on local third party exchanges. As these exchanges proliferate, the utility of Circle consequently increases, since it increases the number of people who can accept bitcoins and convert to local fiat.
- **Compliance Focus** – Circle has focused on ensuring that they comply with relevant regulations by obtaining the required licenses, allowing them to operate in various jurisdictions. It was the first company to obtain the BitLicense in NY. The company is registered as an MSB in the US and holds an e-money license in the UK (first digital currency company to do so). Circle recently announced a partnership with Barclays, which has custody of its client deposits in the UK.
 - **Using AI Techniques for AML** – Circle has developed proprietary technology to improve efficiency in the AML process. It has developed proprietary tools that employ computing techniques such as machine learning and artificial intelligence to detect suspicious transactions, and this technology alone could be one of Circle's most valuable assets.

Circle User Experience was impressive

We tested the Circle app to see what the user experience was like. In our test, we planned to send \$10 from the US to a colleague in the UK.

- The first step was to link a debit card, which was relatively painless thanks to the app's use of the phone's camera to automatically scan and record the debit card number. Adding the \$10 was easy, and logged the first transaction on the activity feed that is displayed on the main screen.
- In order to test the Bitcoin functionality, we converted the money to Bitcoin, which was an instantaneous process. The equivalent USD amount is shown under the main BTC balance so you can keep track of the exchange rate.
- To send money, we had to find our colleague and add her as a friend, which we did via her e-mail address (other options are name, phone or Bitcoin address). Even though the balance was in BTC, we were able to send \$10 through a currency denomination option available next to the sending amount.
- Along with the payment, you can send a message as well as a series of funny GIFs (2-3 second looped videos of a person throwing dollar bills up in the air for example) which highlights the "social" part of the experience.
- The amount received by our colleague was 6.87 GBP, which at the time corresponded to a ~60 bp spread. Overall, the functionality was good and demonstrated once again the Fintechs' ability to create a pleasant UX.

BitPesa: Pivoting from Remittance to B2B/C2B?

BitPesa is a business payments platform that aims to make cross border payments faster, cheaper and more transparent for African small businesses, which are currently underserved by local banks.

- **BitPesa started as a consumer remittance firm...** – BitPesa initially began as a consumer remittance company which allowed inbound money transfers to be converted into Kenyan shillings (KES) and deposited directly into recipients' M-Pesa mobile wallet as mobile money. Due to dual concerns – the worsening nature of its relationship with M-Pesa operator Safaricom and remittance profitability concerns – BitPesa moved away from its original business model. The consumer remittance business model was challenging due to the scale required to acquire new customers, the difficulty in raising brand awareness, KYC/AML and last mile costs.
- **...but the company is now focused on providing a payment platform to African small businesses** – Until now, these businesses have had to rely on slow and inefficient payment infrastructure provided by the local banks. BitPesa's model is advantageous as small business can provide steady flows, and benefit from having certainty on the exchange rate as well as transparency around the payment process. BitPesa uses Bitcoin as an alternative rail for businesses who would traditionally rely on banks to make cross border payments and handle FX. BitPesa makes a market between Bitcoin and other African currencies enabling faster and cheaper cross border payments. For BitPesa, dealing with businesses also removes the need to address the last mile problem since businesses that need such services tend to be banked and transactions can therefore be account-to-account. Bitcoin has allowed BitPesa to break ground in the business with low startup costs. Thanks to the prevalence of third party KYC platforms, BitPesa can also comply with the necessary regulations at comparatively low-cost. As flows increase, BitPesa may also be able to grow their FX business in conventional currencies and step in where major western banks have retreated.

Abra: P2P Digital Cash

Abra (“A better remittance app”) is a remittance solution that enables P2P money transfer by storing digital cash on a user’s phone. The app aims to be as user-friendly as possible, and consequently users do not knowingly interact with Bitcoin. We believe the goal for Abra is to be the foremost remittance app around the globe for the world’s unbanked, with an eye on enabling payments for e-commerce down the line. Abra is currently focused on the Philippines market, and has plans to launch in the U.S. and 50 other markets in 2016.

How Does Abra Work?

The key characteristics of Abra are (1) Direct cash storage on phone; (2) Hedges to remove risk of BTC volatility; (3) Cash-in and cash-out at physical locations and ability to spend digital cash at retail locations (eventually).

- **Abra leverages Bitcoin and mobile technology to allow users to store cash directly on their phones.** Abra users obtain digital cash either electronically, or through Abra tellers. Digital cash is displayed as a fiat currency balance on the device.
- **However, the underlying asset is actually hedged bitcoins, which behaves like a synthetic dollar.** Abra guarantees that a user’s fiat currency (e.g. USD) balance does not fluctuate. It does this by taking both a long and short exposure to Bitcoin (net neutral position) to hedge out its risk. Since the hedges are put in place by Abra’s software and there is not a lot of detail behind the process, it is unclear to us how much of the risk is truly hedged out for the customer.
 - By promising to reverse the exchange at any time by returning the fixed amount of USD regardless of the BTC price, Abra is effectively long BTC, since it benefits if BTC rises and suffers if BTC falls.
 - Abra is short BTC on the back-end since it borrows BTC from mining pools and immediately sells the BTC for USD. In this instance, Abra benefits if BTC falls (needs fewer USD to buy the BTC required to pay off debt), and suffers if BTC rises (needs more USD to buy BTC required to pay off debt).
- **Recipients can then cash out, either through a bank transfer or using an Abra teller.** Funds can be sent to anyone with an Abra app on their phone, and the transaction is settled via the Bitcoin blockchain. Transactions involving FX are quoted to the user before payment is initiated. Cashing out through a bank transfer is usually free but tellers will charge users a fee for this service. At the moment, there are around 30,000 tellers signed up in the Philippines, and Abra plans to expand to 50 countries in 2016.

Abra’s Last-Mile Solution – “Tellers”

Anyone can sign up to be an Abra teller, and sell digital cash to consumers in exchange for physical cash. However, due to security concerns (i.e. displaying one’s ability to disburse cash as an individual on a public map), Abra has become more selective in the types of people it is selecting for tellers. The emphasis has been on recruiting small cash businesses (e.g. LBC in the Philippines, a courier service with ~6,400 locations) who have experience with this type of service. Since the brick and mortar costs are fixed for these businesses, their incentive is cheaply adding an additional source of revenue.

Abra's Test Market – the Philippines

Abra selected the Philippines as a test market due to the favorable demographics as well as the high percentage of un-/under-banked people. As we show in Figure 9, the payments landscape (e.g. only ~5% card penetration, low interoperability between banks) is relatively fragmented and the under-banked population is around 80%. The Philippines has a large population (~100m), 28% of which is made up of millennials. Smart phone penetration is still quite low and there is room for growth. Additionally, the Philippines are a large recipient of remittances, making up around 10% of GDP in 2015²⁷. Finally, up until recently the Philippines government has been relatively relaxed on regulation, although this attitude may be changing²⁸.

These conditions make the Philippines a particularly fertile ground to set up new rails. However, companies like Abra will have to compete with other providers (telcos like Smart and Globe's GCash mobile money) who are also racing to offer their own products.

Regulatory Risk

Abra positions itself as a technology platform and believes that because funds are stored on the users' phones, they do not need to be regulated as an MSB. A specific Abra viewpoint is that its users have a private key to access the funds on their phone and that technically this means that Abra does not handle user funds. They also claim that they do not facilitate money transfer since funds are settled on the blockchain, which is decentralized. By portraying itself as a technology platform, Abra is betting that it can avoid the hefty compliance costs associated with being a registered MSB, and rely on the on- and off-ramps (banks and tellers) to handle KYC and AML.

The above points may be true under the current regulations or interpretations of the law but we believe the risk of being regulated is quite high given the fact that, by all appearances, Abra effectively enables money transfer. If regulations are amended in such a way that would cause Abra to fall under that regime, the advantage emanating from lower costs would disappear, which may potentially have adverse effects on their business model.

²⁷ <http://www.focus-economics.com/countries/philippines/news/remittances/remittances-continue-to-grow-in-january>

²⁸ <http://www.reuters.com/article/cyber-heist-philippines-idUSL4N18W05K>

Figure 9. The Philippines Are a Favorable Test Market Thanks to Its Demographics and Proportion of Un/Under-banked Population

	Unit	Australia	China	Hong Kong	India	Indonesia	Japan	Korea	Malaysia	Philippines	Singapore	Taiwan	Thailand	Vietnam
DEMOGRAPHICS														
Population	mn	23.6	1,367.8	7.3	1,251.0	252.8	127.1	50.4	30.3	99.9	5.5	23.4	67.1	90.7
Adults	mn	19.1	1,121.6	6.5	893.2	180.8	110.8	42.7	22.5	67.7	4.7	20.2	55.0	70.3
- contribution	%	81.0%	82.0%	88.9%	71.4%	71.5%	87.2%	84.7%	74.4%	67.8%	84.5%	86.0%	82.0%	77.5%
Millennial population	mn	4.9	328.3	1.4	340.3	62.6	19.2	10.0	8.8	28.0	1.2	4.7	13.8	24.7
- contribution	%	20.7%	24.0%	18.7%	27.2%	24.8%	15.1%	19.9%	28.9%	28.1%	21.2%	20.2%	20.5%	27.2%
Labour force	mn	12.4	797.4	3.9	491.6	121.9	65.7	26.3	14.2	43.5	3.5	11.6	38.6	54.3
- contribution	%	52.4%	58.3%	54.0%	39.3%	48.2%	51.7%	52.1%	46.9%	43.6%	64.0%	49.6%	57.5%	59.8%
Urban population	mn	21.1	758.4	7.3	410.2	134.0	118.1	40.8	22.3	44.5	5.5	18.3	33.1	30.5
- contribution	%	89.3%	55.4%	99.9%	32.8%	53.0%	93.0%	80.9%	73.8%	44.6%	100.0%	78.0%	49.3%	33.6%
Rural population	mn	2.5	609.5	0.0	840.8	118.8	9.0	9.6	7.9	55.3	0.0	5.2	34.0	60.2
TELECOM & INTERNET														
Smart phones	mn	21.3	670.2	6.4	162.6	68.3	90.2	36.3	16.9	30.0	4.9	13.8	32.2	n.a.
- penetration	%	90.0%	49.0%	88.0%	13.0%	27.0%	71.0%	72.0%	56.0%	30.0%	88.0%	59.0%	48.0%	n.a.
Mobile phones	mn	31.9	1,285.8	14.8	938.3	295.8	156.3	57.0	43.9	112.9	8.2	31.2	97.9	121.4
- penetration	%	135.0%	94.0%	204.0%	75.0%	117.0%	123.0%	113.0%	145.0%	113.0%	148.0%	133.0%	146.0%	133.8%
Mobile's share of web traffic	%	26%	21%	26%	72%	50%	30%	29%	35%	21%	34%	n.a.	36%	20%
Active 3G/4G mobile connections	mn	36.4	565.7	18.2	75.1	121.3	220.6	62.7	34.2	54.2	8.7	n.a.	109.7	44.9
Internet users	mn	19.6	667.5	5.4	220.2	42.5	109.6	43.0	20.7	38.5	4.1	19.7	20.8	43.5
- penetration	%	83.0%	48.8%	74.2%	17.6%	16.8%	86.3%	85.3%	68.5%	38.5%	74.0%	84.0%	31.0%	48.0%
Time spent on internet via computer	hrs/day	4.1	3.9	3.4	5.1	5.1	3.1	3.4	5.1	6.3	4.7	n.a.	5.5	5.2
Time spent on internet via mobile	hrs/day	1.5	2.6	2.3	3.4	3.2	1.0	1.8	3.7	3.3	2.3	n.a.	4.1	2.7
BANKING														
UNBANKED														
Unbanked	mn	0.2	236.4	0.2	422.0	115.8	3.7	2.4	4.4	48.7	0.2	1.7	12.0	48.6
- percentage of adult popn.	%	1.1%	21.1%	3.9%	47.2%	64.1%	3.4%	5.6%	19.3%	71.9%	3.6%	8.6%	21.9%	69.1%
Banked population	mn	18.9	885.3	6.2	471.2	65.0	107.1	40.3	18.2	19.0	4.5	18.4	43.0	21.7
- percentage of adult pop	%	98.9%	78.9%	96.1%	52.8%	35.9%	96.6%	94.4%	80.7%	28.1%	96.4%	91.4%	78.1%	30.9%
- poorest 40%	%	39.4%	28.8%	37.9%	17.5%	8.8%	38.1%	36.9%	30.2%	6.0%	38.5%	34.8%	28.8%	7.5%
- richest 60%	%	59.5%	50.2%	58.3%	35.2%	27.2%	58.5%	57.4%	50.4%	22.3%	57.9%	57.1%	49.4%	23.7%
- rural	%	10.6%	33.1%	0.1%	33.5%	13.4%	6.8%	17.8%	19.3%	13.6%	0.0%	19.9%	39.7%	17.9%
- urban	%	88.3%	45.8%	96.1%	19.3%	22.6%	89.9%	76.6%	61.4%	14.4%	96.4%	71.5%	38.5%	12.9%
Popn. with accounts through Mobile	mn	n.a.	n.a.	n.a.	21.0	0.8	n.a.	n.a.	0.6	2.9	0.3	n.a.	0.7	0.3
- percentage of adult pop	%	n.a.	n.a.	n.a.	2.4%	0.4%	n.a.	n.a.	2.8%	4.2%	6.1%	n.a.	1.3%	0.5%
UNDER-BANKED														
Saved at a Financial Institution	mn	11.8	461.6	3.2	128.3	48.0	66.9	22.5	7.6	10.0	2.2	7.9	22.3	10.3
- percentage of adult popn.	%	61.4%	41.2%	50.0%	14.4%	26.6%	60.4%	52.7%	33.8%	14.8%	46.2%	39.3%	40.6%	14.6%
Borrowed from a financial institution	mn	4.5	107.1	0.5	56.9	23.7	8.8	7.8	4.4	8.0	0.7	2.8	8.5	13.0
- percentage of adult popn.	%	23.4%	9.6%	8.2%	6.4%	13.1%	7.9%	18.2%	19.5%	11.8%	14.2%	13.9%	15.4%	18.4%

Source: CEIC, Central Banks, Euromonitor, IMF, ITU, National Statistical Bureaus, World Bank, Citi Research

Western Union Co.

(WU.N; US\$18.82; 3)

Valuation

Our 12-month target price of \$15.50 for WU is based on the average of our P/E and DCF analyses.

P/E Analysis: We use a ~9x target multiple, which is within our targeted 9x-11x P/E range, and our 2017 EPS estimate of \$1.70 to reach our \$15.00 P/E target for WU. Our targeted multiple range is slightly lower than WU's historical average multiple of ~12x (per FactSet), which reflects increased global macroeconomic uncertainty that has the potential to impact remittance flows.

Discounted Cash Flow (DCF) Analysis: Based on our ten-year DCF analysis, we derive an approximately \$16.00 price target for WU. Our analysis incorporates the following assumptions: Weighted Average Cost of Capital (WACC) of 7.7% (calculated), based upon a Beta of 1.05 (Bloomberg adj. 5-yr weekly), a Risk-Free Rate of 1.81% (Citi Estimate) and a Market Risk Premium of 6.54% (Citi Estimate); Terminal Growth Rate of (3%)-(2.5%), which helps capture the long-term risk of competitive displacement and continued price competition.

Risks

The key risks to our investment thesis on WU are:

- **Economic Impact on Remittances** – Due to soft global economic conditions, remittance growth is expected to remain below historical norms. However, if the global economy recovers faster than we anticipate, WU could exceed our financial projections.
- **Cyclicality of Bill Payment Unit** – WU's Consumer-to-Business (C2B) unit is predominantly its US urgent bill payment platform, which largely depends on the health of the US economy.
- **Regulatory Changes** – WU's C2C business is highly regulated and changes to regulations could have an impact. If these regulatory changes are applied equally to competitors, WU's relative positioning could improve.
- **Technology Displacement** – Over the long term, emerging alternatives to cash money transfer, such as online or mobile payments, could gain traction. If WU's investments in these offerings work out, the company could see better financial performance.
- **Foreign Currency** – A large proportion of WU's revenue is originated outside the US, making it exposed to fluctuations in foreign currency.
- **Taxes** – Any changes on how the US taxes foreign profits or repatriated funds could alter WU's tax rate and/or capital availability.

If any of these risk factors has a greater upside impact than we anticipate, WU could surpass our target price.

Appendix A-1

Analyst Certification

The research analyst(s) primarily responsible for the preparation and content of this research report are named in bold text in the author block at the front of the product except for those sections where an analyst's name appears in bold alongside content which is attributable to that analyst. Each of these analyst(s) certify, with respect to the section(s) of the report for which they are responsible, that the views expressed therein accurately reflect their personal views about each issuer and security referenced and were prepared in an independent manner, including with respect to Citigroup Global Markets Inc and its affiliates. No part of the research analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendation(s) or view(s) expressed by that research analyst in this report.

IMPORTANT DISCLOSURES

Western Union Co. (WU)

Ratings and Target Price History Fundamental Research

Analyst: Ashwin Shirvaikar, CFA



	Date	Rating	Target Price	Closing Price
1	30-Jul-13 16:12:52	2	*19.00	17.75
2	29-Oct-13 23:40:46	2	*17.00	19.24
3	14-Jan-14 03:06:19	*3	*15.00	16.52

	Date	Rating	Target Price	Closing Price
4	16-Jan-15 00:41:44	3	*15.50	17.22
5	11-Feb-15 02:51:05	3	*16.00	18.30
6	01-May-15 01:13:05	3	*16.50	21.25

	Date	Rating	Target Price	Closing Price
7	10-Feb-16 06:36:27	3	*15.50	17.01

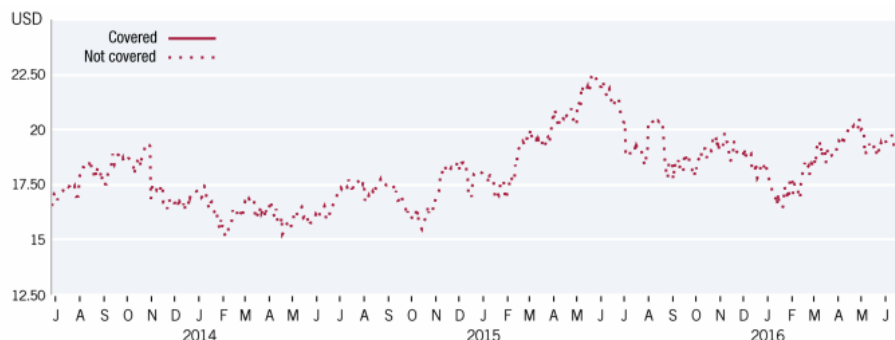
*Indicates Change

Rating/target price changes above reflect Eastern Time

Western Union Co. (WU)

Ratings and Target Price History Best Ideas Research Relative Call (3 Month)

Analyst: Ashwin Shirvaikar, CFA



*Indicates Change

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Data current as of 31 Mar 2016	12 Month Rating		
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