



# The road ahead for digital currency and fast payments

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# Agenda

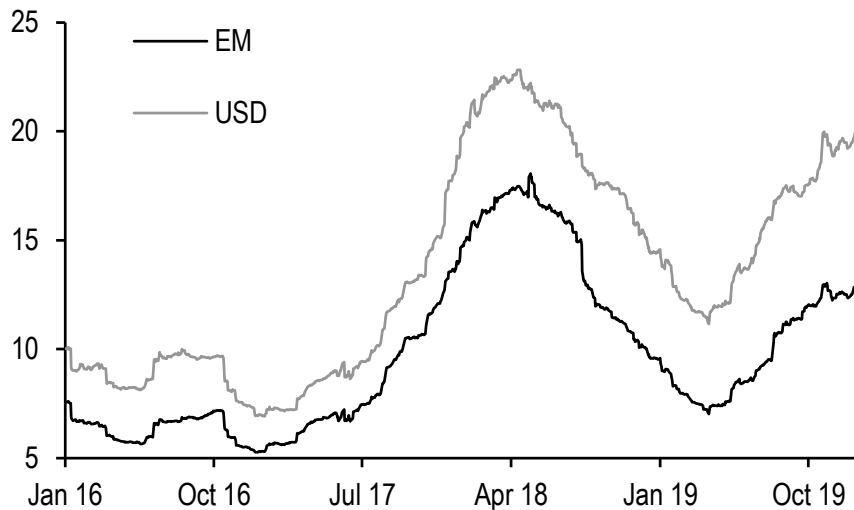
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Freely floating cryptocurrencies continue to exhibit extreme volatility relative to fiat currencies, leading to greater interest in coins designed to minimize these fluctuations

### Bitcoin and other freely floating cryptocurrencies continue to exhibit extreme volatility relative to fiat currencies ...

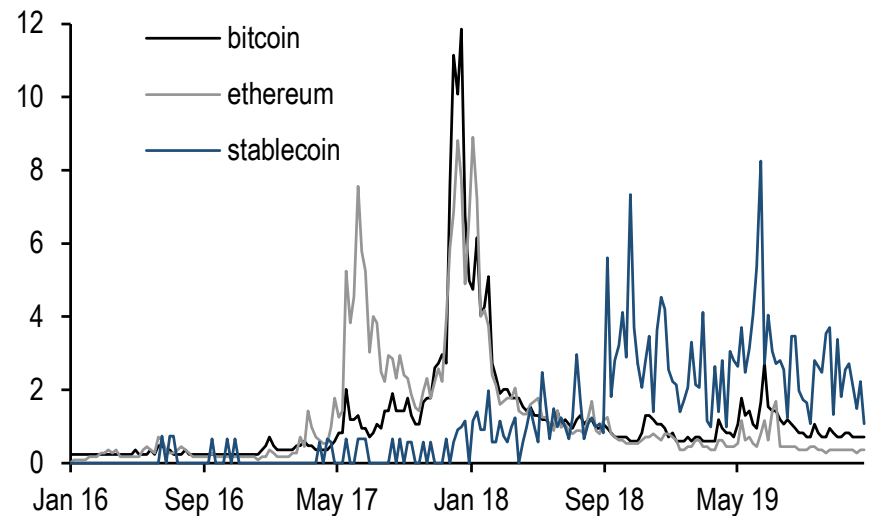
Daily volatility in Bitcoin/USD spot versus EMCI index of emerging market currencies and USD nominal effective exchange rate; unitless



Source: J.P. Morgan, Bitstamp

### ... which has led focus towards stablecoins which are designed to minimize these price fluctuations

Google trends scaled to 1.0 for the average for each series; unitless



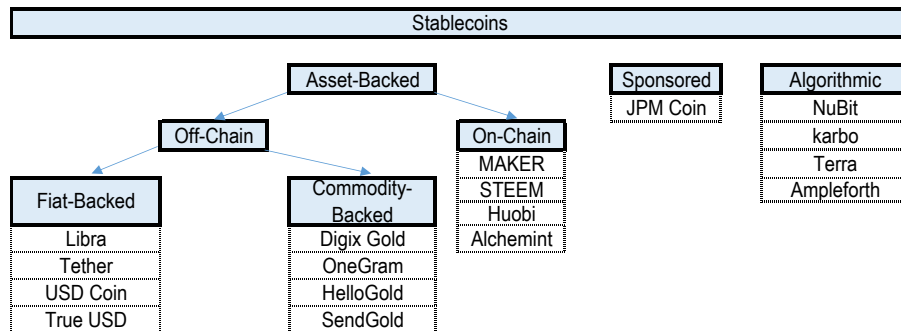
Source: J.P. Morgan, Google Trends

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Stablecoins come in a variety of forms, but most successful tokens have been backed by off-chain assets

## Stablecoins can be broadly split into asset-backed, sponsored, and seigniorage-style (algorithmic) ...

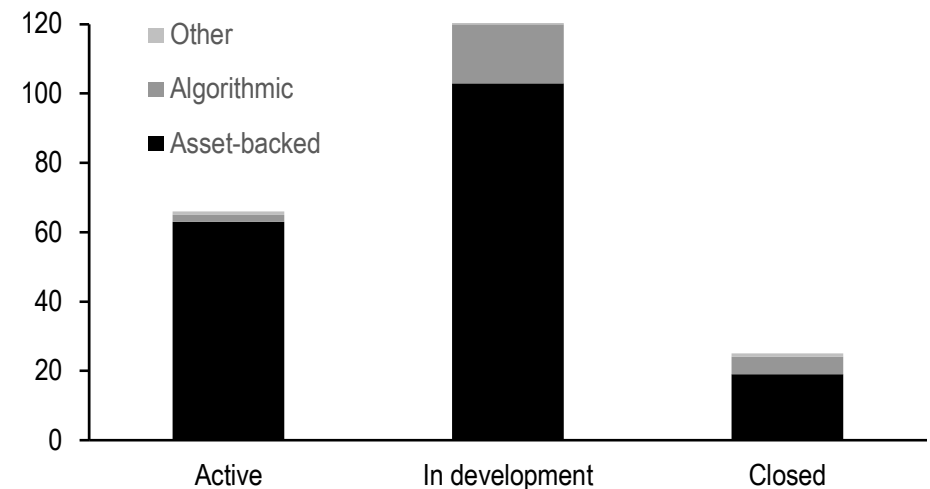
Schematic family tree of stablecoins by underlying methodology and collateral type, with example tokens for each



Source: J.P. Morgan, Bitstamp

## ... but the vast majority of active projects are of the asset-backed variety

Schematic family tree of stablecoins by underlying methodology and collateral type, with example tokens for each



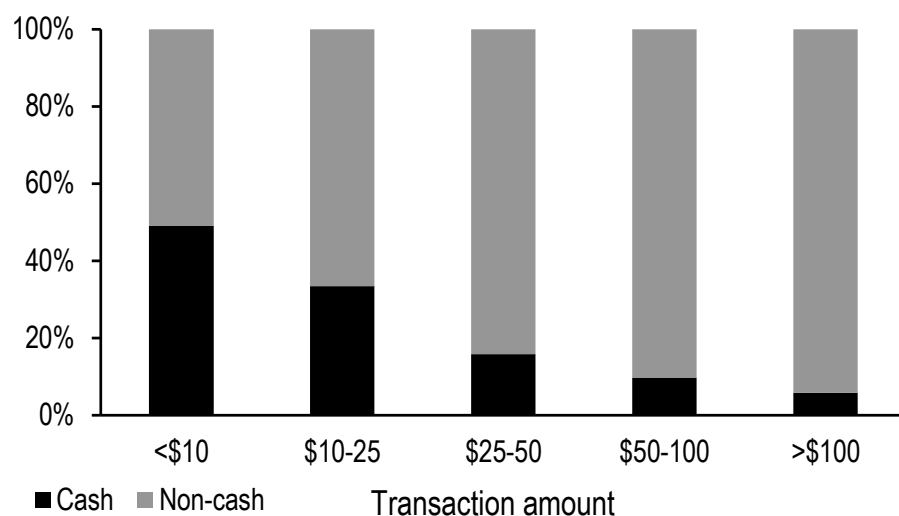
Source: Blockdata.tech

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The world is very much ready for private money: thanks to the ubiquity of fractional reserve banking, most of the money in the world comes from private issuers

### Consumers very rarely use public money in the form of paper currency for even modest purchases

Consumer purchases split into cash and non-cash payments in October 2018; %

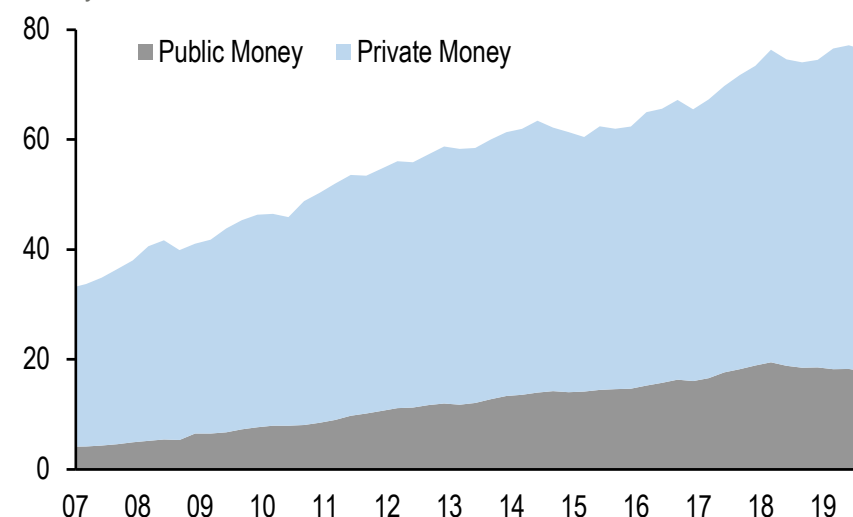


Note: From the 2019 Federal Reserve Diary of Consumer Payment Preferences.

Source: J.P. Morgan, SFFRB

### Though we typically associate “money” with sovereign issuers, the vast majority is provided by private sources

Global public money, defined as the monetary base (MB), versus private money, defined as M2 net of MB; \$tn



Note: Includes the United States, Euro Zone, Japan, U.K., Australia, Switzerland, Sweden, and Canada (developed markets) as well as China, Brazil, India, and South Korea (emerging markets). Converted to U.S. dollar equivalents on a quarterly basis.

Source: J.P. Morgan, Haver Analytics

Retail and e-commerce payments are heavily concentrated in larger and advanced economies, with little activity—even including shadow markets—among the underbanked

**The vast majority of global payments occur in large value payment systems, and e-commerce makes up a modest share even of those remaining retail payments**

Payments data by country as of 2017

Country	Retail & Fast Payments		E-Commerce Volume		
	Amount; \$bn	% of total pmts	Amount; \$bn	% of retail	B2B Share
United States	\$65,654	5%	\$8,883	14%	90%
Japan	\$26,712	5%	\$2,975	11%	95%
China	\$47,282	12%	\$1,931	4%	49%
Germany	\$3,704	5%	\$1,503	41%	92%
Korea	\$18,362	15%	\$1,290	7%	95%
United Kingdom	\$8,781	9%	\$755	9%	74%
France	\$6,572	16%	\$734	11%	87%
Canada	\$4,380	6%	\$512	12%	90%
India	\$1,741	9%	\$31	2%	91%
Italy	\$1,816	1%	\$23	1%	93%
Top 10	\$185,005	7%	\$18,637	10%	87%
Global Total	\$204,854	6%	\$29,367	14%	87%

Source: BIS, UNCTAD

**The underbanked represent a significant fraction of the global population, but economic activity and payments are more concentrated among countries with higher levels of financial inclusion**

Statistics for various counties split by World Bank Income Category

Attribute	World Bank Income Category			
	Low	Lower middle	Upper middle	High
2017 GDP (\$bn USD)	\$418	\$6,439	\$22,231	\$50,346
% of World GDP	0.5%	8%	28%	63%
Shadow economy (% of GDP)	35%	29%	21%	13%
% of adjusted World GDP	0.6%	9%	29%	61%
Avg % with bank accounts	33%	44%	62%	92%
GDP-wtd % w/ bank accounts	37%	58%	73%	95%
Non-bank pmt to GDP Ratio*	N/A	8.1	29.3	12.2

\* As of 2016 for counties covered by the BIS Red Book.

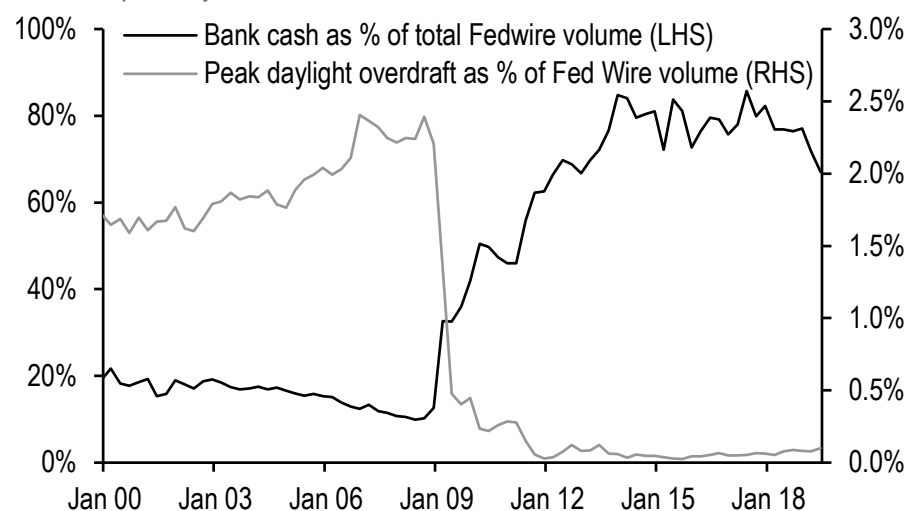
Note: GDP and financial inclusion statistics cover the full World Bank sample of 144 counties; shadow economy data covers 92% of that by count and more than 99% by economic output; and payments data is for the subset of 22 counties covered by the 2017 BIS Red Book.

Source: J.P. Morgan, World Bank, IMF, Bloomberg, BIS, Medina & Schneider

Private stablecoins are likely to face technical hurdles, including the need for intraday liquidity and poor energy efficiency

### The payment system effects of a larger Fed balance sheet provide an invaluable experiment in intraday liquidity requirements of institutions' RTGS systems at different levels of cash

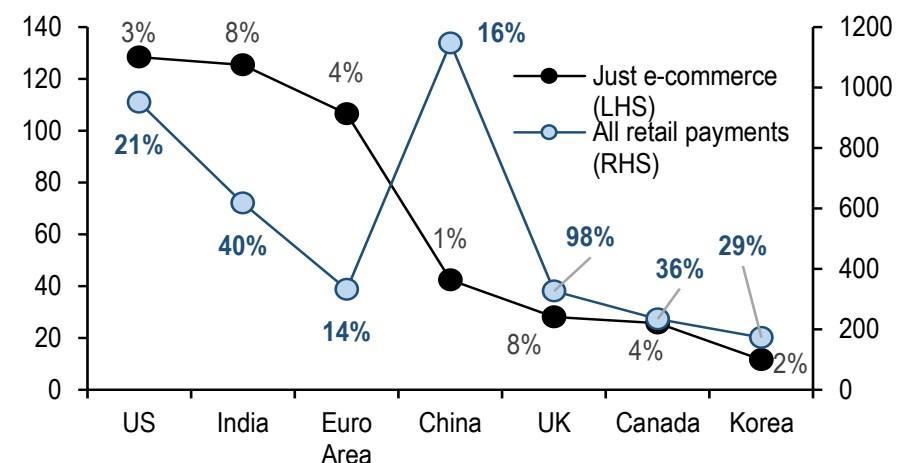
Bank cash (LHS) and peak daylight overdraft (RHS) as a % of total Fedwire volume, quarterly data



Source: J.P. Morgan, FRB

### Using currently popular technology, migrating a significant fraction of global e-commerce, and especially broader retail payments would put significant strain on energy resources

Annual power required to operate a DLT-based retail (RHS) and e-commerce (LHS) payment system by country, based on 2018 figures with fraction of total energy production indicated along each market; both axes in TWh/yr



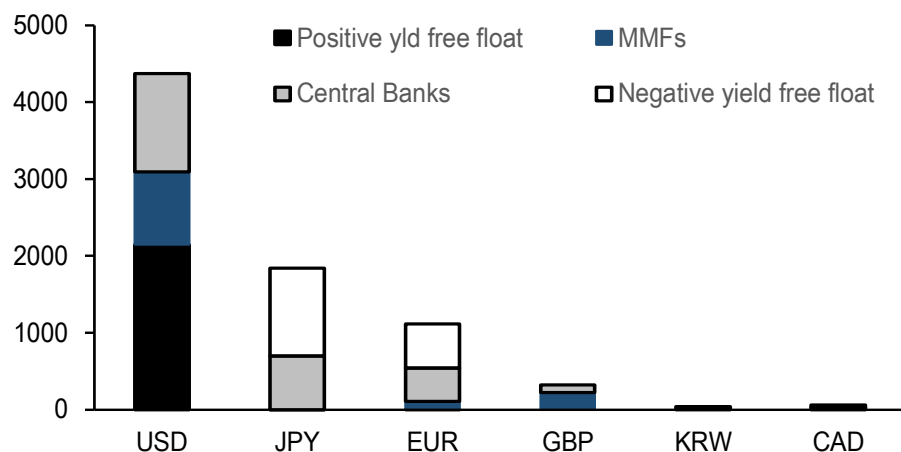
Note: Transaction counts from BIS Red Book data for 2018, electrical generation data from the *BP Statistical Review of World Energy 2019*. E-commerce payments assume gross transaction volumes from a range of official sources for 2018 (see UNCTAD estimates and references therein for the prior year), assuming the number of transactions scales with value. Based on estimated power usage per transaction for Ethereum.  
Source: J.P. Morgan, BP, BIS, Digiconomist.com, UNCTAD

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Negative yielding Reserves are likely unstable, which means coins like Libra are likely to be *de facto* agents of dollarization, with run risk if U.S. yields turn negative as well

## Treasury Bills and short nominal coupons are the only clear source of positive yield short-term government securities, making asset-backed stablecoins likely *de facto* USD equivalents

Government securities with <1yr remaining maturity by currency, split into positive and negative yield free float, central bank holdings (FX reserves and QE-related holdings) and money market fund assets; \$bn

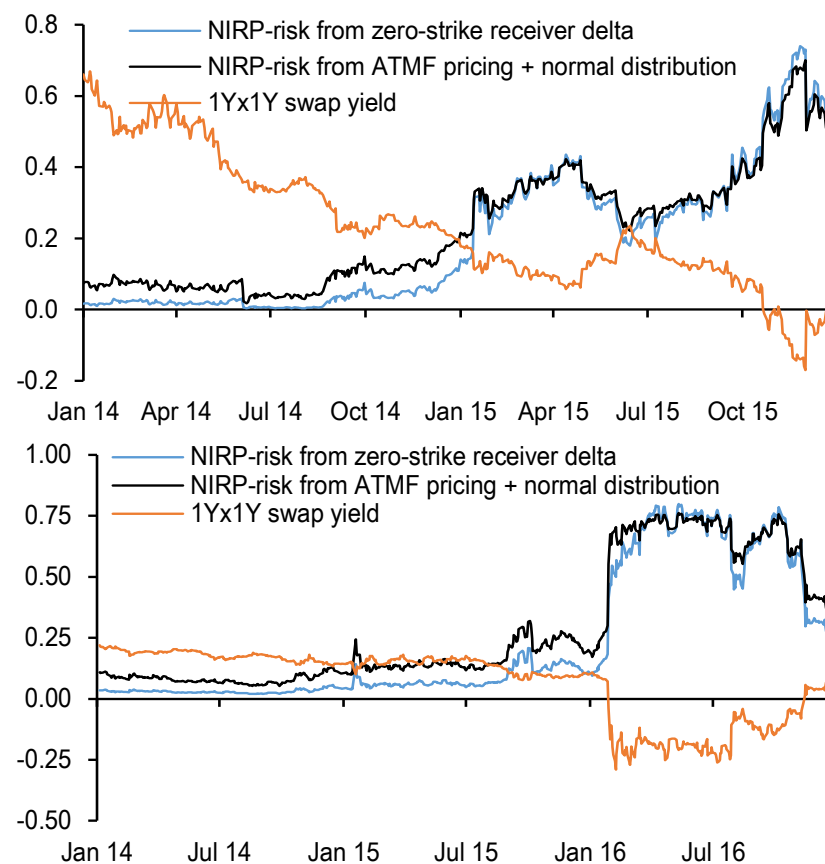


Note: We assume 15% of FX reserve holdings across currencies are <1yr remaining maturity coupon securities. ECB holdings based on J.P. Morgan estimates, while NYFRB, BoE, and BoJ data are more granular.

Source: J.P. Morgan, Crane's, NYFRB, ECB, BoJ, BoE, IMF COFER

## The options market in Europe strongly discounted the risk of negative rates until a few months before they emerged

EUR/JPY 1Yx1Y zero-strike receiver swaption deltas compared to EUR/JPY 1Yx1Y swap yields and NIRP risk inferred from ATM 1Yx1Y swaptions %



Source: J.P. Morgan

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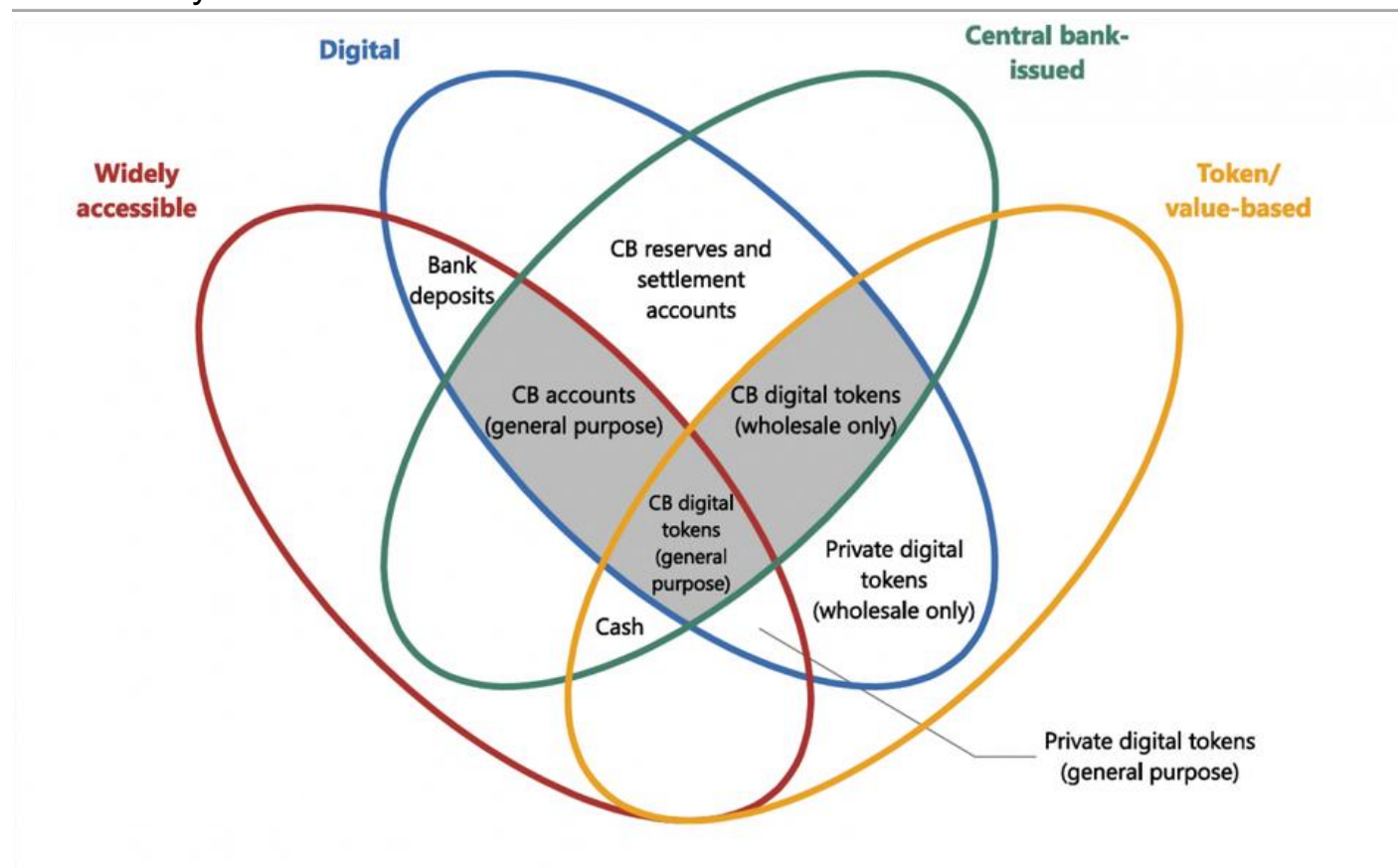
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## Central bank digital currency can be conceptualized in several different forms

### The “money flower” of Bech & Garratt



The Venn diagram illustrates the four key properties of money: *issuer* (central bank or not); *form* (digital or physical); *accessibility* (widely or restricted); and *technology* (account-based or token-based). CB = central bank. *Private digital tokens (general purpose)* include cryptocurrencies, such as Bitcoin. For examples of how other forms of money may fit in the diagram, please refer to the source.

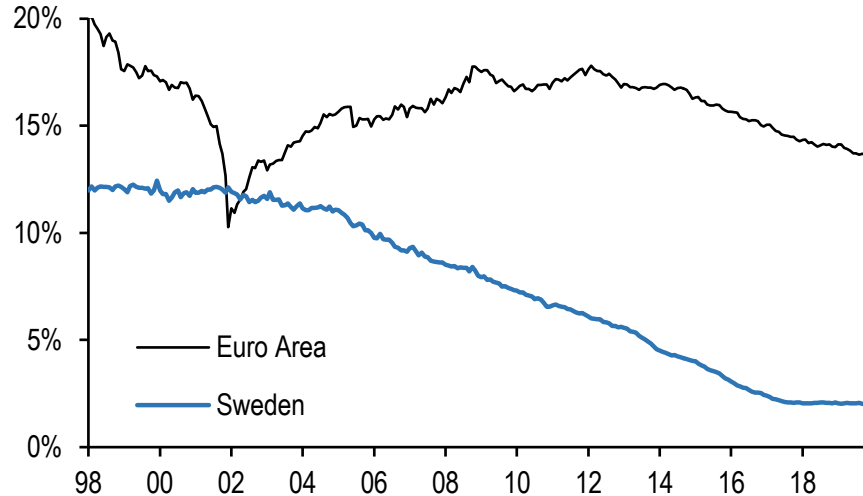
Source: Bech & Garratt, “Central bank cryptocurrencies”, *BIS Quarterly Review*: 55-70

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Paper money remains a cornerstone of most major economies, but has been losing traction in Sweden and a handful of others; most central banks are exploring CBDCs, with some close to experiments, PoC, development and even pilots

### In some cases, particularly that of Sweden, paper money has increasingly gone by the wayside ...

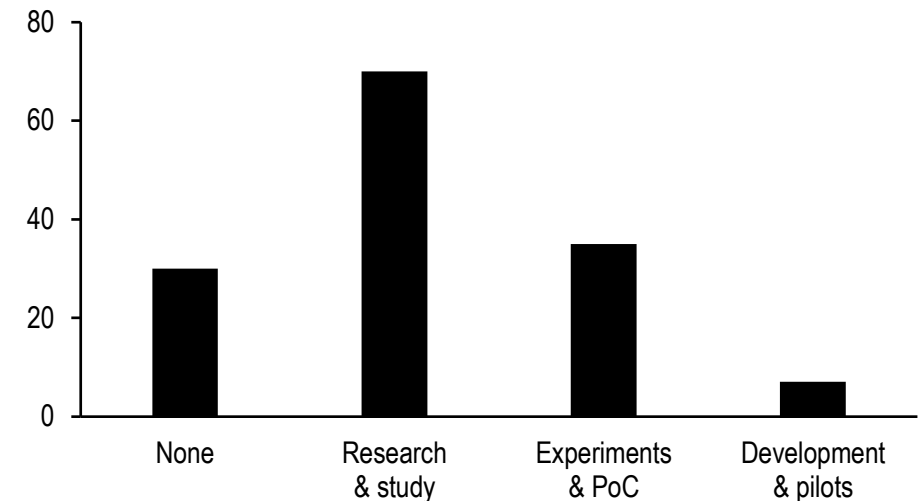
Currency in circulation as a % of the monetary base for Sweden and the Europe Area; % of M1



Source: J.P. Morgan, Haver Analytics

### ... and more generally as of 2018 roughly 70% of global central banks were examining digitizing their currency, with some likely in more active phases of development and testing

State of play for CBDC from the 2018 BIS Survey; % of respondents



Source: J.P. Morgan, BIS

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## Key interrelated questions for those considering CBDCs

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- ***What problem are we trying to solve?***

Central bank “money”—particular that used for interbank payments—is already primarily electronic, though paper currency still plays a significant role in many major economies. We believe that for the most part, these payment systems work quite well. However, in our view, key areas of focus could be more efficient cross-border payments, cybersecurity enhancements, financial stability monitoring, more efficiency sanctions and AML enforcement, and potentially better intraday liquidity management.

- ***Who gets to participate?***

Is the proposed CBDC available for general use—i.e., including consumers and businesses—or just financial institutions—e.g., Federal Reserve member banks. In our view, the latter preserves the fractional reserve and model underlying the vast majority of the global monetary system, while the former introduces the risk of disintermediating commercial banks, nationalizing credit creation, and moving to a *de facto* fully reserved banking system.

- ***What is the appropriate technology?***

It’s not necessarily tokenized distributed ledgers. Studies such as Jasper (Canada) and Ubin (Singapore) suggest proof-of-work protocols are too inefficient, and broader gains are not guaranteed. Liquidity savings mechanisms could be possible, but technically difficult to implement. That said, we believe that there are clear financial stability monitoring gains from token-based payment systems. The appropriate protocol depends on the use case.

# Agenda

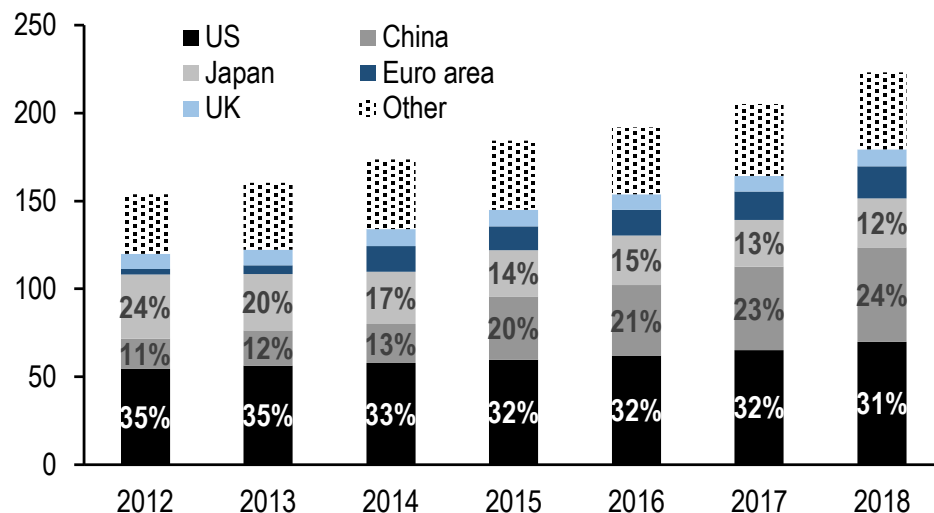
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Asia represents the bulk of global growth in payments, driven in large part by the explosion in third party (non-bank) and especially mobile providers

### Asia has driven most of the growth in retail payments globally over the past few years ...

Gross annual retail payment volume; \$tn



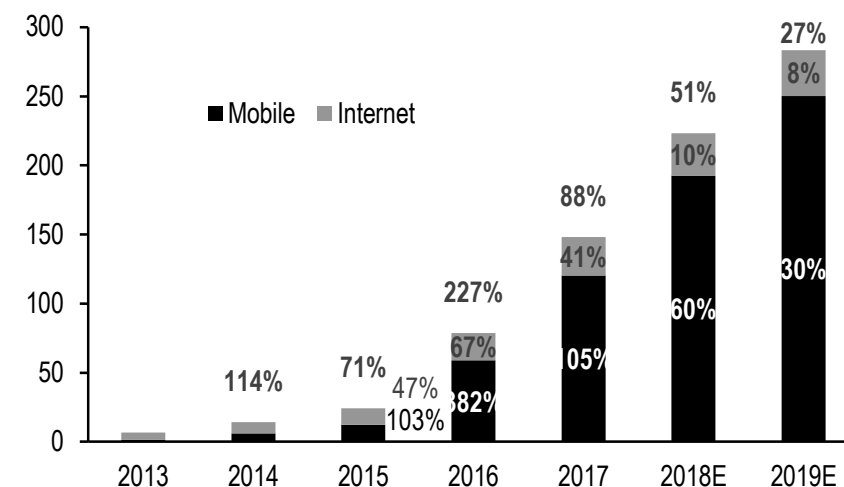
\* Includes the remaining six of the top 10 payments systems by value transferred: the U.K., Brazil, Mexico, Korea, India, and Canada.

Note: Payments data from the most recent BIS Red Book.

Source: J.P. Morgan, BIS

### ... which likely reflects increasing levels of financial inclusion via third party payments venues, especially the explosive growth in mobile wallets

Annual volume in mobile and internet-based third party payments in China, annual growth rates for mobile, internet, and total are indicated; RMB bn



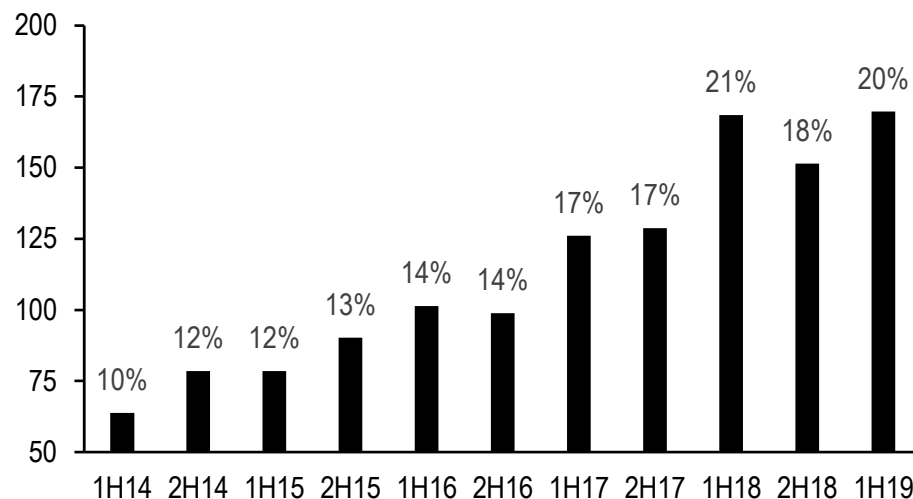
Source: J.P. Morgan, PBoC

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Online platforms have helped drive the growth in the Chinese wealth management industry, including WMPs and MMFs; Yue' Bao was briefly the largest fund in the world

### Online users of wealth management products have been growing rapidly, and faster than all Chinese netizens

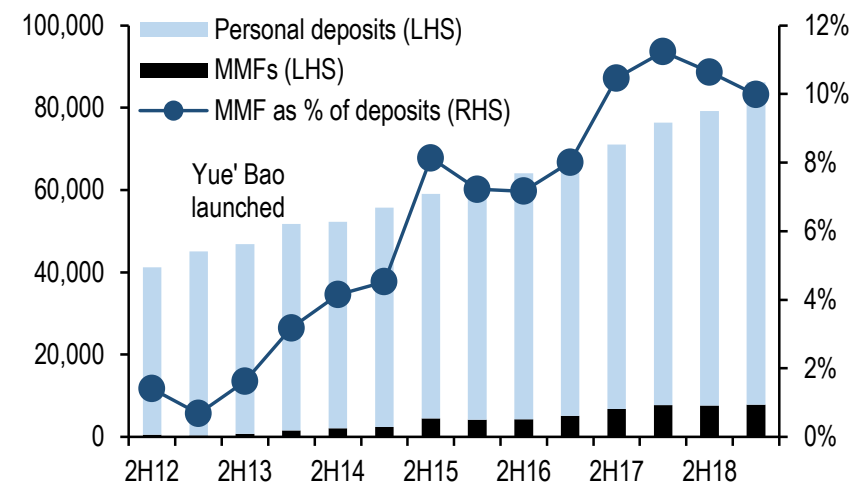
Number of online wealth management services in China at semi-annual frequency, % of all netizens indicated as well; millions



Source: NBS, CEIC

### The rise of digital MMFs has led to noticeable outflows of personal deposits into money markets, as evidenced by their growing share of cash management products

Personal deposits and MMF AUM in China (LHS; RMB bn) and MMFs AUM as a fraction of personal deposits (RHS; %)



Source: J.P. Morgan, PBOC, AMAC

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## The rapid growth of the digital MMF industry posed financial stability risks

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**Redemption risks during periods of rising interbank rates:** in November 2016, 1-month NCD rates rose over 200bp and China bond index fell by 2%, leading the NAV of money market funds to fall by 13% from mid-November to mid-December

**Concentration risks of institutional investors:** it stands to reason that MMFs can better predict potential redemptions when their investor base is predominately small, retail investors. However, as of late-2017 roughly 45% of end-users were financial institutions such as banks and insurance companies—in part due to targeted marketing to large institutional investors on the part of some funds to grow their assets. This raised the risk of unexpected and large redemptions that could impair liquidity.

**Cross market transmission risks:** MMFs are major players in various parts of the money market and bond market. During periods of large redemptions—e.g. in December 2016—MMFs had to meet redemptions of up to RMB 50bn/day. This was a meaningful size relative to the NCD and bond markets, which saw ~RMB 1tn and 5tn in average daily volume, respectively. In several trading days, MMFs selling of NCDs led to spikes in NCD yields, impaired price discovery, and various instruments eventually sold at a discount.

**Timing mismatches between assets and liabilities:** Some internet-based MMFs adopted T+0 redemption mechanisms to compete with savings deposits, but the funds themselves are not subject to equity requirements or reserve requirements. These funds also deposited the aggregate funds to banks with T+1 settlement which could potentially amplify withdrawal risk due to timing mismatches.

This led to the temporary imposition of limits on holdings and same-day withdrawals, though these were lifted in April 2019.

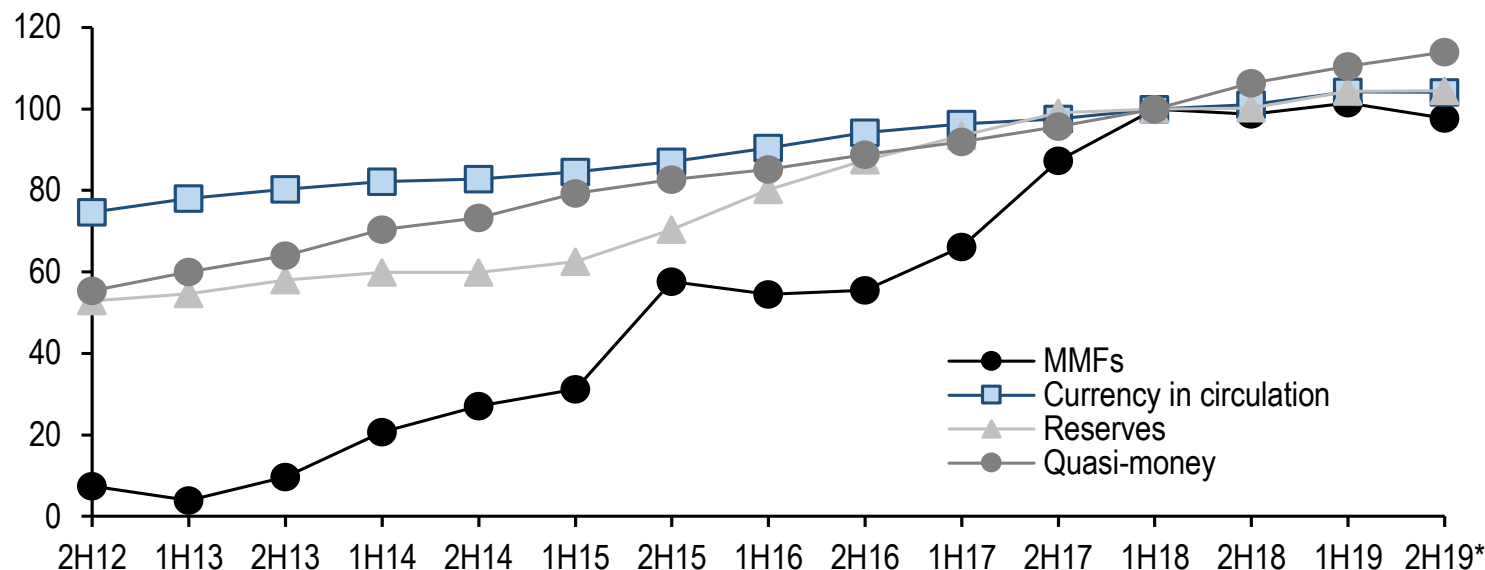
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This is particularly notable in the context of continued growth in the money supply

**The decline in Chinese MMF AUM, even after regulations have been relaxed, stands in contrast to continued growth in private and public money, and suggests investors in these funds are motivated primarily by yields and other economic benefits than network externalities**

MMF AUM, currency in circulation, other MB, and quasi-money (M2 minus MB), in China, normalized to 100 as of 1H 2018; unitless



\* Includes data through September 2019.

Source: J.P. Morgan, IIF, Haven Analytics

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