

STABLE CRYPTOCURRENCIES

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ABSTRACT

The authors examine the emergence and proliferation of stable cryptocurrencies and their uses. After evaluating the core shortcomings associated with fiat currencies, the authors highlight the benefits of stable cryptocurrencies for monetary policy making, overall market stability, and their bilateral impact on the emergence of decentralized commerce. The transition to digital currencies has already started. It is a matter of time until the use cases and applications of stable cryptocurrencies become more mainstream.

INTRODUCTION

Contemporary society is expeditiously embracing decentralized solutions for human interaction. Increasingly complex frameworks, theories and models are needed to understand the issues facing contemporary societies.¹

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The market was seen as the optimal institution for the production and exchange of private goods. For nonprivate goods, on the other hand, one needed “the” government to impose rules and taxes to force self-interested individuals to contribute necessary resources and refrain from self-seeking activities . . . Scholars are slowly shifting from positing simple systems to using more complex frameworks, theories, and models to understand the diversity of puzzles and problems facing humans interacting in contemporary societies.

Elinor Ostrom, *Beyond Markets and States: Polycentric Governance of Complex Economic Systems*, 100 AM. ECON. REV. 641, 641-642 (2010).

Stable cryptocurrencies have been defined as a type of cryptocurrency that is designed to maintain a stable value, rather than experiencing significant price changes.² Others define them as constituting “a new class of cryptocurrencies which offer price stability and/or are backed by reserve asset(s), [combining] the instant processing and security of payments of cryptocurrencies, and the volatility-free stable valuations of fiat currencies.”³ A common denominator between these definitions is the stability of the currency. Stable cryptocurrencies offer the public the prospect of access to the crypto-ecosystem built on the stability and endurance of the existing financial system. Stable cryptocurrencies offer investors the prospect of a safe haven when markets are volatile. They also eschew the costly fiat-to-crypto conversion (and vice versa) for those investors who wish to avoid conversion from crypto to fiat currency but require price stability.

In drawing comparisons between central banks’ monetary policy-making and decentralized attempts at monetary policy-making, it is important to note that such comparisons are inaccurate and incomplete when only considering the industrialized world. Rather, any monetary policy solution comparisons need to be made on a global scale. Taking into account countries with monetary policies that fall short of the objectives outlined by the Western world allows for a comparison of stable cryptocurrencies’ policy means and features that can actually add value in countries afflicted by instability and lacking government policies. For instance, most comparisons of stable cryptocurrencies with fiat currencies, such as the United States dollar, fall short because the complexities of policy-making in a fully operational system do not yet exist in nascent *technologies*’ emulation of monetary policy-making. Yet, conceptually, the technological solutions provided by stable cryptocurrencies can underscore what technology-driven optimization of policy-making is possible, even in fully operational and complex systems.

The transition to stable cryptocurrencies in the private sector has already started. For example, IBM’s blockchain-powered payments network, World

2. *Stablecoin*, BINANCE ACADEMY, <https://www.binance.vision/glossary/stablecoin> [https://perma.cc/SYEU-KCNF].

3. *Stablecoin*, INVESTOPEDIA, <https://www.investopedia.com/terms/s/stablecoin.asp> [https://perma.cc/2RLT-5K3A].

Wire, has already attracted several international banks who will issue their own stable cryptocurrencies, backed by the national fiat currencies in their home jurisdictions.⁴ Moreover, various central banks and governments are experimenting with cryptocurrency solutions. This article shows that stable cryptocurrencies are an essential element for the evolution of money and decentralized systems.

I. FIAT CURRENCIES

A growing body of evidence suggests that fiat currencies and associated monetary policies are subject to significant shortcomings. Existing government-sponsored fiat currencies are not tied to a physical commodity that provides a valuation basis.⁵ In 2018, the International Monetary Fund (IMF) estimated that ten countries are at 20% or higher inflation.⁶ Using black market exchange rates measured weekly, the Cato Institute's Troubled Currencies Project estimates that the real rates are significantly higher than the IMF estimates.⁷ Currency devaluation is rampant in many countries, including Venezuela (2018: -99%),⁸ Argentina (2018: -51.85%),⁹ Turkey

4. Marie Huillet, *Six Global Banks Sign Up to Issue Stablecoins on IBMs Now-Live Blockchain Network*, COINTELEGRAPH (March 18, 2019), <https://cointelegraph.com/news/six-global-banks-sign-up-to-issue-stablecoins-on-ibms-now-live-blockchain-network> [<https://perma.cc/X48N-LLRL>].

5. Sandra Kollen Ghizoni, *Nixon Ends Convertibility of US Dollars to Gold and Announces Wage/Price Controls*, FED. RESERVE HIST. (Nov. 22, 2013), https://www.federalreservehistory.org/essays/gold_convertibility_ends [<https://perma.cc/8AXE-TAJD>]. Nixon in 1971 separated the value of the U.S. dollar from the gold standard, in part because a growing consensus among policy makers acknowledged the weakening of the gold-tied dollar in comparison to enterprises that were not tied to the price of gold. *Id.*

6. *Inflation Rate, Average Consumer Prices Annual Percent Change*, IMF DATA MAPPER (2019), https://www.imf.org/external/datamapper/PCPIPCH@WEO/OEMDC/ADVEC/WEO_WORLD [<https://perma.cc/MJ5M-77LQ>].

7. Steve H. Hanke & Tal Boger, *Inflation by the Decades: Full Dataset*, CATO INST. (Aug. 2018), <https://object.cato.org/sites/cato.org/files/troubled-currencies-project-site/inflation-by-the-decades-full-data-set.xlsx> [<https://perma.cc/AX7K-RX2K>]. According to the Troubled Currencies Project, which is a joint project with Johns Hopkins University, six countries are experiencing over 100% annual inflation. *Id.*

8. Brian Ellsworth & Girish Gupta, *Venezuela Announces 99.6 Percent Devaluation of Official Forex Rate*, REUTERS (Feb. 5, 2018, 5:25 PM), <https://www.reuters.com/article/us-venezuela-economy/venezuela-announces-99-6-percent-devaluation-of-official-forex-rate-idUSKBN1FP2WK> [<https://perma.cc/X2TT-NM43>].

9. Sam Meredith, *Argentina's Peso Has Now Fallen 52% Against the Dollar This Year*, CNBC (Aug. 31, 2018), <https://www.cnbc.com/2018/08/31/argentinas-peso-has-fallen-108percent-against-the-dollar-so-far-this-year.html> [<https://perma.cc/WAU3-HWPK>].

(2018: -35%),¹⁰ and Brazil (2018: -18.7%).¹¹ Government-controlled fiat currencies are as dependent on the faith of the people in the implicit or explicit government guarantees as are any other form of currency not yet fully adopted, such as stable cryptocurrencies.¹²

A. Arbitrary Policy Outcomes

The unfettered discretion of policy makers can lead to arbitrary outcomes.¹³ Policymakers in any given country have the ability to unilaterally decide to devalue assets in that country.¹⁴ The supply of goods and services in any given economy can be changed through arbitrary decisions by policymakers or a central bank.¹⁵ Central bankers' ability to determine when to print money as monetary policy can significantly affect inflation.¹⁶ Monetary policy-making for fiat currencies is largely lacking transparency, which does not allow for anticipatory market action based on policy indicators.¹⁷

10. Roger Aitken, *Turkish Lira 'Currency Crisis' Not Over, Could Hit 8 Against U.S. Dollar*, FORBES (Aug. 16, 2018), <https://www.forbes.com/sites/rogeraitken/2018/08/16/turkish-lira-currency-crisis-not-over-could-hit-8-against-u-s-dollar/#472187cd2301> [<https://perma.cc/4UF8-REED>].

11. Lise Alves, *With Depreciation of Currency, Brazilians Spend Less Abroad*, RIO TIMES (Dec. 24, 2018), <https://riotimesonline.com/brazil-news/rio-business/with-depreciation-of-currency-brazilians-spend-less-abroad> [<https://perma.cc/KJ8M-C4JR>].

12. N. GREGORY MANKIW, *PRINCIPLES OF ECONOMICS* 220 (Cengage Learning, 7th ed. 2014).

13. Giandomenico Majone, *From the Positive to the Regulatory State: Causes and Consequences of Changes in the Mode of Governance*, 17 J. PUB. POL'Y 139, 141-43 (1997).

14. Christina Majaski, *Devaluation*, INVESTOPEDIA (Aug. 5, 2019), <https://www.investopedia.com/terms/d/devaluation.asp> [<https://perma.cc/A2CR-4JVX>].

15. Khaled Abdel-Kader, *What Are Structural Policies?*, 50 FIN. & DEV. 46, 46-47 (2013).

16. See John C. Williams, *Monetary Policy, Money, and Inflation*, FED. RESERVE BANK OF S.F. ECON. LETTER 2012-21, at 1 (2012) (noting that this is a "textbook" understanding of monetary theory, but arguing that developments following the 2008 recession may call this theory into question).

17. See Narayana Kocherlakota, President, Fed. Reserve Bank of Minneapolis, Address at 17th Annual Entrepreneur & Investor Luncheon: Monetary Policy Transparency: Changes and Challenges (June 7, 2012) (transcript available at <https://www.minneapolisfed.org/news-and-events/presidents-speeches/monetary-policy-transparency-changes-and-challenges-20120607> [<https://perma.cc/U56Q-EBF6>]) (discussing this problem and recent attempts to ameliorate it).

B. Cost

Cash-based economies are subject to costs.¹⁸ While only about one-third of all transactions in the United States economy are conducted using cash payments,¹⁹ many countries' economies function primarily in cash. Several studies demonstrate that the poor and those with less access to institutions bear a disproportionate share of these costs of using cash.²⁰ In the United States, for example, cash usage imposes a regressive tax on consumers, with the highest impact on people who do not have an account with a bank.²¹ This impact is higher in countries that have a higher rate of cash usage. The cost increases further because the use of bank notes is inherently insecure: The theft of cash alone costs U.S. retail businesses around \$40 billion annually.²²

The cost of printing paper notes is quite substantial and creates a burden on the economy. Printing one-dollar and two-dollar bills costs 5.5 cents per note, while five-dollar bills cost 11.4 cents, ten-dollar bills cost 11.1 cents, both twenty-dollar and fifty-dollar bills cost 11.5 cents, and one-hundred dollar bills cost 14.2 cents.²³ In other words, the more a bill is worth, the more it costs to produce. In 2014, the United States government created 6.9 billion paper notes, with a total value of \$130.1 billion, which adds up to about 24.8 million notes per day.²⁴ To make matters worse, the printing can never stop and continues to increase. In fiscal year 2018, the United States government planned on making 7.4 billion notes, valued at \$233.4 billion, a 4% increase from the previous year.²⁵

18. Bhaskar Chakravorti, *The Hidden Cost of Cash*, HARV. BUS. REV. (June 26, 2014), <https://hbr.org/2014/06/the-hidden-costs-of-cash> [https://perma.cc/HBY2-FVMA].

19. *See id.*

20. *Id.*

21. *Id.*

22. Will Yaowicz, *Cash Costs U.S. Businesses \$40 Billion a Year*, INC., (Sept. 20, 2013), <https://www.inc.com/will-yakowicz/dealing-with-cash-costs-american-businesses-55-billion.html> [https://perma.cc/ZVA9-69T7].

23. *Currency and Coin*, BD. GOVERNORS FED. RESERVE SYS. (Dec. 27, 2018), https://www.federalreserve.gov/faqs/currency_12771.htm [https://perma.cc/VSD4-G4HE].

24. *Currency and Coin Services*, BD. GOVERNORS FED. RESERVE SYS. (June 10, 2019), https://www.federalreserve.gov/paymentsystems/coin_data.htm [https://perma.cc/C9RB-AJT5].

25. *2018 Federal Reserve Note Print Order*, BD. GOVERNORS FED. RESERVE SYS. (Aug. 9, 2018), https://www.federalreserve.gov/paymentsystems/2018_currency_print_orders.htm [https://perma.cc/VH65-MKDT].

Additionally, counterfeiting of bank notes has been an ongoing phenomenon for centuries. The counterfeit currency and the people's belief in the government are both devalued each time counterfeit money gets disseminated into the market.²⁶ The government is therefore tasked with protecting the currency's integrity.²⁷ Federal law prohibits the possession of counterfeit notes,²⁸ as well as passing on, uttering (i.e., using as if genuine), and dealing with money—either domestic or foreign—with the intention of defrauding.²⁹

According to one study, \$1 of every \$12,400 of cash notes printed may be counterfeit.³⁰ The cost of counterfeit response is significant. These costs are largely associated with upgrades to cash-processing equipment.³¹ Even in countries with low levels of counterfeit interference, the social cost of counterfeits is substantial.³² Some evidence exists that demand for bank notes declines after a counterfeiting shock in a given system.³³ Stock prices of credit card and bank deposit entities increase after counterfeit incidents.³⁴ Such consequences are consistent with a loss of confidence in the currency.

Physical bank notes result in untraceable transactions that facilitate corruption and exert a significant cost on the global economy. Corruption has well-documented negative economic effects.³⁵ According to some

26. See *infra* notes 30-34 and accompanying text.

27. See U.S. CONST. art. I, § 8, cl. 6 (establishing Congress's prerogative to punish counterfeiting). In 1865, the Secret Service was established to go after money counterfeiters. At that time, one-third of U.S. currency was fake. *USSS History*, SECRET SERV., <https://www.secretservice.gov/about/history/events/> [<https://perma.cc/Z2LN-784V>].

28. 18 U.S.C. §§ 470-514 (2018).

29. *Id.*

30. *Costs of Keeping Ahead of Counterfeiters*, FED. RESERVE BANK OF RICHMOND, (Dec. 2009), https://www.richmondfed.org/-/media/richmondfedorg/banking/payments_services/understanding_payments/pdf/costs_counterfeiters.pdf [<https://perma.cc/UHU5-5BXF>]; Ruth Judson & Richard Porter, *Estimating the Worldwide Volume of Counterfeit U.S. Currency: Data and Extrapolation*, DIVISION OF MONETARY AFF., BD. GOVERNORS FED. RESERVE SYS. (2003), <http://www.federalreserve.gov/pubs/FEDS/2003/200352/200352pap.pdf> [<https://perma.cc/3WRN-F8Z4>].

31. *Id.*

32. Nathan Viles, Alexandra Rush & Thomas Rohling, *The Social Costs of Currency Counterfeiting*, RESERVE BANK OF AUSTRALIA, (May 2015), <https://www.rba.gov.au/publications/rdp/2015/2015-05/>. [<https://perma.cc/M7DN-EKS4>].

33. *Id.* at 9.

34. *Id.* at 16.

35. BINYAM REJA & ANTTI TALVITIE, *THE INDUSTRIAL ORGANIZATION OF CORRUPTION: WHAT IS THE DIFFERENCE IN CORRUPTION BETWEEN ASIA AND AFRICA*, 22-24 (2000); J. Edgardo Campos,

studies, the annual cost of corruption on the global economy is \$3.6 billion.³⁶ Economic growth is negatively affected by corruption in terms of gross domestic product (GDP) per capita in a given country, price stability and international trade, and bias in the composition of government expenditures.³⁷ The World Bank suggests that corruption is the single greatest threat to social and economic development.³⁸ Countries that address corruption can increase per capita incomes of their citizens by up to 400%.³⁹

Donald Lien & Sanjay Pradhan, *The Impact of Corruption on Investment: Predictability Matters*, 27 WORLD DEV. 1059 (June 1999); Rafael Di Tella & Ernesto Schargrotsky, *The Role of Wages and Auditing During a Crackdown on Corruption in the City of Buenos Aires*, 46 J. L. & ECON. 269, 270 (2003); Axel Dreher, *IMF and Economic Growth: The Effects of Programs, Loans, and Compliance with Conditionality*, 34 WORLD DEV. 769 (2006); Michael Keating, *Counting the Cost of the Culture of Corruption: A Perspective from the Field*, 20 PAC. MCGEORGE GLOBAL BUS. & DEV. L.J. 317, 319-20 (2007); Lorenzo Pellegrini & Reyer Gerlagh, *Corruption's Effect on Growth and its Transmission Channels*, 57 KYKLOS 429 (2004), <https://ssrn.com/abstract=591558> [<https://perma.cc/3H9P-SENG>]; Carmen M. Reinhart & Kenneth S. Rogoff, *The Modern History of Exchange Rate Arrangements: A Reinterpretation*, 119 Q. J. ECON. 1 (2004); Michael T. Rock & Heidi Bonnett, *The Comparative Politics of Corruption: Accounting for the East Asian Paradox in Empirical Studies of Corruption, Growth and Investment*, 32 WORLD DEV. 999 (2004); Andrei Shleifer & Robert W. Vishny, *Corruption*, 108 Q. J. ECON. 599 (1993); Shang-Jin Wei, *How Taxing is Corruption on International Investors?*, 82 REV. ECON. STAT. 1 (2000); Shang-Jin Wei & Andrei Shleifer, *Local Corruption and Global Capital Flows*, 2000 BROOKING PAPERS ON ECON. ACTIVITY 303 (2000); Heinz Welsch, *Corruption, Growth, and the Environment: A Cross-Country Analysis*, 9 ENV'T AND DEV. ECON. 663 (2004); Arnold Zellner & Henri Theil, *Three-Stage Least Squares: Simultaneous Estimation of Simultaneous Equations*, ECONOMETRICA, Jan. 1962, at 54, 54-78; Zvika Neeman, Daniele Paserman & Avi Simhon, *Corruption and Openness*, Hebrew Univ. of Jerusalem (Discussion Paper No. 8.03 2003), <https://ageconsearch.umn.edu/record/14977/files/dp030008.pdf> [<https://perma.cc/4PXH-K6VF>]; Helene Poirson Ward, *Economic Security, Private Investment, and Growth in Developing Countries* (Int'l Monetary Fund, Working Paper No. 98/4, 1998), <https://www.imf.org/en/Publications/WP/Issues/2016/12/30/Economic-Security-Private-Investment-and-Growth-in-Developing-Countries-2456> [<https://perma.cc/AY4P-RRJT>]; Shang-Jin Wei & Yi Wu, *Negative Alchemy? Corruption and Composition of Capital Flows* (Nat'l Bureau of Econ. Res., Working Paper No. 8187, 2001), <https://www.nber.org/papers/w8187> [<https://perma.cc/4C24-453V>]; Axel Dreher & Thomas Herzfeld, *The Economic Costs of Corruption: A Survey and New Evidence* (June 2005), <https://ssrn.com/abstract=734184> [<https://perma.cc/YA6K-34EJ>].

36. Stephen Johnson, *Corruption is Costing the Global Economy \$3.6 Billion Dollars Every Year*, WORLD ECON. FORUM (Dec. 13, 2018), <https://www.weforum.org/agenda/2018/12/the-global-economy-loses-3-6-trillion-to-corruption-each-year-says-u-n> [<https://perma.cc/3HTW-H6QD>].

37. See Dreher & Herzfeld, *supra* note 35.

38. *Corruption Hunters Rally for Action Against Fraud*, THE WORLD BANK (Dec. 6, 2010), <https://www.worldbank.org/en/news/feature/2010/12/06/corruption-hunters-rally-for-action-against-fraud> [<https://perma.cc/X75S-T5YF>].

39. *The Costs of Corruption*, WORLD BANK (Apr. 8, 2004), <http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:20190187~menuPK:34457~pagePK:34370~piPK:34424~theSitePK:4607,00.html> [<https://perma.cc/ANL8-J2XZ>].

The social cost associated with corruption is holding humanity back in development and affects the poor disproportionately.⁴⁰

The effect of corruption on economic welfare is significant.⁴¹ Most studies capture the negative impact of corruption on economic development by focusing on the GDP and per capita growth of countries relative to the degree of corruption (i.e., more corrupt countries experience statistically significant lower GDP and investment rates).⁴² Similarly, more corrupt countries also experience significantly lower rates of investment.⁴³

Finally, the cost of bank notes in the economy is borne by society at large. In the United States, for instance, the annual value of underreported taxes is somewhere between \$400 billion and \$600 billion.⁴⁴ The U.S. Treasury loses at least \$50 billion annually because of the cash economy, even assuming that only half of this under-reporting by self-employed taxpayers can be traced back to cash.⁴⁵

40. *The Costs of Corruption: Values, Economic Develop Under Assault, Trillions Lost*, says Guterres, UN NEWS (Dec. 9, 2018), <https://news.un.org/en/story/2018/12/1027971> [<https://perma.cc/U2N5-BJBX>].

41. See Shleifer & Vishny, *supra* note 35.

42. See Paulo Mauro, *Corruption and Growth*, 110 Q.J. ECON. 681, 701 (1995); Aymo Brunetti, *Political Variables in Cross-Country Growth Analysis*, 11 J. ECON. SURVS. 163, 184 (1997); Ward, *supra* note 35; Hongyi Li, Lixin Colin Xu & Heng-fu Zou, *Corruption, Income Distribution, and Growth*, 12 ECON. & POL. 155, 162-63 (2000); Pak-Hung Mo, *Corruption and Economic Growth*, 29 J. COMP. ECON. 66, 67 (2001); George T. Abed & Hamid R. Davoodi, *Corruption, Structural Reforms, and Economic Performance in the Transition Economies* (Int'l Monetary Fund, Working Paper No. 00/132, 2000), <https://www.imf.org/en/Publications/WP/Issues/2016/12/30/Corruption-Structural-Reforms-and-Economic-Performance-in-the-Transition-Economies-3697> [<https://perma.cc/3NPK-DBTU>]; Kwabena Gyimah-Brempong, *Corruption, Economic Growth, and Income Inequality in Africa*, 3 ECON. GOVERNANCE 183 (2002); Pierre-Guillaume Meon & Khalid Sekkat, *Does Corruption Grease or Sand the Wheels of Growth?*, 122 PUB. CHOICE 69, 88 (2005); Isaac Ehrlich & Francis Lui, *Bureaucratic Corruption and Endogenous Economic Growth*, 107 J. POL. ECON. 270, 289-90 (1999); Daniel Kaufmann, Aart Kraay & Pablo Zoido, *Governance Matters* (World Bank Pol'y Res. Working Paper No. 2196, 1999); Zvika Neeman, M. Daniele Paserman & Simhon Avi, *Corruption and Openness*, 8 B.E. J. ECON. ANALYSIS & POL'Y 1 (2008). *But see* Pellegrini & Gerlagh, *supra* note 35, at 434; Raul A. Barreto, *Endogenous Corruption, Inequality and Growth: Econometric Evidence* (Univ. of Adelaide Sch. of Econ. Working Paper No. 2001-02, 2001).

43. Mauro, *supra* note 42; Aymo Brunetti, Gregory Kisunko & Beatrice Weder di Mauro, *Credibility of Rules and Economic Growth: Evidence from a Worldwide Survey of the Private Sector*, 12 WORLD BANK ECON. REV. 353 (1998); Aymo Brunetti & Beatrice Weder di Mauro, *Investment and Institutional Uncertainty: A Comparative Study of Different Uncertainty Measures*, 134 REV. WORLD ECON. 513, 529 (1998); Campos et al., *supra* note 35; Mo *supra* note 42; Johann Graf Lambsdorff, *How Corruption Affects Productivity*, 56 KYKLOS 457 (2003).

44. See Chakravorti, *supra* note 18.

45. See *id.* (reporting that underpayment by self-employed individuals is \$109 billion annually).

C. Capital Controls

Fiat currencies can be subject to capital controls. While the majority of the Western developed world does not impose capital controls, leaving economic movement of capital to the markets, a wide variety of capital controls are used in emerging economies.⁴⁶ Capital controls are instituted by some governments to restrict the inflow and outflow of capital into the economy in an attempt to ensure that the economy and currency stay relatively stable in the long run and to prevent currency volatility and inflationary swings.⁴⁷

Capital controls may be categorized as: (1) walled, characterized by long-term capital control measures; (2) gated, characterized by systems in place to be turned on and off episodically; or (3) open, characterized by the absence of a system of control.⁴⁸ Capital controls are controversial. Some economists believe that implementing capital controls can help make economies more stable, because only investors that see long-term potential will invest in a country that employs capital controls.⁴⁹

II. TRANSITION TO DIGITAL CURRENCIES STARTED

The transition of concepts of money from the existing bank notes (i.e., paper money), to digital currencies has already commenced. In the public sector, central banks and governments around the world have been experimenting with digital and cryptocurrencies.⁵⁰ Several of those projects are in the proof-of-concept phase; others are near launch.⁵¹

46. Andrés Fernández, Michael W. Klein, Alessandro Rebucci, Martin Schindler, & Martín Uribe, *Capital Control Measures: A New Dataset* 15 (Int'l Monetary Fund, Working Paper No. 15/80, 2015).

47. *See generally id.* at 4-6.

48. *Id.* at 13.

49. Thomas Kostigen, *Capital Controls Can Stabilize Developing Nations*, MARKETWATCH (Jun. 22, 2012), <https://www.marketwatch.com/story/capital-controls-can-stabilize-developing-nations-2012-06-22> [<https://perma.cc/LAY8-UGRP>].

50. Garrick Hileman & Michel Rauchs, *Global Cryptocurrency Benchmarking Study*, CAMBRIDGE JUDGE BUS. SCH. (2017), https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/global-cryptocurrency/#.XMHF_xNKhTY [<https://perma.cc/YT7K-SARA>].

51. *See infra* notes 92-100 and accompanying text.

Increasing evidence suggests that bank notes are gradually losing ground to other payment systems.⁵² Whereas the overwhelming majority of humans live in cash economies where at least 90% of transactions are conducted in cash, consumers in wealthier economies tend to favor noncash alternatives.⁵³ Illustrating this emerging trend, cash usage in the United States, the United Kingdom, the Netherlands, Sweden, Finland, Canada, and France, among other industrialized nations, has fallen well below 50% of the total transaction volume.⁵⁴ Most significantly, in Northern Europe, as few as one of every five transactions is made in cash.⁵⁵

A. Technological and Monetary Co-Evolution

Technological evolution is tied to the evolution of money. However, while technology has been evolving at an unprecedented rate for the past several decades,⁵⁶ concepts of money evolve much more slowly. Even deeply rooted cultural constraints, such as customary cash businesses, pertaining to money and finance, though, are unable to restrain technological progress in the long term.⁵⁷ Money evolved from barter trade with livestock to coinage to bank notes.⁵⁸ For example, starting over three thousand years ago, cowry shells, or copies of the shells, were used as Chinese currency.⁵⁹

52. KENNETH S. ROGOFF, *THE CURSE OF CASH* (Princeton University Press, 2016).

53. *Id.*

54. "Germany, Japan, and Austria stand apart as wealthy countries where consumers maintain a strong preference for cash at the point of sale, despite universal availability of electronic payments instruments and the broad adoption of electronic transfers for recurring payments." *Id.*

55. *Id.*

56. See Fenwick & Vermeulen, *infra* note 64.

57. Other examples of technological evolution despite deep cultural constraints include Japan's slow removal of individual seals dating back to the shogun era. *Personal Seals Lose Ground as Big Japanese Banks stop Using 1800s Technology*, THE JAPAN TIMES, (Mar. 9, 2019), <https://www.japantimes.co.jp/news/2019/03/09/business/corporate-business/personal-seals-lose-ground-big-japanese-banks-stop-using-1800s-technology/#.XIaxmtlOI-F> [<https://perma.cc/E64M-7URZ>].

58. Andrew Beattie, *The History of Money: From Barter to Banknotes*, INVESTOPEDIA (Feb. 7, 2019), https://www.investopedia.com/articles/07/roots_of_money.asp [<https://perma.cc/S9PQ-SWFE>].

59. Peter Boomgaard, *Early Globalization Cowries as Currency, 600 BCE -1900*, in *LINKING DESTINIES: TRADE, TOWNS AND KIN IN ASIAN HISTORY* 13-28 (Peter Boomgaard, Dick Kooiman & Henk Schulte Nordholt eds. 2008). The Classical Chinese character for "money/currency," 貝, originated

For the last decade, technology has been advancing even more quickly.⁶⁰ Some core examples include artificial intelligence (AI), robotics, big data, and machine learning, among several others. The rapid advances of AI have already affected many sectors of the economy during the past decade.⁶¹ Big data—the ability to examine all data in an empirical study—in combination with AI and machine learning is a significant driver of disruptive innovation.⁶² Big data in the form of digitized data that grows at exponential rates and can be captured and manipulated electronically draws on several core sources including the internet of things, public records, social media, and cameras, as well as satellite tracking.⁶³ The real surge of innovation appears to involve a combined effect of AI, big data, sensors, and blockchain technology.⁶⁴

as a pictograph of a cowrie shell. *Id.* Cowries were also formerly used as means of exchange in India. The Lydian state minted coins, most of the coins mentioning king Alyattes of Lydia. *Id.*

60. See Fenwick & Vermeulen, *infra* note 64.

61. See Craig E. Karl, *The Three Breakthroughs That Have Finally Unleashed AI on the World*, WIRE (Oct. 27, 2014, 6:30AM), <http://www.wired.com/2014/10/future-of-artificial-intelligence/> [<https://perma.cc/A8AX-42JP>] (“Over the past five years, cheap computing, novel algorithms, and mountains of data have enabled new AI-based services that were previously the domain of sci-fi and academic white papers.”).

62. See ERIK BRYNJOLFSSON & ANDREW MCAFEE, *THE SECOND MACHINE AGE: WORK, PROGRESS, AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES* 205–28 (2014); Tess Townsend, *Peter Diamandis: A.I. Will Lead to Massive Disruption Across Industries*, INC. (Sept. 24, 2015), <http://www.inc.com/tess-townsend/diamandis-artificial-intelligence.html> [<https://perma.cc/FMQ2-44GC>]. See James Canton, *From Big Data to Artificial Intelligence: The Next Digital Disruption*, THE HUFFINGTON POST (July 5, 2016, 2:23 PM), http://www.huffingtonpost.com/james-canton/from-big-data-to-artifici_b_10817892.html [<https://perma.cc/76B7-73UW>]; Jitendra Waral, Anurag Rana & Sean Handrahan, *Artificial Intelligence: Disruption Era Begins*, BLOOMBERG PROFESSIONAL: BLOOMBERG INTELLIGENCE (Sept. 29, 2016), <https://www.bloomberg.com/professional/blog/artificial-intelligence-disruption-era-begins/> [<https://perma.cc/MLT9-N2KE>]; Rebecca Merrett, *Intelligent Machines Part 1: Big Data, Machine Learning and the Future*, CIO (June 4, 2015 2:47 PM), <http://www.cio.com.au/article/576664/intelligent-machines-part-1-big-data-machine-learning-future/> [<https://perma.cc/6K69-9XGZ>].

63. See Townsend, *supra* note 62; John Podesta, Penny Pritzker, Ernest J. Moniz, John Holdren, Jeffrey Zients, EXEC. OFFICE OF THE PRESIDENT, *BIG DATA: SEIZING OPPORTUNITIES, PRESERVING VALUES* 53 (2014), <https://goo.gl/xtDerj> [<https://perma.cc/9HSW-LW8X>] (“Big data technologies, together with the sensors that ride on the ‘Internet of Things,’ pierce many spaces that were previously private. Signals from home WiFi networks reveal how many people are in a room and where they are seated.”); See generally JAMES MANYIKA ET AL., *BIG DATA: THE NEXT FRONTIER FOR INNOVATION, COMPETITION, AND PRODUCTIVITY* 15 (McKinsey Glob. Inst., 2011).

64. Mark Fenwick & Erik P.M. Vermeulen, *Technology and Corporate Governance: Blockchain, Crypto, and Artificial Intelligence*, EUROPEAN CORP. GOVERNANCE INST. (Oct. 22, 2018).

The technological evolution takes place in common phases that may help predict future developments in emerging decentralized technologies. Every major technological innovation since the industrial revolution experienced an initial hype cycle, followed by a burst, as well as a short and a long proliferation cycle.⁶⁵ For example, in recent history, the dot-com bubble in the 2000s created a massive hype cycle pertaining to the business opportunities and possibilities associated with internet technology and their possible use cases.⁶⁶ The dot-com bubble burst in the early 2000s, giving birth to one of the greatest periods of consumer innovation in history.⁶⁷ As part of the long-term proliferation cycle, cryptocurrencies and blockchain technology have the opportunity to expand the innovation and associated opportunities started during the early internet years.

Decentralization protocols are at the very beginning of their evolutionary cycle. Just as the internet boom and dot-com bubble created Facebooks, Amazons, Googles and Apples,⁶⁸ the evolution of decentralization protocols may give birth to the next generation of emerging technology and associated companies. Blockchain technology enabled a nascent industry with an unclear use case.⁶⁹ Despite the initial hype cycle in 2017 and 2018, the industry is still nowhere near the required level of maturity. In order to emerge from the initial hype and boom cycle, decentralization technology has to mature and grow towards an understanding of capability. The number of decentralized infrastructure projects needed for the evolution cycle to start is significant. Significant decentralization project failures are necessary and useful while appropriate use cases are being explored.

65. Dilantha De Silva, *Is There a Bubble in the Making? The Dotcom Bubble and Today's Market*, SEEKING ALPHA (Oct. 16, 2018), <https://seekingalpha.com/article/4212027-bubble-making-dotcom-bubble-todays-market> [<https://perma.cc/6JKE-7N4Z>].

66. *Id.*

67. *Id.*

68. See also Eric Jackson, *Cryptocurrency Skeptics Warn of Another Dot-Com Bubble, But Remember: That's Where Amazon and Google Started*, CNBC (Aug. 7, 2017), <https://www.cnbc.com/2017/08/07/cryptocurrency-boom-just-beginning--commentary.html> [<https://perma.cc/5W6W-ZVW9>]; see also Teri Robinson, *Lasting Benefits of the Dot-Com Bubble*, E-COMMERCE TIMES (July 15, 2002), <https://www.ecommercetimes.com/story/18570.html> [<https://perma.cc/M2NA-L676>].

69. Febin John James, *Popular Use Cases of Blockchain Technology You Need to Know*, MEDIUM: HACKERNOON (Jan. 31, 2018), <https://hackernoon.com/popular-use-cases-of-blockchain-technology-you-need-to-know-df4e1905d373> [<https://perma.cc/2ZZA-JSKN>] (providing text explanations).

The emergence of stable cryptocurrency projects can be seen as an early indicator for the possible co-evolution of decentralized technology and money. For example, the rise of an early stable cryptocurrency design, Tether, in terms of its total market capitalization,⁷⁰ its stability around \$1 value,⁷¹ and investors' uses of Tether as a temporary safe haven,⁷² provides some support for stable cryptocurrencies' ability to create market stability, even if only temporarily. Like all other stable cryptocurrency projects, Tether is still afflicted with significant design challenges.⁷³ The emerging role of stable cryptocurrencies in decentralization protocols suggests that part of the evolution of such protocols may involve stability designs.

B. Early Experimentation

Governments, central banks, and the private sector have started experimenting with digital- and cryptocurrencies. In the case of central banks, such experimentation is already close to launch⁷⁴ or fully operational.⁷⁵ Several governments have issued their own digital currencies.

70. *Tether*, COINMARKETCAP, <https://coinmarketcap.com/currencies/tether> [https://perma.cc/U3WP-9GEV] (last visited Apr 22, 2019).

71. Johnson Gitonga, *What is Tether (USDT) and How to Buy It?*, YAHOO! FINANCE (Feb. 5, 2018), <https://finance.yahoo.com/news/tether-usdt-buy-090742535.html> [https://perma.cc/6RHP-HYWN] (discussing the stability of Tether at a \$1 value)

72. Evidence that shows that investors move crypto assets into Tether when the market gets more volatile.

73. Tether's issue with being pegged against the USD and with that subject to Centralized monetary policy. Andrea Tan, Eric Lam & Benjamin Robertson, *Crypto Markets Roiled as Traders Question Tether's Dollar Peg*, BLOOMBERG, (October 14, 2018, 11:30 PM CDT), <https://www.bloomberg.com/news/articles/2018-10-15/dollar-peg-that-underpins-20-of-crypto-trades-is-under-pressure> [https://perma.cc/V7X5-YQKJ].

74. The Bank of Canada and bank of England announced in 2016 that the technology was not ready for a central bank sponsored crypto currency. Yet, other central banks, such as in Singapore and Sweden have already launched their e-currency projects. Morten Bech & Rodney Garratt, *Central Bank Cryptocurrencies*, BIS Q. REV. 66-67 (Sept. 2017), <https://ssrn.com/abstract=3041906> [https://perma.cc/9GYS-ER2J].

75. Usman W. Chohan, *Cryptocurrencies as Asset-Backed Instruments: The Venezuelan Petro*, (Feb. 7, 2018), <https://ssrn.com/abstract=3119606> [https://perma.cc/P3UH-F2ZR] (describing Venezuela's oil token). Bruce Zagaris, *U.S. Bans Venezuela's New Crypto-Currency and Adds 3 Officials to Sanctions List*, 34 INT'L ENFORCEMENT L. REP. 157, 157-161 (2018); Julie Hirschfeld Davis & Nathaniel Popper, *White House Bans Venezuela's Digital Currency and Expands Sanctions*, N. Y. TIMES, (Mar. 19, 2018), <https://www.nytimes.com/2018/03/19/world/americas/trump-venezuela-sanctions-petro.html> [https://perma.cc/VH8G-86FD].

Central banks and governments around the world have been experimenting with government-sponsored digital and cryptocurrencies since 2015.⁷⁶ Examples include Tunisia (eDinar),⁷⁷ Venezuela (Petro),⁷⁸ Senegal (eCFA),⁷⁹ Sweden (eKrona),⁸⁰ Dubai (EmCash),⁸¹ Japan (Jcoin),⁸²

76. Yves Mersch, Member of the Executive Board of the European Central Bank, at the Central Bank of Malaysia Monetary Policy Conference (July 24, 2017) (transcript available <https://www.bis.org/review/r170807c.htm> [<https://perma.cc/PDA7-CWFF>]); *Digital Currency Initiative*, MIT MEDIA LAB, <https://dci.mit.edu/> [<https://perma.cc/TK9P-EWQD>]; *Financial Stability Review 2017*, MONETARY AUTH. OF SING. (Nov. 2017); Bech & Garratt *supra* note 74; see Hileman & Rauchs, *supra* note 50; Jack Meaning, Ben Dyson, James Barker & Emily Clayton, *Broadening Narrow Money: Monetary Policy with a Central Bank Digital Currency* (Bank of Eng., Staff Working Paper No. 724, 2018); J.P. Koning, *Fedcoin: A Central Bank-Issued Cryptocurrency*, R3 REPORT 15 (2016); Sina Motamedi, *Will Bitcoins Ever Become Money? A Path to Decentralized Central Banking*, TANNUTUVA.ORG (July 21, 2014), <https://tannutuva.org/2014/will-bitcoins-ever-become-money-a-path-to-decentralized-central-banking/> [<https://perma.cc/4KCY-N2BB>].

77. Richard Kastelein, *Tunisia to Replace Its National Digital Currency, eDinar, With Blockchain-Driven Monetas Currency*, BLOCKCHAIN NEWS (Dec. 28, 2015), <https://www.theblockchain.com/2015/12/28/tunisia-to-replace-its-national-digital-currency-edinar-with-blockchain-driven-monetas-currency/> [<https://perma.cc/AZC9-R9EH>].

78. Ryan Browne, *Venezuela About to Pre-Sell 'Petro' Cryptocurrency, and Other Countries Could Follow*, CNBC (Feb. 19, 2018), <https://www.cnbc.com/2018/02/19/venezuela-petro-cryptocurrency-pre-sale-starts-february-20.html> [<https://perma.cc/EZ3Q-RFL2>].

79. Samburaj Das, *Senegal Will Introduce a Blockchain-Based National Digital Currency*, CCN (Nov. 28, 2016), <https://www.ccn.com/senegal-will-introduce-blockchain-based-national-digital-currency> [<https://perma.cc/Y4QV-TV2B>].

80. Afraid of a few commercial entities controlling cash supply in Sweden, the Swedish central bank has kicked off its digital currency project e-krona. Amanda Billner, *Now There are Plans for 'e-Krona' in Cash-Shy Sweden*, BLOOMBERG, (Oct. 26, 2018, 2:25 AM CDT), <https://www.bloomberg.com/news/articles/2018-10-26/riksbank-to-develop-pilot-electronic-currency-amid-cash-decline> [<https://perma.cc/85SM-VPLG>].

81. Jon Buck, *Dubai Will Issue First Ever State Cryptocurrency*, COIN TELEGRAPH (Oct. 1, 2017), <https://cointelegraph.com/news/dubai-will-issue-first-ever-state-cryptocurrency> [<https://perma.cc/J7XN-C77Q>].

82. Arjun Kharpal, *Japanese Banks Are Thinking of Making Their Own Cryptocurrency Called the J-Coin*, CNBC: TECH TRANSFORMERS (Sept. 27, 2017), <https://www.cnbc.com/2017/09/27/japanese-banks-cryptocurrency-j-coin.html> [<https://perma.cc/Y8CX-WT75>].

Estonia (Estcoin),⁸³ and Ecuador,⁸⁴ among others.⁸⁵ These early attempts suggest that the countries that are most in need may someday decide to issue their own digital- or cryptocurrencies pegged to an existing stable cryptocurrency.

Several factors explain such early experimentation. Central bank-operated wholesale payment systems are already at the end of their technological life cycle, using database designs and computing languages that are largely obsolete and very expensive to maintain.⁸⁶ The shortcomings of the existing system have created considerations in which a central bank would create a token with one-for-one conversion with cash and reserves. Such token designs would allow token minting and destruction if an equivalent amount of cash or reserves were created or destroyed.⁸⁷

Emerging trends in payment systems and the end of technological life cycles necessitate central banks' enhanced examination with cryptocurrency solutions. Central banks in countries with rapidly declining cash usage⁸⁸ are subject to the most pressure to find alternatives to bank notes. Given these trends in technology and in light of the shortcomings of the existing payment system infrastructure, all central banks will eventually need to evaluate if and when issuing central bank sponsored cryptocurrencies can create value in their own systems.⁸⁹

The private sector is equally engaged in cryptocurrency experimentation. Most cryptocurrency exchanges are creating their own stable

83. Kaspar Korjus, *We're Planning to Launch Estcoin – and That's Only the Start*, MEDIUM (Dec. 18, 2017), <https://medium.com/e-residency-blog/were-planning-to-launch-estcoin-and-that-s-only-the-start-310aba7f3790> [<https://perma.cc/2VBP-ATXM>].

84. Everett Rosenfeld, *Ecuador Becomes the First Country to Roll Out Its Own Digital Cash*, CNBC: CURRENCIES (Feb. 9, 2015), <https://www.cnbc.com/2015/02/06/ecuador-becomes-the-first-country-to-roll-out-its-own-digital-durrency.html> [<https://perma.cc/A7A9-M87V>].

85. *Cryptocurrencies by Country*, THOMPSON REUTERS (Oct. 25, 2017), <https://blogs.thomsonreuters.com/answeron/world-cryptocurrencies-country> [<https://perma.cc/XQ67-5PUY>].

86. Bech & Garratt, *supra* note 74, at 66.

87. *Id.*; Koning, *supra* note 76; Motamedi, *supra* note 76.

88. Jonathan Brugge, Olivier Denecker, Hamza Jawaid, Andras Kovacs, & Ibrahim Shami, *Attacking the Cost of Cash*, MCKINSEY & COMPANY (Aug. 2018), <https://www.mckinsey.com/industries/financial-services/our-insights/attacking-the-cost-of-cash> [<https://perma.cc/8PB8-ZJ6V>].

89. Bech & Garratt, *supra* note 74, at 67; Hileman & Rauchs, *supra* note 50.

cryptocurrencies.⁹⁰ On February 14, 2019, J.P. Morgan (JPM) introduced the first prototype of its blockchain settlement product: JPM Coin, a stable cryptocurrency backed one-to-one by JPM's fiat currency reserves.⁹¹ The close structure of the JPM coin, namely that JPM only makes it available to existing clients, appears to be an anachronism.⁹² Finally, Facebook is developing a stable cryptocurrency in an attempt to break into the financial services business.⁹³ The emergence of stable cryptocurrencies that are funded by private banking institutions and technology behemoths suggests that, in addition to central banks, established banking and technology institutions are also realizing the benefits and potential of stable cryptocurrencies.

III. STABLE CRYPTOCURRENCIES

Since their inception in 2014 with Tether,⁹⁴ stable cryptocurrencies have primarily been used as a cash equivalent for cryptocurrency portfolios. In 2019, stable cryptocurrencies have grown substantially in popularity as an answer to the high volatility associated with the cryptocurrency markets.⁹⁵ Depending on their design, they can offer additional features such as

90. Jeff J. Roberts, *Cryptocurrency Exchanges Back \$32 Million Stable Coin Project*, FORTUNE (Aug. 29, 2018), <http://fortune.com/2018/08/29/cryptocurrency-exchanges-back-32-million-stable-coin-project> [<https://perma.cc/539Z-7WFQ>]; Julie Verhage, *Crypto Exchange Coinbase to List Stable Coin Backed by Circle*, BLOOMBERG (Oct. 23, 2018), <https://www.bloomberg.com/news/articles/2018-10-23/crypto-exchange-coinbase-to-list-stable-coin-backed-by-circle>.

91. Michelle Davis & Alastair Marsh, *JPMorgan to Use Digital Coin to Speed Up Corporate Payments*, BLOOMBERG (Feb. 14, 2019), <https://www.bloomberg.com/news/articles/2019-02-14/jpmorgan-to-use-cryptocurrency-for-payments-business-cnbc-says> [<https://perma.cc/6ACY-DLZH>].

92. Brad Garlinghouse (@bgarlinghouse), TWITTER (Feb. 14, 2019, 10:45 AM), <https://twitter.com/bgarlinghouse/status/1096118363506434048> [<https://perma.cc/P5PR-SYAP>].

93. Sarah Frier & Julie Verhage, *Facebook is Developing a Cryptocurrency for WhatsApp Transfers*, *Sources Say*, BLOOMBERG (Dec. 20, 2018, 6:35 PM), <https://www.bloomberg.com/news/articles/2018-12-21/facebook-is-said-to-develop-stablecoin-for-whatsapp-transfers> [<https://perma.cc/JG6T-UKBH>]; Nathaniel Popper & Mike Isaac, *Facebook and Telegram Are Hoping to Succeed Where Bitcoin Failed*, N. Y. TIMES (Feb. 28, 2019), <https://www.nytimes.com/2019/02/28/technology/cryptocurrency-facebook-telegram.html> [<https://perma.cc/3KH3-TGHX>].

94. Pete Rizzo, *Realcoin Rebrands as 'Tether' to Avoid Altcoin Association*, COINDESK (Nov. 20, 2014, 12:01 PM), <https://www.coindesk.com/realcoin-relaunches-tether-avoid-altcoin-association>.

95. BINANCE ACADEMY, *supra* note 2

transparency, privacy, and increased decentralization.⁹⁶ Stable cryptocurrencies can also offer lower fees and faster transaction speeds, “making them quite useful for international transactions and everyday payments.”⁹⁷

The evolution of stable cryptocurrencies creates a new opportunity to reexamine earlier decades of monetary policy-making and scholarship. In particular, it allows an expansion and reexamination of the quantity theory of money and associated models.⁹⁸ In 2014, Robert Sams introduced the first attempt at creating a stability mechanism for cryptocurrencies.⁹⁹ Sams’s early academic attempt was quickly followed by commercial applications and expansions of his earlier vision.¹⁰⁰ In 2019, the leading notable stable cryptocurrency startups and their respective approaches include: Ampleforth,¹⁰¹ Paxos Standard Token (PAX),¹⁰² Gemini Dollar

96. *Id.*

97. *Id.*

98. The quantity theory of money predicts that money growth should be neutral in the long run in its effects on the growth rate of production and should affect the inflation rate on a one-for-one basis. In David Hume's pioneering essays of 1752, *Of Money and Of Interest*, Hume stressed that changes in the number of units of money in circulation will have proportional effects on all prices that are stated in money terms. In turn, Hume suggests that changes in the number of units of money in circulation have no effect on economic output, i.e., on how much people produce or on the goods they produce or consume. The quantity theory of money has evolved dramatically since the beginnings of modern monetary theory in Hume's pioneering essay. David Hume, *Of Money and of Interest*, in WRITINGS ON ECONOMICS (Eugene Rotwein ed., 1970).

99. Robert Sams, *A Note on Cryptocurrency Stabilisation: Seigniorage Shares*, BRAVE NEWCOIN (Apr. 28, 2015), <https://assets.ctfassets.net/sdlntm3tthp6/resource-asset-r390/5a940afb21681d19c0b3b76cf69259e1/58ebe9e2-1f28-4a8d-8ce1-26abef07aedf.pdf> [<https://perma.cc/25AM-EVGB>]

100. See, e.g., *The Cryptoeconomics of Seigniorage Shares Stablecoins: Basis and Carbon*, SMITH + CROWN (May 28, 2018), <https://www.smithandcrown.com/cryptoeconomics-seigniorage-shares-look-basis-carbon/> [<https://perma.cc/A6EU-DSP4>] (Basis's design and expansion of Sams' 2014 attempt).

101. See generally P.H. Madore, *Crypto Firm Fragments Launches Stablecoin Following 'Ampleforth' Rebrand*, CCN.COM (Nov. 12, 2018), <https://www.ccn.com/crypto-firm-fragments-launches-stablecoin-following-ampleforth-rebrand> [<https://perma.cc/AB3K-BNTR>].

102. See generally Josiah Wilmoth, *Paxos Standard: Why the Stablecoin You've Never Heard of Just Might Take Down Tether*, CCN.COM (Feb. 12, 2018), <https://www.ccn.com/paxos-standard-why-the-stablecoin-youve-never-heard-of-just-might-take-down-tether> [<https://perma.cc/DN2C-XX64>].

(GUSD),¹⁰³ TrueUsd (TUSD),¹⁰⁴ Circle's CENTRE consortium (USD-C),¹⁰⁵ Facebook's Stablecoin launch,¹⁰⁶ and, of course, Tether,¹⁰⁷ among several others.

Cryptocurrency-backed tokens are even more expensive because the stability is achieved via pegs to (currently) much more unstable cryptocurrencies. Any cryptocurrency-backed token must be backed with much more than one hundred percent of the current value of the cryptocurrency in case the total value in the group of other cryptocurrencies' values drops. On the other hand, the uncollateralized schemes include (formerly) Basis and NuBits, which follow the quantity theory of money, algorithmically minting and burning tokens in order to maintain a peg.¹⁰⁸ At the time of this writing no uncollateralized algorithmic project had created a provable stable mechanism for its tokens.

103. Jack Mathis, *Gemini's New USD Cryptocurrency Stablecoin: A Whitepaper Deep Dive*, CCN.COM NEWS (Dec. 9, 2018), <https://www.ccn.com/gemini-new-usd-cryptocurrency-stablecoin-a-whitepaper-deep-dive> [<https://perma.cc/48NK-7UDS>]; see also Jeff Kauflin et al., *The Most Innovative Fintech Companies in 2019*, FORBES.COM (Feb. 4, 2019, 10:00 AM), <https://www.forbes.com/fintech/2019/#4da63f0f2b4c> [<https://perma.cc/Y4F7-24KH>].

104. *Tether(USDT) Vs TrueUSD(TUSD): Which Stablecoin is Better?*, COINTOPPER (Sept. 5, 2018), <https://cointopper.com/guides/tetherusdt-vs-trueusdtusd-which-stablecoin-is-better> [<https://perma.cc/2WDC-U28D>]; see also Bloomberg, *Love Crypto but Not Its Volatility? Meet Stablecoins*, FORTUNE.COM (Jan. 30, 2019), <http://fortune.com/2019/01/30/stablecoins-bitcoin-cryptocurrency/> [<https://perma.cc/3BK3-HW3S>]; P.H. Madore, *Exclusive: TrueUSD Partners with Nexo to Provide Holders with Instant Loans on Cryptocurrency*, CCN.COM (Dec. 19, 2019), <https://www.ccn.com/exclusive-trueusd-partners-with-nexo-to-provide-holders-with-instant-loans-on-cryptocurrency> [<https://perma.cc/RKJ9-TDFA>].

105. *Stablecoin Guide: Why are Stablecoins so Important to Crypto Markets?*, CRYPTOGLOBE (Oct. 11, 2018), <https://www.cryptoglobe.com/latest/2018/10/stablecoin-guide-why-are-stablecoins-so-important-to-crypto-markets/> [<https://perma.cc/5RV6-62WF>].

106. Nathaniel Popper & Mike Isaac, *Here Comes a Facebook Coin*, N.Y. TIMES, Feb. 28, 2019, at B1; see also Linas Kmieliauskas, *Facebook is Already Pitching its Stablecoin to Exchanges – Report*, CRYPTONEWS (Mar. 01, 2019), <https://cryptonews.com/news/facebook-is-already-pitching-its-stablecoin-to-exchanges-rep-3453.htm> [<https://perma.cc/7YFD-5H7J>].

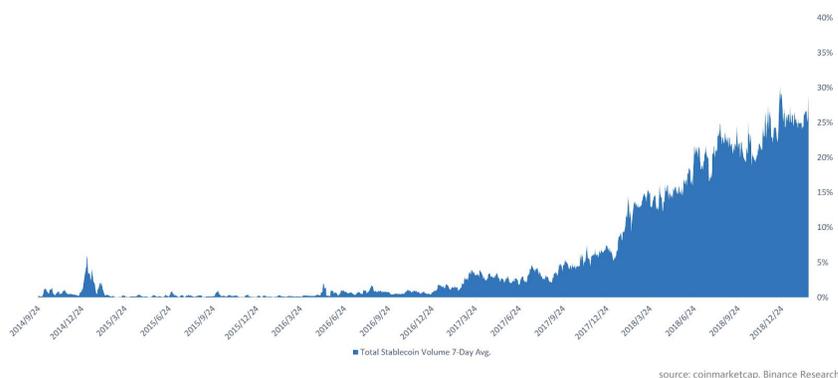
107. Nikhilesh De, *Tether to Launch New Version of USDT Stablecoin on Tron Blockchain*, COINDESK (Mar. 4, 2019, 12:01 PM), <https://www.coindesk.com/tether-to-launch-new-version-of-usdt-stablecoin-on-tron-blockchain> [<https://perma.cc/XET2-PWGH>]; see also Carlo C., *Tether Brings Benefits of P2P Transactions to Fiat Currency Transfers*, COINTELEGRAPH (Nov. 22, 2014), <https://cointelegraph.com/news/tether-brings-benefits-of-p2p-transactions-to-fiat-currency-transfers> [<https://perma.cc/EWD8-KTAK>].

108. Nader Al-Naji, Josh Chen & Lawrence Diao, *Basis: A Price-Stable Cryptocurrency with an Algorithmic Central Bank*, BASIS 9-10 (June 20, 2017), https://www.basis.io/basis_whitepaper_en.pdf [<https://perma.cc/N6T2-CTK9>]; Jordan Lee, *Nu*, NUBITS.COM (Sept. 23, 2014), <https://nubits.com/NuWhitepaper.pdf> [<https://perma.cc/5Y5C-VCZG>].

A. Growth

The growth of stable cryptocurrencies can largely be traced back to attempts to combine the utility and benefits of cryptocurrencies and blockchain technology with remedies for the existing fluctuation and volatility in the cryptocurrency markets.¹⁰⁹ The growth data suggests that demand for products that help manage the volatility inherent in other crypto-assets is likely to continue to increase.¹¹⁰

Ever-increasing Volume: Contribution of Stablecoin Volume to Total Industry Volume



B. Cost Reduction

The total cost of creating and maintaining cryptocurrencies is a fraction of the cost associated with printing and maintaining bank notes.¹¹¹ First and foremost, all cost associated with printing and transporting paper notes¹¹² becomes obsolete with the use of cryptocurrencies. The cost associated with

109. BINANCE ACADEMY, *supra* note 2

110. *Can JPM Coin Disrupt the Existing Stablecoin Market?*, BINANCE RESEARCH 4, (Mar. 1, 2019), <https://info.binance.com/en/research/marketresearch/img/BinanceResearch-JPMCoin.pdf> [<https://perma.cc/LH8B-PXDV>].

111. *See supra* note 27 and accompanying text.

112. *See supra* notes 24-27 and accompanying text.

fiat bank note counterfeit response¹¹³ is also unnecessary for cryptocurrencies because the technology makes counterfeit attacks nearly impossible. Moreover, all fees associated with money transmission services, such as ATM fees and other intermediary fees¹¹⁴ associated with fiat bank notes are reduced.

Cost reductions associated with stable cryptocurrencies can be quite substantial in the banking, money transfer, underwriting, trading, and investment management contexts. Given the enhanced transparency and auditability of transactions on the blockchain, transactions between institutional banking clients can be executed without the need for trust stemming from a pre-existing relationship. According to some estimates, significant cost savings are possible in the context of reporting, know-your-customer and client onboarding, business operations, and overall compliance cost.¹¹⁵

Stable cryptocurrencies can help lower the cost of trading in the cryptocurrency market. The existing cryptocurrency market forces the investing public to convert from diverse cryptocurrencies traded in different jurisdictions into other cryptocurrencies in a diverse jurisdiction or on diverse exchanges that may actually trade a currency pair that is needed by the given investor in a given case. Consumers pay a price every time they convert in and out of a currency. The use of stable cryptocurrencies, if traded in pairs, with another currency, with the cryptocurrency in question, allows investors to remove several levels of conversion fees and removes the risk of depreciation of the bridge currency—the currency temporarily used for an investment for purposes of conversion—during the trades.

113. See *supra* notes 28-44 and accompanying text.

114. See *infra* note 123.

115. *Banking on Blockchain*, ACCENTURE, https://www.accenture.com/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Consulting/Accenture-Banking-on-Blockchain.pdf#zoom=50 [https://perma.cc/YP9P-V6QF]. Finance-reporting costs could be lowered by seventy percent as a result of optimized data quality, transparency, and internal processes enabled by a shared and verified database: the blockchain. Supporting functions of centralized operations (e.g., KYC, client-onboarding) could bring fifty percent savings by establishing more efficient processes for managing digital identities and by “mutualizing” or sharing client data on a blockchain across multiple financial institutions. Business operations expenses from, for instance, middle office, clearing, and settlement activities could be lowered by up to fifty percent by reducing or eliminating the need for third-party reconciliation, confirmation, and validation of trades. Compliance costs could be reduced by thirty to fifty percent, owing to higher transparency and easiness to audit financial transactions. *Id.*

The perverse cost and fee structure in the existing cryptocurrency market and stable cryptocurrencies' ability to overcome those downsides can best be illustrated with a representative hypothetical. Imagine a cryptocurrency project that claims to be the Amazon of the crypto world, offering the public the ability to buy tangible goods in exchange for cryptocurrencies. In order to buy or sell its tokens, investors are forced to open an account on the Indodax trades the tokens in pairs against ETH or BTC, among other currencies. If an investor wishes to sell her entire holdings of the tokens, Indodax only allows withdrawals of one BTC every twenty-four hours from its exchange.¹¹⁶ The investor now sells the tokens for BTC (representing the first conversion and associated fee required), then transfers the BTC to their BTC wallet with, for example, Coinbase (requiring a second conversion and fee), and lastly sells the BTC via Coinbase for conversion into U.S. dollars (requiring yet another conversion and fee). Had the investor used a well-established stable cryptocurrency that is traded on an exchange with deep liquidity in pairs with the token, the investor would have avoided two of the three conversion fees. In addition, the investor is no longer subject to the downward risk of BTC itself after conversion.

The true power of a well-established stable cryptocurrency can best unfold in combination with an evolving universal exchange that provides deep liquidity. Cost savings enabled by stable cryptocurrencies that remove the need for conversions can only truly be facilitated by a deeply liquid market facilitated by a universal exchange, which bridges the traditional assets and crypto assets for all investors. The national Swiss exchange,¹¹⁷ as well as several private projects,¹¹⁸ are working on exchange projects that attempt to accomplish this universality. In the above hypothetical, not only would the need to move assets from one illiquid exchange to another (with the associated fees) be obviated, but market participants could also simply park their assets by converting into a well-established stable

116. *What is the Minimum and Maximum Amount of Bitcoin That I Can Withdraw in a Day?*, INDODOX.COM, https://help.indodax.com/id_ID/berapa-jumlah-minimal-dan-maksimal-bitcoin-yang-dapat-saya-tarik-dalam-sehari/ [<https://perma.cc/Q9X5-V5EX>] (last visited July 2, 2019) (translated via Google Translate).

117. Jimmy Aki, *Switzerland's National Exchange is Listing an XRP Investment Product*, CCN.COM, (Mar. 3, 2019), <https://www.ccn.com/switzerland-national-exchange-xrp-etp> [<https://perma.cc/BQ2D-PDUX>].

118. See SHINGO LAVINE, *DEMOCRATIZING CRYPTOCURRENCY* (2d ed. 2017), https://www.ethos.io/Ethos_Whitepaper.pdf [<https://perma.cc/5GHH-KAWB>].

cryptocurrency.¹¹⁹ This would create more certainty and trust in the market which, in turn, would increase market liquidity. In essence, the combination of a well-established stable cryptocurrency with a universal exchange creates a positive feedback loop. The exchange liquidity is enhanced by the stable cryptocurrency and the stability and adoption of the stable cryptocurrency is enhanced through the exchange.

C. Equity

Using cash in an economy has a disproportionate impact on the poor and unbanked.¹²⁰ In the United States, the Federal Deposit Insurance Corporation estimates that 6.5% of U.S. households are unbanked and 18.7% of U.S. households are underbanked.¹²¹ These estimates are even higher in the developing world.¹²² Using cash for consumption imposes a regressive tax—with the highest impact on the unbanked. Fees associated with gaining access to cash are around four times higher than fees associated with using bank accounts for transactions.¹²³ These effects on the poor get exacerbated in economies that are mostly cash-based. Whereas in the United States only about one third of all transactions in the economy are conducted using cash payments, in countries like India, Mexico, and Egypt, nearly every transaction is conducted in cash.¹²⁴

Stable cryptocurrencies can help support equality. The disproportionate effects of cash economies on the poor and the unbanked can be remedied with stable cryptocurrencies. Access to cryptocurrency transactions is

119. In essence, a well-established stable cryptocurrency may serve the same function as bitcoin in crypto-assets and the U.S. dollar in traditional assets with the additional benefit of avoiding exchange rate risk exposure. *Id.*

120. Rogoff, *supra* note 52, at 48.

121. 2017 FDIC National Survey of Unbanked and Underbanked Households, FEDERAL DEPOSIT INSURANCE CORPORATION (2018), <https://www.fdic.gov/householdsurvey/> [<https://perma.cc/G8BU-FSSK>].

122. Compare the United States with Mexico, Egypt and India. See Chakravorti, *supra* note 18.

123. Examples of fees associated with cash transactions are ATM fees, payday lending, cashing check fees, buy-here-pay-here auto loans, among others. “The unbanked have a five times higher risk of paying cash access fees on payroll and EBT cards. Poorer consumers have to spend far more time getting cash. On average, Americans spend twenty-eight minutes a month travelling to get cash, but that time isn’t evenly distributed. People who don’t use a bank spend about five minutes longer getting to the place where they can get cash, and unemployed people spent nearly nine minutes more.” *Id.*

124. *Id.*

possible without a banking relationship. With equality of payment system access, the poor and unbanked would no longer be disadvantaged through the use of cash.¹²⁵

Reliance on cash in developing economies results in lost tax revenues for the government because of the associated underreporting of earnings and transactions. With fully traceable cryptocurrencies that are fully transparent, those tax revenues will not get lost.¹²⁶

D. Counteracting Corruption

The use of cryptocurrencies in commerce decreases the likelihood of corruption in its many forms such as governmental, economic, and corporate. The aforementioned negative economic effects of corruption¹²⁷ that often are associated with the lack of traceability of bank notes can largely be eradicated with the use of cryptocurrencies. Corruption in the economies of many countries largely maintains the status quo, undermines economic growth,¹²⁸ and makes participation of the entire population of a given country in its gross domestic product and value-chain appreciation less likely.

125. It is of course debatable if this gain for the poor and unbanked that is associated with equal payment system access is offset by the inability to evade taxes that comes with the enhanced accountability of cryptocurrencies. This problem represents a “cash paradox: while cash may be considered the poor man’s best friend, it also places a disproportionate burden on the poor.” *Id.*

126. The tensions and tradeoffs between transparency opportunities and privacy concerns in cryptocurrencies has been recognized in the literature. *See, e.g.*, Susan Athey, Christian Catalini & Catherine Tucker, *The Digital Privacy Paradox: Small Money, Small Costs, Small Talk* (Stanford University Graduate School of Business, Working Paper, No 17-032, 2017), <https://siepr.stanford.edu/sites/default/files/publications/17-032.pdf> [<https://perma.cc/Z3XX-8Y5S>]; Bech & Garratt, *supra* note 74, at 65.

Privacy and freedom from government interference are sometimes presented as two of the big advantages of a cryptocurrency. However, privacy is a feature that government or central bank-sponsored cryptocurrency may foster less than transparency. It will be left to the designers of such cryptocurrencies to determine which parts of the currency will follow transparency metrics and which need to discount transparency to protect privacy. Making those determinations necessitates decentralized governance mechanisms. *See* CRAIG CALCATERRA, ON-CHAIN GOVERNANCE OF DECENTRALIZED AUTONOMOUS ORGANIZATIONS: BLOCKCHAIN ORGANIZATION USING SEMADA, (May 2018), <https://ssrn.com/abstract=3188374> [<https://perma.cc/H732-68RG>]. Ultimately, market acceptance of government sponsored stable cryptocurrencies will determine the most efficient tradeoffs between accountability and privacy.

127. *See supra* notes 36-44 and accompanying text.

128. *See supra* notes 36-44 and accompanying text.

The transparency and traceability of public blockchain transactions in business and commerce counteract corruption. Using public blockchains in commerce makes each and every transaction publicly visible and traceable for consumers and the government alike. The transparency and traceability make it significantly more difficult for corrupt public officials to siphon off value by accepting bribes, thereby increasing the overall cost of doing business in such countries.¹²⁹

E. Transforming the Cryptocurrency Market Structure

The market structure for cryptocurrencies is subject to multiple convolutions and inefficiencies that undermine mass adoption. The market structure of cryptocurrencies from their inception to 2019 is comparable to mandating customers who wish to purchase groceries to purchase a different currency for each store they visit and for each product chosen.

The market for cryptocurrencies is very volatile and illiquid and lacks the investing infrastructure that is needed. It is very difficult for investors to borrow cryptocurrencies in the market. Leverage in the cryptocurrency market exacerbates the liquidity and volatility problems. Moreover, leverage may particularly benefit speculators at the expense of the overall trading public. Such speculators driving up the prices can deepen the liquidity problem. This exacerbates the problem of illiquidity as borrowed money is driving the price. Options on cryptocurrencies add another layer of cost and also exacerbate the illiquidity problem.

Speculators know better than investors what generates supply and demand in cryptocurrency markets. The very high illiquidity of the cryptocurrency market in combination with the herd mentality of crypto-investors benefits speculators because it allows scarcity to appear out of nowhere including for investors who are about to make an investment decision.

Stable cryptocurrencies help transform the cryptocurrency market structure. Stable cryptocurrencies are a necessary first step to address the shortcomings of the existing market structure for cryptocurrencies. Stable cryptocurrencies create a cash equivalent for the cryptocurrency market. As

129. See *supra* notes 36-44 and accompanying text.

such, they function as a proxy for conversion to fiat currencies or as a cash component of investment portfolios.

Stable cryptocurrencies have knock-on effects on consumer confidence. Stable cryptocurrencies transform the cryptocurrency market by experimenting with stability designs. The experimentation and its effect on consumer and market confidence may follow similar patterns as emerging market currencies. Emerging market currencies were initially pegged to the U.S. dollar, and policy makers would allow them to free float in the market to evaluate the stability of the currency.¹³⁰ If and when the currency moved outside of a predetermined price stability range (or band), the currency would be repegged against the dollar until more confidence in the market enabled price stability.¹³¹

F. Fighting Inflation

Stable cryptocurrencies' ability to address inflation is evolving. Countries with high inflation and year-to-date currency devaluation,¹³² have started to evaluate cryptocurrency alternatives to offset some of the effects of currency devaluation in their economies.¹³³ Most early cryptocurrency attempts in 2015 to 2018 used designs that relied on limiting supply of tokens, like capping and hardcoding the total number of tokens available in a given ecosystem, as policy tools to fight inflation.¹³⁴ Since 2017, a slowly increasing number of token designs is entering the market with designs that allow the minting of additional tokens.

Several factors help explain the emergence of minting token designs. In fact, fixing token supply removes the core policy tool—minting of additional tokens to increase supply—intended to address overvaluation, speculation, market frenzy and irrational exuberance.

130. Shaghil Ahmed, Brahim Coulibaly & Andrei Zlate, *International Financial Spillovers to Emerging Market Economies: How Important are Economic Fundamentals?*, 76 J. INT'L MONEY AND FIN. 133, 140 (2017).

131. *Id.*

132. See, for example, Venezuela (2018: -99%), Argentina (2018: -51.85%), Turkey (2018: -35%), and Brazil (2018: -20.6%). See *supra* notes 8-11 and accompanying text.

133. *Id.*

134. Wulf Kaal, *Crypto Economics—The Top 100 Token Models Compared*, BANKING & FIN. SER. POL. REP. (2018) at 22, <https://ssrn.com/abstract=3249860> [<https://perma.cc/9PYE-JJP6>].

G. Price Stability

The economics literature has examined central banks' ability to maintain currency price stability over the long and short term.¹³⁵ The majority of economic authors emphasize the core role central banking plays in the betterment of society,¹³⁶ A large part of the literature discusses the limitation of central bank-controlled monetary policy.¹³⁷ The core critique of central banks' monetary policy revolves around the elusive goal of currency stability under the control of central banks.¹³⁸ Central banks are constantly

135. F.A. HAYEK, DENATIONALISATION OF MONEY: THE ARGUMENT REFINED 20 (3d ed. 1990); See also DON PATINKIN, MONEY, INTEREST, AND PRICES (2d. ed. Harper & Row 1965). *Contra* Milton Friedman, *The Role of Monetary Policy*, 58 AM. ECON. REV. 1, 2 (1968). "If liquidity preference is absolute or nearly so-as Keynes believed likely in times of heavy unemployment-interest rates cannot be lowered by monetary measures. If investment and consumption are little affected by interest rates-as Hansen and many of Keynes' other American disciples came to believe-lower interest rates, even if they could be achieved, would do little good. Monetary policy is twice damned. The contraction, set in train, on this view, by a collapse of investment or by a shortage of investment opportunities or by stubborn thriftiness, could not, it was argued, have been stopped by monetary measures. But there was available an alternative-fiscal policy. Government spending could make up for insufficient private investment. Tax reductions could undermine stubborn thriftiness. The wide acceptance of these views in the economics profession meant that for some two decades monetary policy was believed by all but a few reactionary souls to have been rendered obsolete by new economic knowledge. Money did not matter. Its only role was the minor one of keeping interest rates low, in order to hold down interest payments in the government budget, contribute to the "euthanasia of the rentier," and maybe, stimulate investment a bit to assist government spending in maintaining a high level of aggregate demand." *Id.* See also JOHN STUART MILL, PRINCIPLES OF POLITICAL ECONOMY (1929). "There cannot be intrinsically a more insignificant thing, in the economy of society, than money; except in the character of a contrivance for sparing time and labour. It is a machine for doing quickly and commodiously, what would be done, though less quickly and commodiously, without it: and like many other kinds of machinery, it only exerts a distinct and independent influence of its own when it gets out of order." *Id.* at 296.

136. JOHN M KEYNES, A TREATISE ON MONEY (1930). The economic turmoil of the 1930s shifted attention away from problems of monetary neutrality and lead to a focus on monetary policy for short-term economic stimulus. *Id.* See also JOHN M KEYNES, THE GENERAL THEORY OF EMPLOYMENT, INTEREST, AND MONEY. (1936); JAN TINBERGEN, BUSINESS CYCLES IN THE UNITED STATES OF AMERICA (1939).

137. Friedman, *supra* note 135, at 11. "The link between the policy actions of the monetary authority and the price level, while unquestionably present, is more indirect than the link between the policy actions of the authority and any of the several monetary totals. Moreover, monetary action takes a longer time to affect the price level than to affect the monetary totals and both the time lag and the magnitude of effect vary with circumstances. As a result, we cannot predict at all accurately just what effect a particular monetary action will have on the price level and, equally important, just when it will have that effect. Attempting to control directly the price level is therefore likely to make monetary policy itself a source of economic disturbance because of false stops and starts." *Id.* at 15.

138. Robert Skidelsky, *Why Reinvent the Monetary Wheel*, PROJECT SYNDICATE (May 23, 2018),

being lobbied to increase or decrease money supply away from equilibrium.¹³⁹ Moreover, even without lobbying, central banks are subject to information asymmetries that do not allow them to determine the optimal amount of supply at any given point in time.¹⁴⁰

Stable cryptocurrencies are not subject to those limitations to the same degree. By making rationales and outcomes hardcoded as part of their policies stable cryptocurrencies limit the amount of lobbying that can affect policy decisions. Cryptocurrencies enable optimized balancing of the transparency factors associated with monetary policy. Because of this transparency and associated predictability, market participants can anticipate policy making and adjust behavior accordingly. In fact, such anticipatory policy reactions could, over time, make actual policy-making the exception rather than the rule.

The protocols underlying stable cryptocurrencies enable unprecedented tools for monetary policy-making.¹⁴¹ No stable cryptocurrency can

<https://www.project-syndicate.org/commentary/cryptocurrencies-false-promise-by-robert-skidelsky-2018-05?barrier=accesspaylog> [<https://perma.cc/3PJG-L2SJ>]; Richard M. Ebeling, *The Myth that Central Banks Assure Economic Stability*, FOUND. FOR ECON. EDUC. (June 8, 2018), <https://fee.org/articles/the-myth-that-central-banks-assure-economic-stability/> [<https://perma.cc/ZR7G-MC28>]; Hayek, *supra* note 135, at 91; Friedman, *supra* note 135. “I have selected two limitations of monetary policy to discuss: (1) It cannot peg interest rates for more than very limited periods; (2) It cannot peg the rate of unemployment for more than very limited periods. [Yet,] The first and most important lesson that history teaches about what monetary policy can do-and it is a lesson of the most profound importance is that monetary policy can prevent money itself from being a major source of economic disturbance A second thing monetary policy can do is provide a stable background for the economy-keep the machine well oiled.” *Id.* at 5-13.

139. Kevin Dowd, *Against Helicopter Money*, CATO INST. (Winter 2018), <https://www.cato.org/cato-journal/winter-2018/against-helicopter-money> [<https://perma.cc/6BSW-CFSN>].

140. John J. Merrick, Jr. & Anthony Saunders, *Bank Regulation and Monetary Policy*, 17 J. MONEY, CREDIT AND BANKING 691, 706 (1985). The lack of transparency in centralized monetary policy making for fiat currencies also serves legitimate policy interests. For example, a healthy level of market speculation over and examination of interest rate decisions by Federal Reserve Banks can help make markets more efficient and stable. Richard Dennis & John C. Williams, *Monetary Policy, Transparency, and Credibility: Conference Summary*, FED. RESERVE BANK OF S.F. (2007), <https://www.frbsf.org/economic-research/publications/economic-letter/2007/may/monetary-policy-transparency-credibility-conference-summary/> [<https://perma.cc/ZL9D-3GXL>].

141. For instance, in the central banking comparison, if a central bank were to issue its own cryptocurrency it could help the central bank solve the zero lower bound problem. *See generally* Michael Bordo & Andrew Levin, *Central Bank Digital Currency and the Future of Monetary Policy*, VOXEU.ORG (Sept. 23, 2017), <https://voxeu.org/article/benefits-central-bank-digital-currency> [<https://perma.cc/M5D9-VC7N>].

hardcode all required policies and policy-making actions with full transparency, as future policy cannot be fully anticipated before the needs occur. However, in addition to hardcoded and fully transparent policy guidelines, monetary policy for cryptocurrencies can be supported by protocols enabling decentralized autonomous organizations (DAOs).¹⁴²

The transparency afforded by cryptocurrencies may, over time, enable feedback effects between decentralized and centralized policy making. As stable cryptocurrencies evolve, it is conceivable that policy makers in centralized institutions will consider trends and announcements of cryptocurrencies for their own policy-making.¹⁴³ Such feedback effects enable dynamic regulatory structures¹⁴⁴ that help facilitate innovation,¹⁴⁵ market efficiency, and capital allocation.

Several countervailing arguments reduce the long-term impact of stable cryptocurrencies' policy-making. Stable cryptocurrencies are not subject to the same real-world complexities and political positioning as central banks. This allows them to experiment with monetary policy tools on an unprecedented scale. If and when real-world market factors pertain to such stable cryptocurrencies, such experimentation is limited.

142. DAOs do not suffer from comparable democratic legitimacy concerns as centralized policy making is equally dominated by unelected officials. Yet, a core argument against DAO monetary policy making is associated with the lack of expertise and perverse incentives of DAO members. In many existing DAOs, such governance and incentive design concerns are not fully addressed. Other authors have already provided a governance and incentive optimization framework for DAOs. Craig Calcaterra, *On-Chain Governance of Decentralized Autonomous Organizations: Blockchain Organization Using Semada*, (May 24, 2018), <https://ssrn.com/abstract=3188374> [<https://perma.cc/H732-68RG>].

143. Central banks are already experimenting with cryptocurrencies. Jordan Daniell, *Central Banks On Cryptocurrency*, ETHNEWS (Oct. 8, 2017), <https://www.ethnews.com/central-banks-on-cryptocurrency> [<https://perma.cc/YE74-5V2V>]; see also *supra* notes 83-86 and accompanying text.

144. Wulf A. Kaal, *Dynamic Regulation of the Financial Services Industry*, 48 WAKE FOREST L. REV. 791, 791–828 (2013); Wulf A. Kaal, *Evolution of Law: Dynamic Regulation in a New Institutional Economics Framework* (University of St. Thomas – Minnesota School of Law, Legal Studies Research Paper No. 13-17) (forthcoming 2013), <https://www.ssrn.com/abstract=2267560> [<https://perma.cc/FUN9-QZ2P>].

145. Wulf A. Kaal & Erik P.M. Vermeulen, *How to Regulate Disruptive Innovation- From Facts to Data*, 57 JURIMETRICS J. L., SCI. & TECH. 169 (2017).

H. Interoperability

The existing market structure for cryptocurrencies is dominated by project competition, data silos, and a significant lack of technological interoperability.

The lack of interoperability is a very serious threat to the survival to cryptocurrency projects. As the so-called “crypto winter” of 2018 and 2019 has demonstrated, the thousands of projects that dominated the market in 2017 and 2018 often competed and the lack of serious attempts at interoperability of projects undermined their survival.¹⁴⁶ While some commendable projects hope to address the lack of interoperability in the industry,¹⁴⁷ the progress on interoperability is still insufficient.

Stable cryptocurrencies provide a common denominator that can increase interoperability. Consumers expect one currency they can trust and use for many purposes. Consumers do not care how interaction with other technologies and disparate blockchains is facilitated.

I. Enabling Global Decentralized Commerce

Several factors limit the evolution of a distributed app economy and decentralized commerce. The low transaction throughputs of public blockchains¹⁴⁸ is a core limitation that holds back more advanced DApps.

146. Paul Wilson, *The Interoperability Problem of Blockchain May Soon Be Over*, GLOBAL COIN REPORT (Apr. 10, 2019), <https://globalcoinreport.com/the-interoperability-problem-of-blockchain-may-soon-be-over/> [<https://perma.cc/P9V6-ZULY>]; Daniel Jeffries, *Surviving Crypto Winter – Part one: Mattereum and the Internet of Agreements*, HACKERNOON (Jan. 1, 2019), <https://hackernoon.com/surviving-crypto-winter-part-one-mattereum-and-the-internet-of-agreements-19c99453060> [<https://perma.cc/3PF7-9X7Q>].

147. See POLKADOT, <https://polkadot.network/> [<https://perma.cc/4RWQ-KDET>]; TEZOS, <https://tezos.com/> [<https://perma.cc/DP3W-KYRL>].

148. One of the leading projects on the transaction throughput front, EOS, was reportedly capable of processing up to 4000 transactions per second in January 2019. *EOS vs Ethereum vs TRON*, DAILYCRYPTOTIMES (Apr. 21, 2019), <https://dailycryptotimes.com/2019/04/eos-vs-ethereum-vs-tron/> [<https://perma.cc/SPS8-KA7L>].

Moreover, without a core use case, other than the storage of value, decentralization technology is less likely to proliferate. Banking and money transmission-related services and triple entry accounting via blockchain technology are natural use cases but they fall short in their application as the universal use cases for public blockchains. It will be very difficult to educate the public sufficiently to seamlessly adopt decentralized protocols into daily life if users have to discern and manage public and private keys to wallets, among other concerns.

The existing limitations for decentralized commerce can be overcome. Emerging technological improvements, such as the evolution of 5G wireless communications technology,¹⁴⁹ enable overall higher levels of applications of big data solutions¹⁵⁰ and higher transaction throughput in decentralized systems. Even without the availability of 5G technology, the rapid advances of AI in combination with big data and machine learning have already affected many of the sectors of the economy.¹⁵¹ The combined effect of AI, big data, sensors, and blockchain technology¹⁵² foreshadows a market expansion for DApps.

The adoption, acceleration, and evolution of decentralized commerce depends, in part, on the functioning and stability of cryptocurrencies. Stable cryptocurrencies that allow for smart contracting can be expected to create widespread usage in cryptoasset trading, payments for products and services in decentralized applications, commerce across industries, and as a treasury currency for decentralized projects. Because of their disciplining and market stability-enhancing effects, stable cryptocurrencies are part of the financial

149. Tadilo Endeshaw Bogale & Long Bao Le, *Massive MIMO and mmWave for 5G Wireless HetNet: Potential Benefits and Challenges*, IEEE VEHICULAR TECH. MAG. (Feb. 1, 2016), <https://ieeexplore.ieee.org/abstract/document/7397887> [<https://perma.cc/WDC7-8T47>].

150. Kristiina Valtanen, Jere Backman, & Seppo Yrjola, *Blockchain-Powered Value Creation in the 5G and Smart Grid Use Cases*, 7 IEEE ACCESS 25690 (Feb. 21, 2019), <https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8648405> [<https://perma.cc/J7VA-VMA3>].

151. ERNST & YOUNG, DIGITAL TRANSFORMATION FOR 2020 AND BEYOND: A GLOBAL TELECOMMUNICATIONS STUDY (2017), [https://www.ey.com/Publication/vwLUAssets/ey-digital-transformation-for-2020-and-beyond/\\$FILE/ey-digital-transformation-for-2020-and-beyond.pdf](https://www.ey.com/Publication/vwLUAssets/ey-digital-transformation-for-2020-and-beyond/$FILE/ey-digital-transformation-for-2020-and-beyond.pdf) [<https://perma.cc/K2E7-YM8N>]. (suggesting that seventy-nine percent of executives in the study claim that technological progress creates an unprecedented paradigm shift). See ERIK BRYNJOLFSSON & ANDREW MCAFEE, THE SECOND MACHINE AGE: WORK, PROGRESS, AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES 205–28 (2014); Townsend, *supra* note 62. See Canton, *supra* note 62; Waral, Rana & Handrahan, *supra* note 62; Merrett, *supra* note 62.

152. See Fenwick & Vermeulen, *supra* note 64.

technology infrastructure that will form the backbone of any emergence of the distributed app economy and decentralized commerce. In turn, decentralized commerce has knock-on effects for the evolution of stable cryptocurrencies.

J. Market Stability

Abundant evidence exists regarding the high volatility of cryptocurrency markets.¹⁵³ Several factors contribute to the existing volatility in cryptocurrency markets.

The use of cryptocurrencies increases the efficiency of capital allocation and overall functioning of markets. Centralized marketplace leaders often act as rent-seeking intermediaries that create numerous inefficiencies in the market, in addition to the aforementioned transaction cost. Cryptocurrencies allow for the partial removal of such intermediation¹⁵⁴ and, thus, can help increase the efficiency of capital allocation and overall functioning of markets.

Existing stable cryptocurrency designs are already creating market stability. The rise of an early stable cryptocurrency design, Tether, in terms of its total market capitalization,¹⁵⁵ its stability around a one-dollar value, and investors' uses of Tether as a temporary safe haven, provide some support for stable cryptocurrencies' ability to create market stability.

As the cryptocurrency market matures, stable cryptocurrencies serve a similar function for cryptocurrency market stability as emerging market currencies did for emerging markets. Unlike emerging market currencies, stable cryptocurrencies may not be subject to the independent currency trilemma of emerging markets, or some derivation thereof for cryptocurrency markets. The currency trilemma of emerging markets postulates tradeoffs between different currency objectives. In essence, the

153. JT Hamrick, et al., *The Economics of Cryptocurrency Pump and Dump Schemes* (December 18, 2019), <https://ssrn.com/abstract=3303365> [<https://perma.cc/9S7U-Q5QJ>].

154. Yet, at the same time, cryptocurrencies and decentralized systems create new intermediators. Christian Cataline & Joshua S. Gans, *Some Simple Economics of the Blockchain*, MIT SLOAN RESEARCH PAPER NO. 5191-16 (Apr. 20, 2017), <https://ssrn.com/abstract=2874598> [<https://perma.cc/Y6TP-78ME>].

155. *Cryptocurrency Market Capitalizations*, COINMARKETCAP (2019), <https://coinmarketcap.com/> [<https://perma.cc/W8VG-A7DW>].

trilemma suggests that no currency can attain all three core objectives: (1) fixed foreign exchange rate, (2) free capital movement (i.e., the absence of capital controls), and (3) an independent monetary policy.¹⁵⁶ The lack of real-world pressures that afflict emerging market currencies may enable stable cryptocurrency projects to experiment with solutions that can help overcome the trilemma. The idea of a fully independent monetary policy in decentralized currencies, especially, may be attainable for stable cryptocurrencies because they can use a combination of hardcoded protocol elements and decentralized autonomous organizations (DAO) as monetary policy making bodies. The prospect of fully decentralized and independent monetary policy for stable cryptocurrencies hinges on DAO governance protocols.¹⁵⁷ Free capital movement is nearly guaranteed because capital controls are nearly impossible to enforce in the case of decentralized

156. Atish R. Ghosh, Jonathan David Ostry & Mahvash Saeed Qureshi, *Exchange Rate Management and Crisis Susceptibility: A Reassessment*, 14 Int'l Monetary Fund Working Papers 238–276 (IMF Working Papers WP/14/11, 2014); Michael Klein & Jay Shambaugh, *Rounding the Corners of the Policy Trilemma: Sources of Monetary Policy Autonomy*, 7 AM. ECON. J.: MACROECONOMICS 33 (2015); Maurice Obstfeld, *Trilemmas and Trade-Offs: Living with Financial Globalisation* (BIS Working Papers No. 480, 2015); Geert Bekaert & Arnaud Mehl, *On the Global Financial Market Integration “Swoosh” and the Trilemma*, 94 J. INT'L MONEY & FIN. 227 (2019); Valentina Bruno & Hyun Song Shin, *Capital Flows and the Risk-Taking Channel of Monetary Policy*, 71 J. MONETARY ECON. 119 (2015); Carlos Caceres, Yan Carriere-Swallow & Bertrand Gruss, *Global Financial Conditions and Monetary Policy Autonomy* (IMF Working Papers WP/16/108, 2016); Maurice Obstfeld, Jonathan Ostry & Mahvash Qureshi, *A Tie That Binds: Revisiting the Trilemma in Emerging Market Economies* (IMF Working Papers WP/17/130, 2017); Jonathan D. Ostry, Atish R. Ghosh, Marcos Chamon & Mahvash S. Qureshi, *Capital Controls: When and Why?*, 59 IMF ECON. REV. 562 (2011); Evgenia Passari & Hélène Rey, *Financial Flows and the International Monetary System*, 125 ECON. J. 675 (2015); Symposium, *Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence*, PROCEEDINGS FED. RESERVE BANK KANSAS CITY (2015); Hélène Rey, *International Channels of Transmission of Monetary Policy and the Mundellian Trilemma*, 64 IMF ECON. REV. 6–35 (2016).

157. DAO governance for monetary policy making depends on a governance design that attains full decentralization and with it full independence. The Semada Research Institute has created an early design that accomplishes those goals. Calcaterra, *supra* at 142; Craig Calcaterra, Wulf A. Kaal, & Vlad Andrei, *Semada Technical Whitepaper - Blockchain Infrastructure for Measuring Domain Specific Reputation in Autonomous Decentralized and Anonymous Systems*, (University of St. Thomas - Minnesota Legal Studies Research Paper No. 18-11, 2018), <https://ssrn.com/abstract=3125822> [<https://perma.cc/F93H-K3HY>]; Craig Calcaterra & Wulf A. Kaal, *Semada's Proof of Stake Protocol* (University of St. Thomas - Minnesota Legal Studies Research Paper No. 18-10, 2018), <https://ssrn.com/abstract=3125827> [<https://perma.cc/F97F-2F4W>].

currencies.¹⁵⁸ Given the ability to use a fully independent monetary policy tool, stable cryptocurrencies' ability to overcome the trilemma may hinge on their ability to create a fixed foreign exchange rate. The example of Tether demonstrates that price stability is attainable despite a lack of independence from the U.S. dollar.

K. Supporting Mass Adoption

The existing cryptocurrency market structure undermines mass adoption of cryptocurrencies. The existing cryptocurrency market structure consists of multiple different and highly volatile tokens for disparate projects and use cases.¹⁵⁹ Moreover, project silos and significant lack of interoperability of cryptocurrencies and associated projects is a very serious threat to the survivability of cryptocurrency projects.¹⁶⁰ The average user is unwilling to identify, research, and purchase a diverse sets of tokens, even if their application and use cases would create value. The existing market structure for cryptocurrencies is simply too cumbersome for the average user.¹⁶¹ Consumers expect one currency they can trust and use for many purposes.

Stable cryptocurrencies facilitate the adoption of cryptocurrencies by the general public and their proliferation. The general public will not use cryptocurrencies if a public perception of risk exists that suggests that consumers' value may halve or double at the time of any given transaction or purchase. The proliferation of stable cryptocurrencies can help correct that consumer perception over time.

Stable cryptocurrencies help adapt the cryptocurrency market structure to support mass adoption of decentralized technology. Consumers' experimentation with and increasing belief in the stability provided by cryptocurrencies can help form the foundation for adoption and evolution of decentralized technologies. Once that foundation is formed—which

158. LAW LIBRARY OF CONGRESS, REGULATION OF CRYPTOCURRENCY AROUND THE WORLD 106-08 (June 2018); Laney Zhang, *Regulation of Cryptocurrency: China*, L. LIBR. CONG., (June 2018), <https://www.loc.gov/law/help/cryptocurrency/china.php> [<https://perma.cc/N3Y8-UZLB>].

159. See, e.g., *supra* notes 77-85.

160. See *supra* Section IV.B.

161. The existing cryptocurrency structure can be compared with requiring consumers to research, understand, and purchase different currencies in centralized systems to make basic economic decisions on consumption. See *supra* Section IV.B.

could take decades, depending on the economy and jurisdiction—consumers will increasingly convert and apply stable cryptocurrencies into other tokens for products and services in the evolving decentralized commerce.

CONCLUSION AND OUTLOOK

As cryptocurrencies evolve, increasing evidence suggests that they can establish and support core functions that are currently sub-optimally provided in the centralized economies of emerging markets. Cryptocurrencies can provide more than just stability for the cryptocurrency market as a safe harbor for investors. It is possible that in certain countries, stable cryptocurrencies can function, as they evolve over time, as a supplement or even replacement for paper fiat currency.

Yet, many open questions need to be answered as the technology and associated stability designs evolve. While a progressively growing body of literature on cryptocurrencies is focused on technical aspects and implementation, some recent studies have approached the subject from a monetary economics perspective. One such noteworthy study is by Fernandez-Villaverde and Sanches¹⁶² who use the celebrated framework of Lagos and Wright¹⁶³ to conduct a theoretical investigation of the issue of price stability in a world of competing private currencies, among other subjects.

Fernandez-Villaverde and Sanches's work¹⁶⁴ provides significant insights that merit further research. They show that profit-maximizing issuers of cryptocurrencies, in order to benefit from seignorage, will in general be motivated to keep increasing the quantity of a cryptocurrency, thereby driving down the value of the currency to zero over time.¹⁶⁵ Even under conditions in which a stable equilibrium is possible, self-fulfilling inflationary expectations cannot be ruled out. The authors argue that even

162. Jesús Fernández-Villaverde & Daniel R. Sanches, *On the Economics of Digital Currencies* (Federal Reserve Bank of Philadelphia Working Paper No. 18-7, 2018), <https://ssrn.com/abstract=3117347> [<https://perma.cc/DZW8-AKE3>].

163. Ricardo Lagos & Randall Wright, *A Unified Framework for Monetary Theory and Policy Analysis*, *J. Pol. Econ.* 463 (2005).

164. Fernández-Villaverde & Sanches, *supra* note 162.

165. *Id.*

in cases such as Bitcoin with a preprogrammed growth rate, the system is unlikely to result in a socially optimal outcome. In their model, private cryptocurrencies are in general socially wasteful, and hinder monetary policy implementation; the government can implement an efficient allocation only by driving out private money from the economy.

Another interesting study of cryptocurrency prices and the impact on monetary policy of competition between a cryptocurrency and fiat money is by Schilling and Uhlig.¹⁶⁶ They consider a setting consisting of a cryptocurrency – which they refer to as “Bitcoin” – and an official currency – which they refer to as the “Dollar.” The main difference between these two varieties of money is that Bitcoin production is decentralized while the supply of Dollars is controlled by a Central Bank with the objective of achieving an inflation target. The analysis reveals that under different conditions, Bitcoin prices may, in expectational terms, increase or decrease or stay the same over time.¹⁶⁷ The study goes on to investigate the interaction between Bitcoin prices and monetary policy. For the purposes of this article, the important result is that it is possible for official money and cryptocurrencies to co-exist in a manner consistent with stability.

In light of the trends examined in this paper, the authors expect a world in which cryptocurrencies and fiat currencies may offer different benefits, complement one another, and provide more functions than just serving as media of exchange. For future research in this evolving field, a particular emphasis should be placed on open questions pertaining to real-world applications and the uses of cryptocurrencies over time.

166. Linda Schilling & Harald Uhlig, *Some Simple Bitcoin Economics* (Becker Friedman Institute for Research in Economics Working Paper No. 2018-21, 2019), <https://ssrn.com/abstract=3155310> [<https://perma.cc/BQ4T-UXY3>].

167. *Id.*

