

DIGITAL PAYMENT VELOCITY OF MONEY RESEARCH: A BIBLIOMETRIC ANALYSIS AND FUTURE RESEARCH

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Abstract

The velocity of money has long occupied a central position in monetary economics because it links money prices output transaction technology and monetary policy transmission. Yet the literature has become increasingly dispersed across classical money demand theory, shadow economy measurement, financial innovation, e-money, cryptocurrencies, central bank digital currencies, and emerging market payment system. This study provides a bibliometric analysis of Scopus indexed research on the velocity of money over the period 2010-2026. Using 139 documents and combining performance analysis with science mapping in VOSviewer, the paper examines publication trends, citation structure, productive countries and institutions, co-authorship patterns, co-citation foundations, author-keywords, co-occurrence and title abstract term co-occurrence. The results show that the field remains relatively specialized, with 139 documents and 873 citations, but has developed around several intersecting streams, monetary theory and money demand, currency demand approaches to shadow an economy, digital payment and financial innovation cryptocurrency and CBDC implications and inflation growth dynamics. The United States is the most visible country in publication output, while the intellectual structure remains anchored in monetarist and money demand traditions. Collaboration networks are fragmented, indicating substantial room for cross country and interdisciplinary work. The thematic maps suggest that next research frontier lies in connecting money velocity with digital payment infrastructure, transaction cost, financial inclusion, monetary stability and the changing structure of the financial industry. The study contributes a systematic knowledge map and a future research agenda for scholars and policymakers working at the intersection of monetary economics and digital finance.

Keywords: Velocity Of Money Money Demand, Financial Innovation, Digital Payment, Monetary Policy, Bibliometric Analysis

INTRODUCTION

The velocity of money is one of the oldest and most persistent concepts in monetary economics. In the classical equation of exchange, $MV = PY$, velocity indicates how often a unit of money is used to finance nominal transaction during a given period (Fisher, 1911). In a contemporary statistical formulation, the Federal Reserve Bank of St Louis (2025) defines velocity as “the frequency at which one unit of currency is used to purchase domestically produce goods and services within a given time period”. Although the equation appears simple, the behavior of velocity is analytically complex because it depends not only on the quantity of money and nominal output but also on payment habits, financial innovation, institution trusts, money demand, interest rates, uncertainty, and the organization of the financial system (Friedman, 1956; Goldfeld & Sichel, 1990).

The relevance of money velocity has changed substantially over time. In traditional monetary theory, velocity was often treated as relatively stable or predictable, allowing money aggregates to serve as informative indicators for inflation and nominal spending (Fisher, 1911; Friedman, 1956). Keynesian and post Keynesian perspective, however, emphasized liquidity preference, uncertainty and demand for money as factors that could make velocity unstable (Keynes, 1936). More recent debates have pushed the concept further. The expansion of mobile money, e-money, QR based payment, cryptocurrencies and central bank digital currency (CBDC) projects has changed the costs and speed of transaction (Mbiti & Weil, 2013; Narayan et al., 2019; Wronka, 2023). These developments raise a key question: does digital merely change the form of money, or does it also alter the relationship between money, output, inflation and monetary-policy transmission?

Despite its theoretical importance the velocity of money literature is not as consolidated as adjacent literatures on inflation, money demand, digital finance or monetary policy. Research is spread across several domains. Some studies examine determinants of income velocity and the stability of money demand (Goldfeld & Sichel, 1990; (Sharma & Syarifuddin, 2019). Other used currency demand approaches to estimate underground or underrecorded economic activity (Ardizzi et al., 2014; Dell'Anno & Halicioglu, 2010). A newer stream investigates how financial innovation, digital payments, cryptocurrency and CBDC's may reshape velocity and monetary stability (Mbiti & Weil, 2013; Narayan et al., 2019; Wronka, 2023). This dispersion creates a knowledge mapping problem, without a systematic overview, it is difficult to identify the dominant intellectual foundations, the most influential works, the main thematic clusters, and the underdeveloped research opportunities. Bibliometric analysis is appropriate for this purpose because it allows a structured, transparent, and quantitative mapping of scientific production and intellectual structure. Since Pritchard (1969) introduced bibliometric as the statistical analysis of written communication, the approach has developed into a widely used method for performance analysis and science mapping (Zupic & Cater, 2015; Donthu et al., 2021). Instead of relying only on narrative selection, bibliometric techniques combine publication counts, citation indicators, co-citation network, co-authorship patterns, and keyword co-occurrence maps to identify how a research field develops (Small, 1973; van Eck & Waltman, 2010). For a topic such as velocity of money, this approach is particularly useful because the field intersects macroeconomics, monetary theory, financial innovation, payment systems and digital finance.

This paper aims to answer four research questions. First, how has Scopus-indexed research on the velocity of money evolved during 2010-2026? Second, which countries, institutions, sources, and documents are most visible in the field? Third, what intellectual foundations and collaboration structures shape velocity-of-money research? Fourth, what emerging themes and research gaps can inform a future agenda, particularly in relation to digital payment systems and monetary stability?

The contribution of this paper is threefold. First, it consolidates a scattered literature by mapping publication performance and scientific networks in line with established bibliometric-review practice (Donthu et al., 2021; Zupic & Cater, 2015). Second, it identifies the conceptual transition from classical money-demand and quantity-theory foundations toward digital finance, financial innovation, and CBDC-related concerns (Fisher, 1911; Friedman, 1956; (Wronka, 2023). Third, it proposes a future research agenda that connects velocity with transaction costs, payment-system infrastructure, financial inclusion, shadow economy, and monetary-policy design in both advanced and emerging economies (Ardizzi et al., 2014; Mbiti & Weil, 2013; Sharma & Syarifuddin, 2019).

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

2.1 Conceptual foundations of the velocity of money

The velocity of money is commonly derived from the equation of exchange, $MV = PY$, where M is the money stock, V is velocity, P is the price level, and Y is real output (Fisher, 1911). In this framework, velocity represents the ratio of nominal output to the money stock; operationally, FRED also describes money velocity as nominal GDP divided by a money aggregate such as $M1$ or $M2$ (Federal Reserve Bank of St. Louis, 2025). When nominal output grows faster than money velocity rises when money grows faster than output, velocity falls. The simplicity of this identity makes it useful, but it also creates a risk of overinterpretation. Velocity is not an independent mechanical constant it is behavioral and institutional outcome. Fisher's classical formulation placed velocity at a center of the quantity theory of money (Fisher, 1911). Friedman (1956) later restated the quantity theory as a theory of money demand rather than a mechanical theory of prices highlighting the role of stable money demand behavior in monetarist analysis. Keynes (1936) offered a different emphasis by focusing on liquidity preference and the motives for holding money, including transaction, precautionary, and speculative motives. This theoretical tension explains why the behavior velocity remains important if money demand is stable velocity may be predictable if financial conditions expectations or payment technology shifts hello city may become unstable modern money demand research treats velocity as a function of income opportunity cost inflation expectations financial innovation and institutional factors (Goldfeld & Sichel, 1990; (Benk et al., 2010). In this view, a decline in transaction costs can either increase the speed of circulation or reduce the need to hold transaction balances, depending on how household and firms' respond (Mbiti & Weil, 2013; Nampewo & Opolot, 2016). The same digital payment technology may increase transaction frequency, reduce cash balances, and modify the relationship between money aggregates and inflation. Therefore, the study of velocity must be linked not only to monetary aggregates, but also to the architecture of the payment system.

2.2 Financial innovation, digital money and monetary transmissions

Financial innovation has become a major source of renewed interest in money velocity. Studies of mobile money and e-money show that digital payment instruments can change cash management, transaction costs, and demand for liquid balances (Mbiti & Weil, 2013; Nampewo & Opolot, 2016). Analysis of M-Pesa users, for example explicitly link e-money to velocity and case management behavior. Evidence from Uganda by (Nampewo & Opolot, 2016) similarly connects financial innovation with the stability of money velocity. Indonesia-focused studies by (Hermawan et al., 2024; Narayan et al., 2019; Sharma & Syarifuddin, 2019) demonstrate that emerging-market monetary system provide important empirical settings because payment digitalization, inflation dynamics, and exchange rate behavior interact in ways that may not be captured by older monetary models.

The cryptocurrency and CBDC literature extend this debate. Bitcoin related research asked whether privately issued digital assets influence inflations, exchange rates or velocity velocity (Bouoiyour et al., 2015; Narayan et al., 2019). CBDC studies as whether a new central bank liability could affect bank deposits, payment system efficiency, and monetary policy pass-through (Wronka, 2023)(Wronka, 2023). These developments do not make the classical concept of velocity obsolete, instead they make the empirical measurement and theoretical interpretation of velocity more demanding. A useful way to frame the current literature is that velocity sits at the intersection of three mechanisms (1) the transaction cos mechanism, where payment technology changes the cost of exchange; (2) the portofolio-allocation mechanism, where household and firms choose among cash, deposits, e-moneym crypto-assets,a d other liquid assets; and (3) the monetary-transmission mechanism, where changes in money demand and payment behavior affect inflation, output, and policy pass-through (Friedman, 1956; Goldfeld & Sichel, 1990; Mbiti & Weil, 2013; Wronka, 2023). This framing helps explain why velocity has reappeared in debates on digital money and monetary stability.

2.3 Bibliometric analysis as a review method

Bibliometric analysis applies quantitative technique to scientific publication to evaluate research performance and map knowledge structures. Pritchard (1969) introduced the term bibliometrics to describe the application of mathematical and statistical methods to books and other media communication. Later, co-citation analysis becomes a central method for detecting intellectual relationship among documents and authors (Small, 1973). Contemporary bibliometric reviews commonly combined performance indicators with science mapping to reveal influential works, research communities, and thematic evolution (Zupic & Cater, 2015; Donthu et al., 2021). For this study, bibliometric analysis is not treated as a substitute for economic theory. Rather, it is used as a structured tool for identifying how the velocity of money literature has evolved, which works are most influential, and where conceptual gaps remain. This position follows Donthu et al. (2021), who emphasize that bibliometric analysis is most useful when descriptive mapping is interpreted through a clear theoretical lens. The visualization component is supported by VOSviewer, a tool designed to construct and display bibliometric networks such as co-authorship, co-citation, and keyword co-occurrence maps (van Eck & Waltman, 2010).

RESEARCH METHODS

3.1 Research design

This study uses a bibliometric review design. The unit of analysis is the Scopus-indexed document related to velocity of money. The bibliometric approach follows established guidance for performance analysis and science mapping (Zupic & Cater, 2015; Donthu et al., 2021). The analysis combined descriptive statistic with network visualization, consistent with the use of bibliometric tools to identify scientific structure, collaboration patterns, and conceptual clusters (Aria & Cuccurullo, 2017; Moral-Munoz et al., 2020). The review is designed to be transparent and reproducible. The search and filtering process was implemented at the database search stage, so the bibliographic file use for analysis contained the final records. This explains why post-hoc record removal is reported as zero. Although this study is bibliometric rather than a full systematic review, transparent reporting of identification and inclusion steps follow our logic of PRISMA-style evidence mapping (Page et al., 2021).

3.2 Data source and search strategy

The data set was obtained from Scopus and covered publication from 2010 to 2026. Because the data set includes 2026 records, the 2026 publication and citation figures should be interpreted as partial-year evidence. The search was constructed around the core concept of money velocity, including terms such as velocity of money, money velocity and income velocity of money. This operationalization is consistent with the conceptual definition of velocity as a turnover of money relative to nominal economic activity (Federal Reserve Bank of St. Louis, 2025; Fisher, 1911). The final bibliographic file contained multiple document and source types, including articles, book chapters, reviews, conference papers, books and conference reviews. Therefore, the study retained the full Scopus-index bibliometric corpus of 139 records to capture the breadth of the field. This inclusive approach is suitable for science mapping because citation, co-authorship and keyword structures can be shaped by both theoretical and applied contribution across several publication formats.

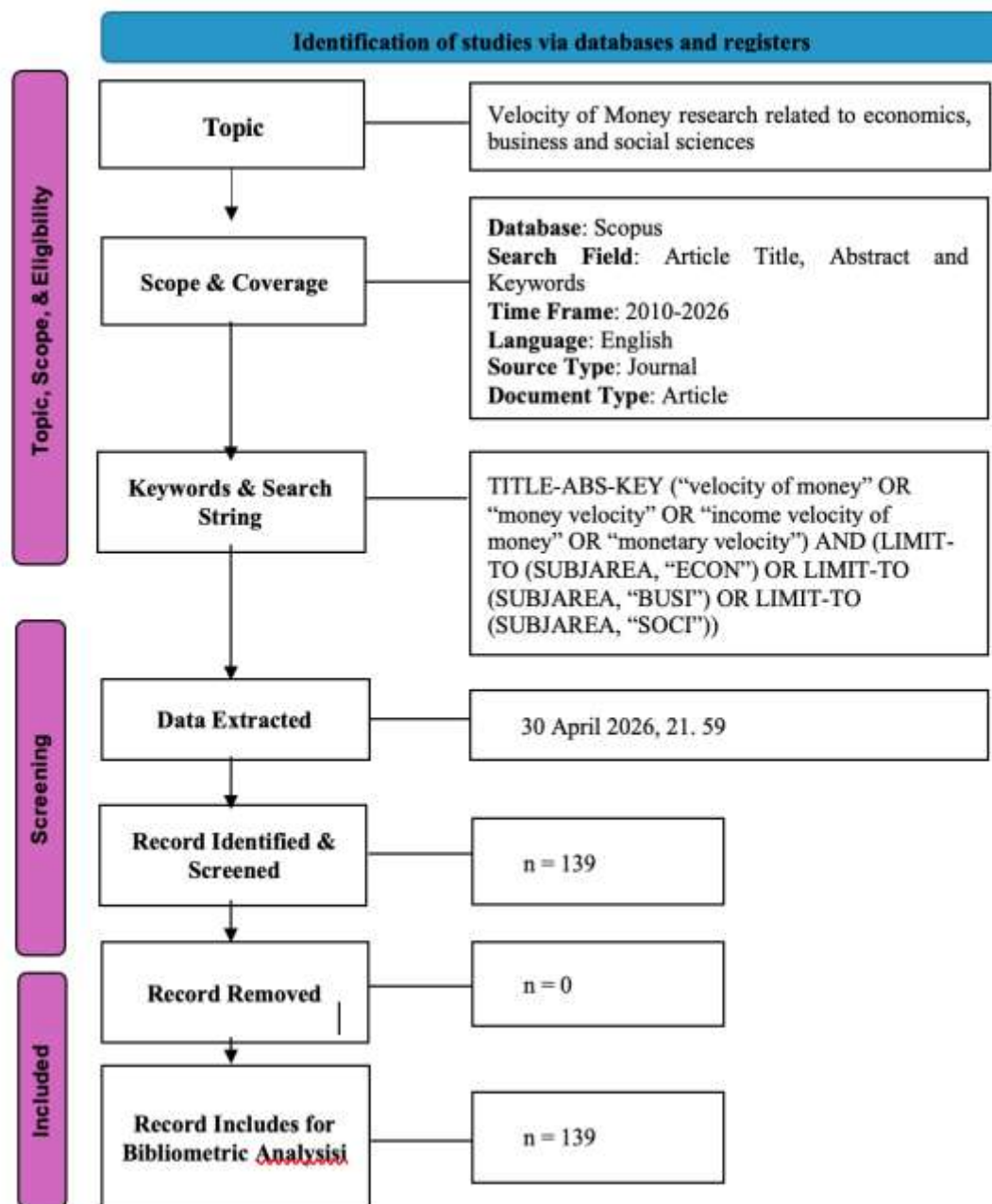


Figure 1. Flow of document identification and inclusion

Note: the record removal value is zero because topic year database and subject area filters were implemented before the bibliometric file was exported

3.3 Bibliometric indicators and network thresholds

The analysis used to complementary techniques. First performance analysis summarized document type, source type, language metadata, annual publication trend, citation counts, productive countries, institution, sources, and authors. Second science may be examined relationship among documents, countries, authors cite authors, and keywords. This combination follows common bibliometric practice, where performance analysis identifies the veasible actors and outputs, while science mapping reveals intellectual and social structure (Zupic & Cater, 2015; Donthu et al., 2021) Network visualization was conducted in VOSviewers. The threshold were selected to balance inclusiveness and interpretability. For co-citation by cited authors, the minimum citation threshold was five. For author co-authorship, the

minimum number of documents was one and the minimum number of citations was one. For keyword co-occurrence, the minimum occurrence threshold was one, while title-abstract term mapping used a minimum occurrence threshold of five and selected the 60% most relevant terms. These procedures are consistent with VOSviewer's network-mapping logic, where node size, link strength, and clustering reveal the structure of bibliometric relationships (van Eck & Waltman, 2010).

RESULTS AND DISCUSSION

This study utilized various forms of scholarly metadata, including publication year, author productivity, document type, source title, source category, author keywords, author affiliation, country of publication, and publication language, as the basis for the bibliometric analysis. Furthermore, citation metrics and frequency distributions were calculated to examine the average citation performance of the publications and to support a more meaningful interpretation of the network maps generated using VOSviewer software. The frequency results are presented in both numerical and percentage forms.

4.1 Document Profiles

The dataset consists of 139 Scopus-indexed documents. Articles dominate the corpus, accounting for 116 documents or 83.45% of the dataset. This confirms that the velocity-of-money literature is primarily disseminated through peer-reviewed journal articles, although book chapters, reviews, conference papers, books, and conference reviews also contribute to the field. The presence of non-article formats indicates that the topic crosses empirical, theoretical, and policy-oriented discussions. The source-type data show that journals are the dominant outlet, with 112 records or 80.58% of the dataset. Because the extracted source-type table classified 129 records explicitly, an additional category of other or not specified was added to reconcile the total to 139. Language metadata indicate that English is the main language of publication. Non-English language tags are limited and should be interpreted cautiously because bibliographic databases may assign more than one language tag to a record.

Table 1. Document Type

Document Type	Total Publication	Percentage (N = 139)
Article	116	83%
Book Chapter	11	8%
Review	5	4%
Conference Paper	4	3%
Book	2	1%
Conference Review	1	1%

Source: Scopus.com

Table 2. Source Type

Source Type	Total Publication	Percentage (N = 139)
Journal	112	81%
Book	10	7%
Conference Proceeding	4	3%
Book series	3	2%

Source: Scopus.com

Table 3. Languages

Language	Total Publication	Percentage (N = 139)
English	134	96%
Czech	3	2%
Spanish	2	1%
Chinese	1	1%
Persian	1	1%

Source: Scopus.com

4.2 Annual publication and citation trends

The annual distribution shows a fluctuating but persistent publication pattern. The highest number of documents appears in 2019, with 14 publications, followed by 2024 with 12 publications and 2013, 2022, and 2023 with 11 publications each. This pattern suggests that velocity-of-money research did not develop as a smooth cumulative field; rather, it was periodically renewed by changes in monetary conditions, payment innovation, and macroeconomic shocks. Citation patterns differ from publication counts. The year 2010 has the highest total citation count with 120 citations, followed by 2020 with 115 citations, 2014 with 105 citations, and 2019 with 99 citations. This indicates that older foundational works and recent high-impact studies both shape the field. The total citation count is 873, with 98 cited papers. The corrected average citation per paper is 6.28, while the average citation per cited paper is 8.91. The dataset has an h-index of 14 and a g-index of 24.

Table 4. Annual Publication and Citation Performance

Year	Documents	%	NCP	TC	C/P	C/CP	h	g
2010	8	6%	7	120	15.00	17.14	4	8
2011	7	5%	6	30	4.29	5.00	4	5
2012	2	1%	2	4	2.00	2.00	2	2
2013	11	8%	11	98	8.91	8.91	4	9
2014	7	5%	7	105	15.00	15.00	5	7
2015	7	5%	5	77	11.00	15.40	3	7
2016	9	6%	4	26	2.89	6.50	3	5
2017	5	4%	4	30	6.00	7.50	3	5
2018	6	4%	5	42	7.00	8.40	4	6
2019	14	10%	9	99	7.07	11.00	5	9
2020	6	4%	5	115	19.17	23.00	4	6
2021	8	6%	7	37	4.63	5.29	4	6
2022	11	8%	7	19	1.73	2.71	3	3
2023	11	8%	8	32	2.91	4.00	4	5
2024	12	9%	8	25	2.08	3.13	3	4
2025	10	7%	3	14	1.40	4.67	2	3
2026	5	4%	0	0	0.00	0.00	0	0
Total	139	100%	98	873	6.53	8.21	14	24

Note. C/P = citations per paper; C/CP = citations per cited paper. Total C/P and C/CP have been recalculated to ensure consistency with the dataset, h=h-index; and g=g-index.

4.3 Countries, institutions, and source outlets

Country productivity is geographically dispersed, but the United States is clearly the most visible country, with 34 documents or 24% of the dataset. China and the United Kingdom follow with 10 documents each, while the Czech Republic contributes 9 documents. Indonesia and India each contribute 7 documents, which is notable because velocity-of-money issues are particularly relevant for emerging economies experiencing rapid payment digitalization and structural change. Institutional productivity is modest and dispersed. Prague University of Economics and Business is the most productive institution with five documents. The City University of New York and Bank Indonesia each contribute three documents. The remaining leading institutions have two documents each. This pattern indicates that no single institution dominates the field; instead, the research agenda is distributed across central banks, universities, and policy-oriented research units.

The source-outlet distribution also confirms dispersion. Computational Economics is the most frequent source with five documents, followed by Banks and Bank Systems and the Journal of Money, Credit and Banking with four documents each. Core monetary economics outlets such as the Journal of Monetary Economics and Macroeconomic Dynamics appear among the visible sources, but the dataset also includes applied economics, banking, international economics, and regional journals. This supports the view that velocity-of-money research is interdisciplinary but not yet organized around a single journal community.

Table 5. Top 20 Countries Contributed To The Publications

Country	Total Publication	Percentage N=139
United States	34	24%
China	10	7%
United Kingdom	10	7%
Czech Republic	9	6%
Indonesia	7	5%
India	7	5%
Germany	6	4%
Portugal	6	4%
Japan	5	4%
Spain	5	4%
Turkey	5	4%
Canada	5	4%
Switzerland	5	4%
Italy	4	3%
France	4	3%
South Korea	3	2%
Romania	3	2%
Colombia	3	2%
Undefined	3	2%
Russian Federation	3	2%
Australia	3	2%

Source: Scopus.com

Table 6. Most Influential Institutions with A Minimum of Two Publications

No.	Institution	Total Publication	Percentage	Country
1	Prague University of Economics and Business	5	3,60%	Czech Republic
2	The City University of New York	3	2,16%	United States
3	Bank Indonesia	3	2,16%	Indonesia
4	University of Calgary	2	1,44%	Canada
5	Universität Rostock	2	1,44%	Germany
6	Università della Svizzera italiana	2	1,44%	Switzerland
7	Universidade do Porto	2	1,44%	Portugal
8	Stanford University	2	1,44%	United States
9	University of International Business and Economics	2	1,44%	China
10	Renmin University of China	2	1,44%	China
11	John Jay College of Criminal Justice	2	1,44%	United States
12	Panjab University	2	1,44%	India
13	Deakin University	2	1,44%	Australia
14	University of Wisconsin-Milwaukee	2	1,44%	United States
15	University of Bern	2	1,44%	Switzerland
16	Allameh Tabataba'i University	2	1,44%	Iran
17	Hoover Institution	2	1,44%	United States
18	Lunds Universitet	2	1,44%	Sweden
19	The University of Chicago	2	1,44%	United States
20	European Central Bank	2	1,44%	Germany / European Union
21	South-West University Neofit Rilski	2	1,44%	Bulgaria
22	Cardiff Business School	2	1,44%	United Kingdom
23	Deakin Business School	2	1,44%	Australia

Source: Scopus.com

Based on institutional affiliation, Prague University of Economics and Business emerged as the most productive institution in publications related to the velocity of money, contributing 5 documents, or 3.60% of the total dataset. It was followed by The City University of New York and Bank Indonesia, each producing 3 documents, equivalent to 2.16%. Meanwhile, several other institutions, including the University of Calgary, Stanford University, Renmin University of China, Deakin University, the University of Chicago, and the European Central Bank, each contributed 2 documents. These findings indicate that research on the velocity of money is internationally distributed and is not dominated solely by universities, but also involves monetary authority institutions, such as Bank Indonesia and the European Central Bank.

Table 7. Most Active Source Title

Source	Documents
Computational Economics	5
Banks and Bank Systems	4
Journal of Money Credit and Banking	4
Journal of Monetary Economics	3
Macroeconomic Dynamics	3
American Economist	2
Applied Economics	2
Applied Economics Letters	2
Empirical Economics	2
Eurasian Economic Review	2
International Economic Journal	2
International Journal of Economics and Financial Issues	2
International Review of Economics and Finance	2
Journal of Central Banking Theory and Practice	2
North American Journal of Economics and Finance	2
Open Economies Review	2
Politicka Ekonomie	2
Romanian Journal of Economic Forecasting	2
Springer Proceedings in Business and Economics	2

Source: scopus.com

Notes: TP=total number of publications; TC=total citations.

4.4 Citation structure and influential documents

Citation analysis identifies the intellectual entry points of the field. The most cited article in the dataset is Ardizzi et al.'s (2014) study on measuring the underground economy using a reinterpretation of the currency demand approach. Dell'Anno and Halicioglu's (2010) ARDL model of recorded and unrecorded economies in Turkey, Mbiti and Weil's (2013) analysis of e-money and cash management among M-Pesa users, Bouoiyour et al.'s (2015) Bitcoin study, and Van's (2020) study of money supply, inflation, and growth are also highly cited. The presence of shadow-economy, e-money, Bitcoin, and monetary-growth studies among the most cited papers indicates that the field is not confined to a narrow money-demand tradition.

The citation map by document shows that influential papers are connected through shared concerns about money demand, transaction behavior, payment innovation, and macroeconomic stability. This pattern is consistent with the theoretical linkage between monetary exchange, money demand, and transaction technology (Fisher, 1911; Friedman, 1956; Mbiti & Weil, 2013). However, the network is not fully integrated. Several clusters remain separated, suggesting that theoretical monetary-economics work, applied shadow-economy studies, and digital-finance studies often speak to adjacent but not fully integrated audiences.

Table 8. Most cited publications in the dataset

Authors	Short title	Year	Citations
Ardizzi, Petraglia, Piacenza, & Turati	Measuring the underground economy with the currency demand approach	2014	61
Dell'Anno & Halicioglu	An ARDL model of unrecorded and recorded economies in Turkey	2010	59
Mbiti & Weil	The home economics of E-Money	2013	59
Bouoiyour, Selmi, & Tiwari	Is Bitcoin business income or speculative foolery?	2015	59
Van	Money supply and inflation impact on economic growth	2020	59
Narayan, Narayan, Rahman, & Setiawan	Bitcoin price growth and Indonesia's monetary system	2019	58
Gil & Iglesias	Endogenous growth and real effects of monetary policy	2020	26
Petersen, Thieben, & Wohlleben	Shadow economy, tax evasion, and transfer fraud	2010	25
Benk, Gillman, & Kejak	A banking explanation of the US velocity of money	2010	20
Rocheteau, Weill, & Wong	A tractable model of monetary exchange with ex post heterogeneity	2018	20

Source: scopus.com & Publish or Perish

Citation Analysis

Table 9. Citations Metrics

Metrics	Data
Papers	139
Citations	873
Years	16
Cites/Year	54.56
Cites/Paper	6.28
Authors/Paper	1.88
h-index	14
g-index	24

Source: scopus.com

Based on the citation analysis of 139 Scopus-indexed documents on the velocity of money published during the 2010–2026 period, a total of 873 citations were identified. Over the 16-year observation period, the average number of citations per year was 54.56, while the average number of citations per document was 6.28. The authors-per-paper value of 1.88 indicates that most publications were written by one to two authors. Furthermore, the h-index value of 14 suggests that 14 articles received at least 14 citations each, whereas the g-index value of 24 indicates the presence of several core articles with relatively strong accumulated citation impact within the velocity of money literature.

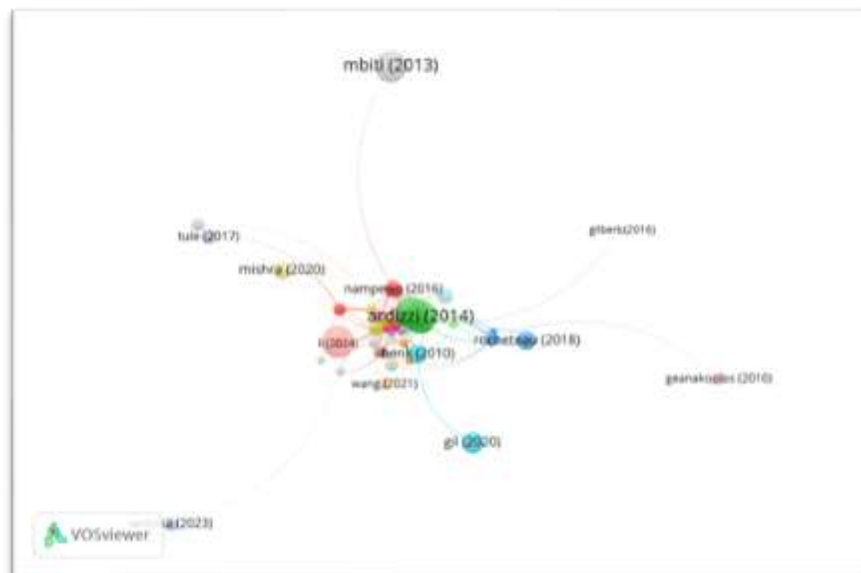


Figure 2. Network Visualisation Map of Citation Based on Document

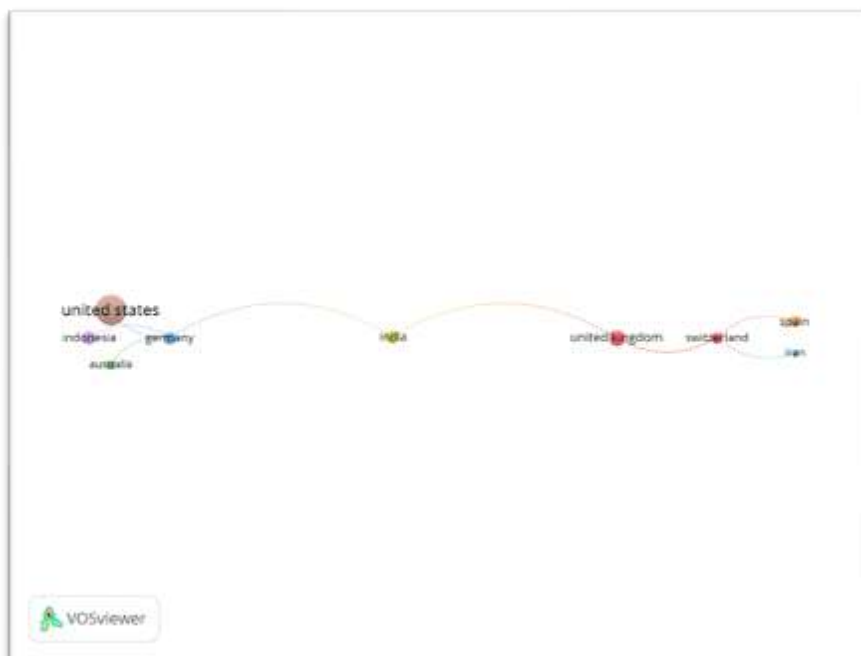


Figure 3. Network Visualisation Map of Citation Based on Countries

Note. Minimum number of documents per country = 2; 27 of 43 countries met the threshold.

Of the 43 identified countries, 27 met the threshold of a minimum number of documents of 2 and were visualized using VOSviewer. The network map shows that the United States is one of the most prominent countries, with connections to several other countries, including Indonesia, Germany, and Australia. India appears to serve as a bridging node between country groups located on the left and right sides of the network, while the United Kingdom, Switzerland, Iran, and Spain form a distinct subgroup. Overall, the country network in the velocity of money literature remains relatively dispersed and not yet highly dense, indicating that international collaboration and connectivity on this topic still have considerable room for further development.

4.5 Co-citation structure and intellectual foundations

The co-citation analysis by cited authors provides a clearer picture of the field's intellectual roots. With a minimum threshold of five citations per cited author, 145 of 3,455 cited authors were included in the VOSviewer map. Friedman appears as the most central cited author, confirming the lasting influence of monetarist theory and the quantity-theory tradition (Friedman, 1956). Other visible names represent money demand, monetary policy, financial innovation, and empirical macroeconomics, reflecting the broader evolution of money-demand research (Goldfeld & Sichel, 1990; Benk et al., 2010). This finding is important because it shows that even when the topic shifts toward digital payments and cryptocurrencies, the field continues to interpret velocity through classical and modern monetary frameworks (Fisher, 1911; Friedman, 1956; Narayan et al., 2019). The challenge for future research is not to abandon these foundations, but to update them with explicit payment-system frictions, digital money balances, heterogeneous agents, and institutional differences across economies (Mbiti & Weil, 2013; Wronka, 2023).

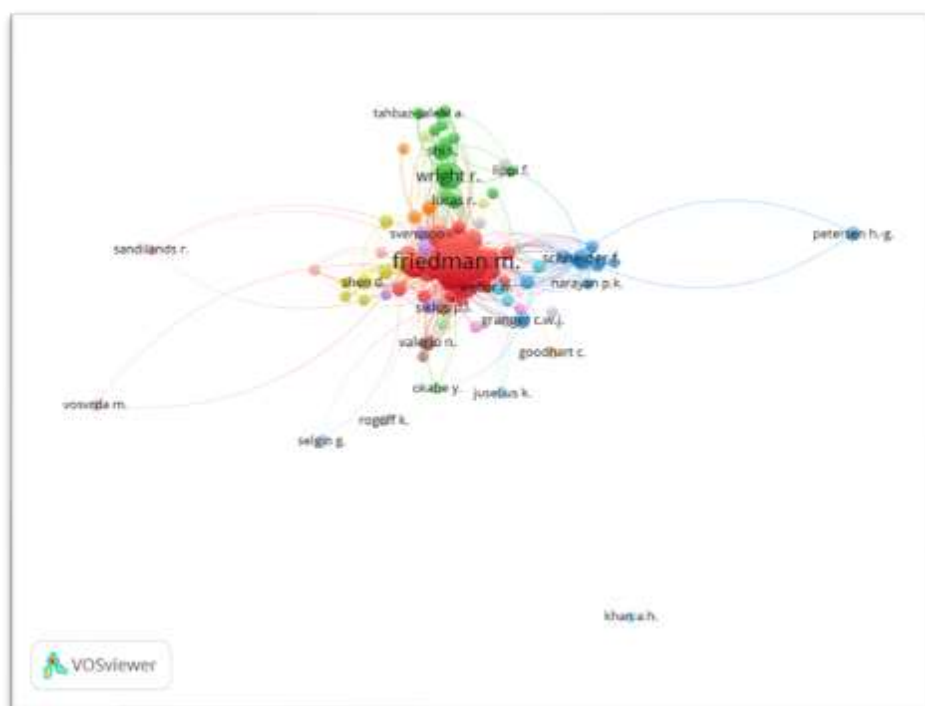


Figure 4. Network Visualisation Map of Co-Citation Based on Cited Authors

Note. Minimum number of citations of a cited author = 5; 145 of 3,455 cited authors met the threshold.

4.6 Authorship and collaboration patterns

Authorship analysis shows that the field is relatively fragmented. Single-authored documents account for 58 records, or 41.73% of the dataset. Two-authored papers account for 47 records, or 33.81%. Papers with three or more authors are less common. This suggests that much velocity-of-money research remains individual or small-team based, unlike large collaborative fields in data science, finance, or health economics. The most productive authors each have only two publications, indicating that there is no dominant author group controlling the research agenda. This fragmentation can be interpreted in two ways. On the positive side, it suggests openness: scholars from many institutions and countries can contribute. On the negative side, it implies that cumulative theory-building may be weak because research communities are not strongly connected. The co-authorship maps support this interpretation:

several small clusters are visible, but a dense global collaboration network has not yet emerged.

Country-level co-authorship also remains limited. The United States is visible as a relatively prominent node, but the overall map shows small collaborative clusters rather than a highly integrated international network. For a topic affected by global payment innovation and cross-border monetary spillovers, this is an important gap. Future work should build cross-country datasets and collaborative projects, especially between advanced economies, emerging markets, and central banks.

Table 10. Number of Author(S) Per Document

Authors Count	Total Publication	Percentage (N=139)
1	58	41.73%
2	47	33.81%
3	21	15.11%
4	9	6.47%
5	2	1.44%
Not Identified	2	1.44%
Total	139	100.00%

Source: scopus.com & Publish or Perish

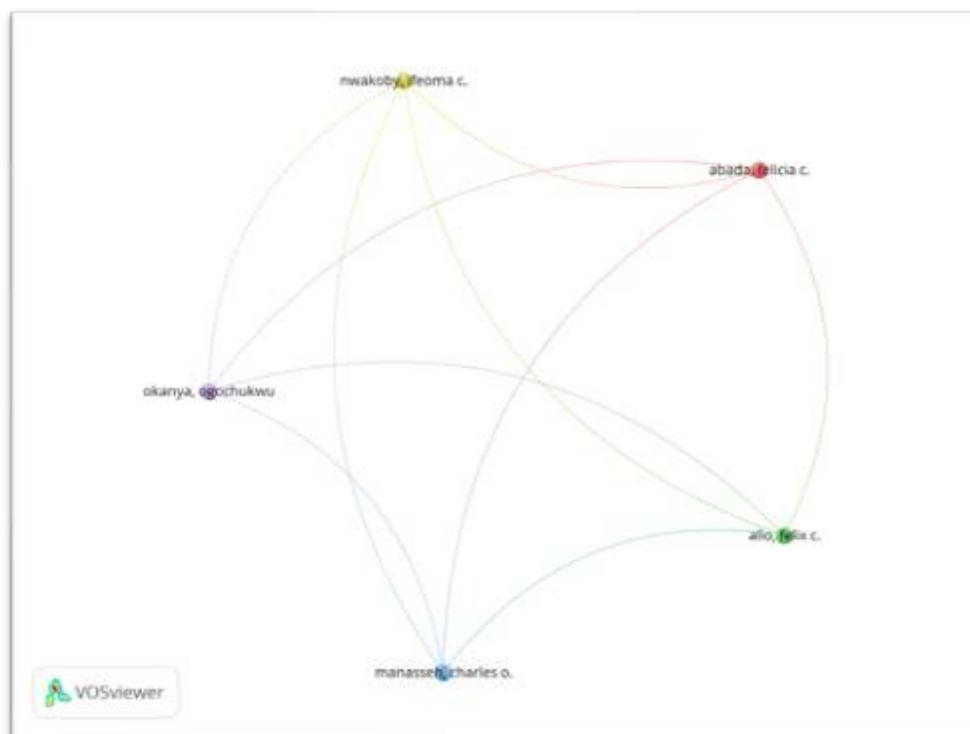


Figure 5. Network Visualisation Map of Co-Authorship by Authors

Note. Minimum number of documents per author = 1; minimum number of citations per author = 1; 191 of 251 authors met the threshold.

Figure 5 illustrates the co-authorship network by authors in velocity of money research. Using thresholds of at least one document and one citation per author, 191 of 251 identified authors met the criteria and were visualized in VOSviewer. The results show that author collaboration remains limited and fragmented, with only small collaborative groups and no dominant large-scale network. This indicates that velocity of money research is still

dispersed among individual authors or small teams, leaving room for broader collaboration, particularly on cashless payment, digital payment, and monetary stability

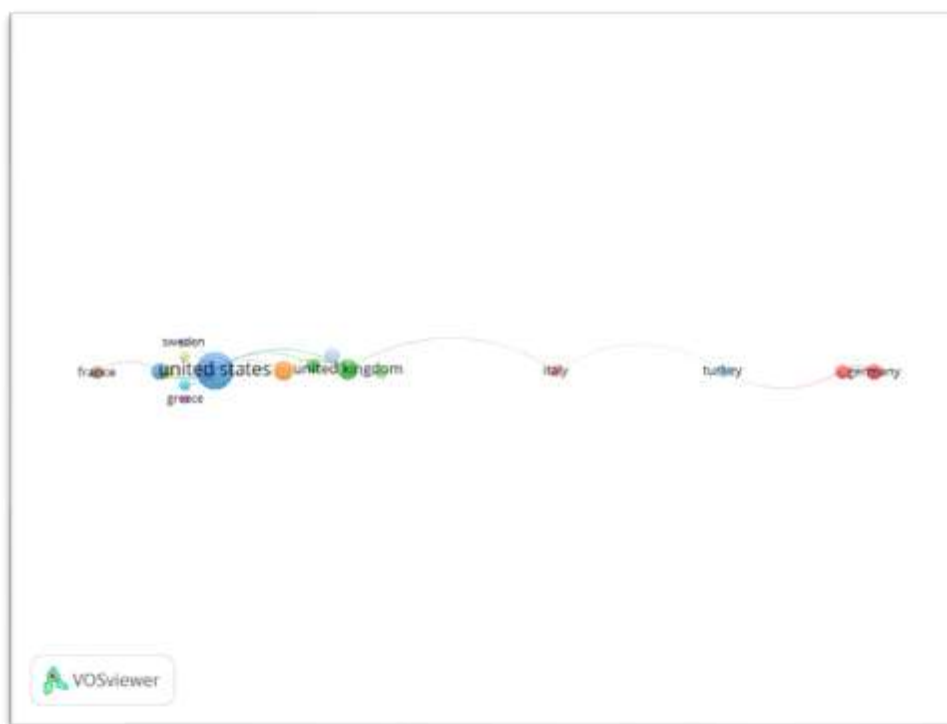
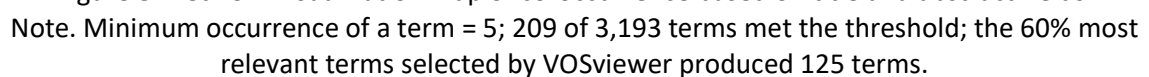
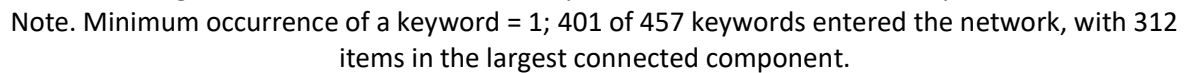


Figure 6. Network visualization map of co-authorship by countries.

Note. Minimum number of documents per country = 2; minimum number of citations = 0; 27 of 43 countries met the threshold.

4.7 Thematic structure: keywords and title abstract

The author-keyword co-occurrence map shows that velocity of money and inflation are the most central terms. They relate to money, central bank, credit growth, shadow economy, digital payment, e-money, Bitcoin, and monetary policy. This pattern indicates that the field is organized around a monetary-policy core rooted in quantity-theory and money-demand traditions but extends toward payment innovation and informal-economy measurement (Fisher, 1911; Goldfeld & Sichel, 1990; Ardizzi et al., 2014; Mbiti & Weil, 2013). The title and abstract term map provide a broader semantic picture. With a minimum occurrence threshold of five, 209 terms met the threshold, and the 125 most relevant terms were visualized. The most visible terms include inflation, velocity, money, growth, monetary policy, uncertainty, transaction, payment, currency, and economy. The map suggests that the literature is moving from a narrow discussion of money aggregates toward a broader framework involving uncertainty, payment systems, digital finance, and macroeconomic transmission (Nampewo & Opolot, 2016; Sharma & Syarifuddin, 2019; Hermawan et al., 2024). The thematic structure can be summarized into five clusters. The first cluster concerns classical monetary theory, money demand, inflation, and growth. The second concerns the shadow economy and currency-demand methods. The third concerns financial innovation, e-money, and payment systems. The fourth concerns cryptocurrencies, Bitcoin, and CBDC. The fifth concerns empirical macroeconomic modeling in emerging economies. These clusters overlap, but the overlap is still incomplete, which explains why a future research agenda is needed.



4.8 Discussion

The bibliometric evidence supports the argument that velocity-of-money research is specialized, fragmented, and increasingly important. It is specialized because the dataset contains only 139 Scopus-indexed documents over a long period. It is fragmented because publications are dispersed across authors, institutions, countries, and journals, with limited large-scale collaboration. It is increasingly important because the thematic structure now connects classical monetary theory with digital payment systems, financial innovation, cryptocurrency, and CBDC debates (Mbiti & Weil, 2013; Narayan et al., 2019; Wronka, 2023). The first major insight is that the field is intellectually old but technologically renewed. The centrality of Friedman and money-demand foundations shows that the conceptual grammar of velocity remains rooted in monetary economics (Friedman, 1956; Goldfeld & Sichel, 1990). However, the presence of e-money, Bitcoin, CBDC, and digital-payment themes shows that the empirical environment has changed (Mbiti & Weil, 2013; Narayan et al., 2019; Wronka, 2023). This creates a theoretical tension. Older models often treat velocity as stable, exogenous, or indirectly captured through money-demand behavior. Digital payment systems require velocity to be modeled as an endogenous outcome of transaction technology, payment-network adoption, and portfolio substitution between cash, deposits, digital balances, and alternative assets.

The second insight is that shadow economy research remains a major bridge between velocity and applied policy analysis. Currency demand methods use cash demand and monetary behaviors to infer unrecorded activity (Dell'Anno & Halicioglu, 2010; Ardizzi et al., 2014). This explains why shadow economy, tax evasion, and cash transaction appear among influential studies. The policy implication is that payment digitalization may have two opposing effects. On the one hand, it can reduce cash-based informality by making transaction more traceable. On the other hand, a new digital channel may create alternative forms of opacity if regulatory capacity and data governance do not keep pace.

The third insight is that emerging economies deserve greater attention. Indonesia, India, Uganda, Turkey, and other emerging markets appear in influential or visible studies because these economies often experience rapid payment innovation while still maintaining significant cash use, informality, and monetary-policy challenges (Dell'Anno & Halicioglu, 2010; Nampewo & Opolot, 2016; Sharma & Syarifuddin, 2019; Hermawan et al., 2024). In such contexts, velocity is not merely an abstract monetary ratio. It relates to financial inclusion, payment-system infrastructure, inflation management, exchange-rate stability, and household liquidity behavior. The fourth insight concerns collaboration. The co-authorship networks are not dense, and most productive authors have only two publications. For a topic that crosses monetary economics, payment systems, finance, and public policy, this is a limitation. Future research would benefit from collaboration among central banks, universities, data scientists, and payment-system operators. Such collaboration is particularly important because high-quality velocity research increasingly requires granular transaction data, institutional knowledge, and econometric sophistication.

The fifth insight is methodological. Many empirical studies of velocity use ARDL, VAR/VECM, structural models, and money-demand equations (Dell'Anno & Halicioglu, 2010; Sharma & Syarifuddin, 2019; Benk et al., 2010). However, the digital era creates new measurement problems. Traditional velocity indicators based on broad money and nominal GDP may not capture high-frequency payment flows, platform-based transactions, or the substitution between bank deposits, e-wallet balances, and crypto-assets. Future studies should therefore combine macro aggregates with payment-system microdata, while remaining careful about privacy, data access, and comparability across countries.

4.9. Future Research Agenda

Based on the bibliometric evidence, the future research agenda should move from a descriptive question, whether velocity rises or falls toward an explanatory question, through what mechanism do payment technologies, financial structure, and policy regimes change the relationship between money, transactions, output and inflation? This agenda is consistent with the shift from classical quantity-theory reasoning toward money demand, payment-innovation and digital payment perspectives (Fisher, 1911; Friedman, 1956; Mbiti & Weil, 2013; Wronka, 2023).

Table 11. Future research agenda for velocity-of-money studies

Theme	Core research question	Potential variables	Suggested methods
Digital payment infrastructure and velocity	How do QR payments, instant payment systems, and e-wallets alter transaction velocity and money demand?	Payment transaction values/volumes, M1/M2, nominal GDP, CPI, interest rate, transaction fees	ARDL, VAR/VECM, local projections, structural break tests
CBDC and monetary transmission	Would retail or wholesale CBDC strengthen or weaken monetary-policy pass-through?	CBDC adoption scenarios, deposits, bank liquidity, payment shares, policy rate, inflation	DSGE/NKPC models, counterfactual simulation, panel experiments
Velocity, inflation, and uncertainty	Does velocity amplify or dampen inflation under macroeconomic uncertainty?	Velocity, inflation expectations, uncertainty indices, exchange rate, output gap	Time-varying parameter VAR, regime-switching models, quantile ARDL
Shadow economy and payment traceability	Does digital payment adoption reduce cash-based informality, or does informality migrate to new channels?	Cash withdrawals, non-cash payments, tax revenue, informal-sector indicators	Currency demand model, ARDL bounds testing, panel data models
Financial inclusion and heterogeneous behavior	How do poor, rural, and informal households respond to digital money in terms of saving and spending velocity?	Account ownership, mobile money, income, consumption, remittances, liquidity balances	Microeconometrics, difference-in-differences, household panel models
Industry structure of finance	Does payment digitalization concentrate market power or broaden access to transaction services?	Payment-provider market shares, banking concentration, fintech adoption, fees	Network analysis, industrial organization models, panel regression

A particularly promising direction is the formulation of a digital-payment trilemma. Researchers can examine whether payment systems can simultaneously maximize transaction speed, preserve monetary stability, and maintain competitive financial-industry structure. The velocity of money can serve as the connecting variable because it links the speed and frequency of transactions with macroeconomic outcomes and the institutional organization of finance (Federal Reserve Bank of St. Louis, 2025; Goldfeld & Sichel, 1990). Another priority is to develop better measurement traditional income velocity is often calculated as nominal GDP divided by a monetary aggregate such as M1 or M2 M2 (Federal Reserve Bank of St. Louis, 2025). This remains useful but digital economies require additional measure such as transaction velocity platform velocity settlement velocity and segmented velocity across cash deposits the wallets and CBDC. Without better measurement empirical conclusion may confuse change in money definition with change in actual transaction behavior. Finally future reseach should distinguish between short-run and long- run effects. Digital payment may

increase short-run transaction frequency while reducing long-run demand for transaction balances (Mbiti & Weil, 2013; Nampewo & Opolot, 2016). CBDC may reduce transaction costs but also alter bank funding and credit creation (Wronka, 2023). Therefore, the sign and magnitude of velocity effects are likely to be conditional on institutional design, adoption rate, financial inclusion, and monetary-policy regime.

CONCLUSION

This study maps the development of copus-indexed velocity of money research from 2019 to 2026 using bibliometric performance analysis and VOSviewer science mapping. The findings show that the literature is relatively small but conceptually important. It is anchored in monetary theory and money-demand foundations (Fisher, 1911; Friedman, 1956; Goldfeld & Sichel, 1990), while increasingly connected to digital payments, financial innovation, cryptocurrency, CBDC, shadow economy, and inflation dynamics (Ardizzi et al., 2014; Mbiti & Weil, 2013; Narayan et al., 2019; Wronka, 2023). The dataset contains 139 documents and 873 citations. Publication activity fluctuates over time, with 2019 showing the highest publication count. The United States is the most visible country, while institutional productivity remains dispersed. Citation analysis highlights influential works on shadow-economy measurement, e-money, Bitcoin, money supply, and monetary-system stability. Co-citation analysis confirms the central role of monetarist and money-demand traditions, while co-authorship analysis reveals limited collaboration and fragmented author networks.

The main conclusion is that the velocity of money remains relevant, but its interpretation must be updated for the digital-finance era. Payment innovation changed transaction costs, cash management, liquidity preference, and monetary transmission. (Mbiti & Weil, 2013; Nampewo & Opolot, 2016; Hermawan et al., 2024). Therefore, future research should integrate monetary theory with payment system data, digital financial inclusion, CBDC design and financial industry structure. For policymakers, the result imply that velocity should not be treated as a passive residual. It is meaningful indicator of how money, technology, and institution interact in a changing monetary system.

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