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ABOUT THE COLLEGE

Hansraj College is one of the largest constituent colleges of the University of Delhi. The college was founded by the D.A.V. College Managing Committee on 26th July, 1948 in the sacred memories of Maharshi Dayanand Saraswati and Mahatma Hansraj who spent their magnificent lives emphasizing the importance of knowledge. It is one of the leading lights in the D.A.V. family of over 700 institutions.

Hansraj College is a premier institution dedicated to teaching and research. It has highly qualified academicians who impart education in Science, Commerce, and Arts at undergraduate and graduate levels to more than 5000 students. The college has consistently demonstrated outstanding performance in academics, sports, and extracurricular activities.

The college has completed 76 years in the realm of imparting higher education. It has made significant and unparalleled contributions in terms of producing scholars, bureaucrats, intellectuals, and sportsperson serving in different domains not only in our own country but even at international levels.

Hansraj College stands at the cusp between the past and the future today. While it retains inspiring facets of its proud history, with an equally sharp gaze it looks ahead, assimilating the exciting world of new knowledge as it unfolds in front of it, holding the promise of an experience seeped with exhilarating learning and holistic growth for all those who enter its portals.

About the Journal

The *HRC Journal of Economics and Finance* is a **double-blind peer-reviewed academic journal** for students, researchers, and faculty to showcase their research pertaining to the discipline of economics and business. It is an international journal. Our mission is to provide a platform through which scholars can publish their scholarly findings to showcase them with the research community at large. We invite research papers and articles on topics related to the field of economics, business and management for its quarterly journal publication.

Message from the Principal

The launch of the *HRC Journal of Economics and Finance* is a milestone that marks our dedication towards providing a platform to young researchers in the field of economics and finance. It is even more fortuitous that the launch has been manifested in the Platinum jubilee year of the college, the Centenary year of the University of Delhi and the 75th year of India's independence.

The New Education Policy, 2020 has launched a paradigm shift that encourages research both at the faculty and student level. Accordingly there is a growing need to provide credible platforms to present research outputs at all levels. This journal fills a significant gap and will contribute to fostering a research ecosystem thereby advancing the objectives of the NEP 2020. This journal will provide an opportunity to students, teachers and scholars, around the world to come together and showcase the links between classroom teaching and their practical training.

I congratulate the authors whose papers/articles have been published in the journal and encourage others to contribute to future issues. Appreciation is due to the Editor In-Chief of this journal, Dr. Apoorva Gupta who has worked tirelessly for the successful launch of this issue of the journal. My best wishes for the success of this venture.

Prof. (Dr.) Rama
Principal
Hansraj College

From the Editor's Desk

Dear Readers,

It is my great pleasure and privilege to present the next issue of the Journal of Hansraj College, the *HRC Journal of Economics and Finance*. The journal provides a platform to young researchers in the field of economics, business, social sciences, finance and management to publish their scholarly articles. Our inclusive nature ensures that we cover the wide range of issues in the field. This issue features a diverse range of articles that provide insightful analyses and innovative perspectives on various contemporary economic topics.

We have received around thirty papers relevant to the field of development economics, political economy, macroeconomic policy, financial markets, international trade, and behavioral economics. All the papers went through three rounds of review process, first by the editors and then by the review board. All the papers have gone through double blind peer review process. The authors were communicated with the revisions. The papers were accepted only after the satisfactory revisions were being made. We strictly follow the research ethics and do not tolerate plagiarism. All the selected papers were tested for plagiarism before publication. We have worked tirelessly to bring out the fourth issue of the journal with high quality research work.

Writing quality research papers takes a lot of time and effort, and the authors must be congratulated for writing their research papers for the journal, which is launched in the Platinum Jubilee year of the college, the Centenary year of the University of Delhi and the 75th year of India's independence. We also take this opportunity to congratulate the review board of this issue for their constant academic support for the timely release of the journal. We also thank the support received from the Principal of the college, Prof. (Dr.) Rama, the Advisory Board and the Editorial Board.

We hope that readers find the articles interesting, informative and engaging, and enjoy reading it. We believe that this effort of ours will stimulate further research and discussion in the field of economics and finance, and encourage readers to write for further issues of the journal. We look forward to receiving your feedback and suggestions for future issues.

Disclaimer: The opinions expressed in this journal belong to the contributors and do not necessarily reflect the viewpoints of the college, the editors, the Advisory Board, the Editorial Board, and the Review Board of the *HRC Journal of Economics and Finance*.

Dr. Apoorva Gupta

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The Political Economy of De-Dollarization: Navigating the Currency Shift under BRICS

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Abstract

The United States' dollar has long maintained a position of primacy within the global financial & monetary system and international trade governance architecture. However, the BRICS (Brazil, Russia, India, China, and South Africa) is actively endeavouring to restructure its reliance on the US dollar in global trade, promoting local currency transactions and developing alternative financial infrastructure to diminish the dollar's hegemonic role. This strategic realignment is driven by a desire for enhanced financial autonomy and reduced vulnerability to external monetary policy decisions. The de-dollarization process has the potential to recalibrate the global economic order, eroding US influence on international trade and finance. This study assesses the BRICS' de-dollarization efforts and their implications for the international trade and global financial architecture. The expansion of BRICS, bolstered by the inclusion of Egypt, Indonesia, Ethiopia, Iran, and the UAE (BRICS+), amplifies the bloc's economic influence and revitalizes its pursuit of a robust alternative to the existing global trade and financial arrangement. The BRICS+ is spearheading a paradigm shift in the global financial landscape, aggressively advocating for alternative currencies, payment systems, and financial institutions that challenge the dollar's dominance. However, this ambitious endeavour has pressing challenges, necessitating deep economic integration, robust financial infrastructure, and coordination among BRICS+ nations. The BRICS' de-

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dollarization initiative has the potential to disrupt the existing financial paradigm, recasting the global economic order and ushering in a new era of multi-polarity that could redefine the global balance of power. This study contributes to the critical discourse on global trade and finance, highlighting the BRICS' efforts to craft a more diverse, inclusive, and sustainable financial system that could reshape the global economic landscape.

Keywords: De-dollarization; Global Financial System; Trade Dynamics; BRICS; Global Economic Order; Multi-polarity

1. Introduction

A currency's global stature is substantially bolstered by its role in international trade, where it functions as a medium of exchange and unit of account, thereby catalyzing demand for its use (Auboin, 2012). Centuries of global economic evolution have crafted a hierarchical arrangement, with certain currencies reigning supreme in international trade owing to their perceived value and trustworthiness, resulting in an uneven landscape where nations rely heavily on these dominant currencies for international transactions. In this connection, United States' (US) dollar has long been dominating the international transactions. The dollar has retained its status as the world's primary reserve currency since World War II, commanding a substantial majority of global foreign exchange reserves at 58%, share in export invoicing at 54% and share in foreign exchange transactions at 88% with the Euro, the next most widely held reserve currency, accounting for a considerably smaller share of 20%, 30% and 31% respectively (Atlantic Council, 2025). The dollar's hegemonic status in international transactions has continued for an extended duration, with the currency playing a critical position in global trade, investment, and reserve requirements. The dollar's stability, liquidity, and widespread acceptability have strengthened its position as the preferred currency for cross-border transactions, trade settlements, and foreign exchange reserve holdings (Bertaut, et al., 2025). Its dominance in global markets has been a longstanding phenomenon, remarkably enduring even as the US economy's share of global output has gradually declined over the past twenty years, highlighting the dollar's persistent and disproportionate influence in

international trade and finance (Arslanalp et al., 2022). However, the changing global financial and monetary landscape re-oriented dependence on US' dollar for international trade and financial transactions. The process of reducing dependence of US dollar in the international transactions is known as de-dollarization.

The declaration by Russia and China, signalling their intention to phase out the US dollar in bilateral transactions represents a notable milestone in the evolving landscape of de-dollarization (Chabarovskaya, 2025). A perfect storm of geo-economics and monetary shifts has converged, precipitating urgent calls for multilateral reform amidst increasingly complex global dynamics. Within this turbulent milieu, China, as the economic linchpin of BRICS, is charting a new course, spearheading groundbreaking initiatives that leverage local currencies in trade and policy, poised to potentially reshape the global economic architecture (Johnston, 2024a). This strategic shift reflects BRICS' commitment to reshaping global economic governance and promoting a more inclusive international financial architecture. The BRICS group is set to transform its financial landscape by starting with bilateral implementations and potentially expanding to broader multilateral use among its members. In this connection, BRICS has challenged the Bretton Woods institutions (the World Bank and the International Monetary Fund (IMF) through its New Development Bank (NDB) and the Contingent Reserve Arrangement (CRA). The BRICS expansion injects fresh momentum into the bloc's quest for a multi-polar world order, leveraging the collective economic prowess of its new member states. With the addition of key nations like Egypt, Ethiopia, Indonesia, Iran, and the UAE, BRICS Plus is poised to redefine global economic dynamics and challenge the status quo. The BRICS monetary agenda is a major drive to restructure the global financial architecture, aligning it with the evolving landscape of international economics and politics, and giving emerging markets a stronger voice in global economic decision-making. Raising status of BRICS' agenda is bringing attention to the flaws of the Bretton Woods institutions, prompting attempts to create alternative institutional arrangements, nevertheless, it appears that these efforts will unlikely yield smooth displacement of the existing system challenging the dollar diplomacy, due to the complexity of the global financial system and geo-politics (Johnston, 2025). In addition, the Society for Worldwide Interbank Financial Telecommunication (SWIFT) framework enables to communicate and transfer funds efficiently and securely globally. Being the central component of the international

financial system, SWIFT allows countries and businesses to conduct trade and financial transactions; however, it has been used as a potent instrument for sanctions (Iran, Russia, and North Korea) to leverage geopolitical dominance dictating the terms of international relations. BRICS thus resorted to endorsing alternative payment systems and strengthening global financial governance through NDB, CRA, and local currency trade to foster economic collaboration and south-south cooperation for a multi-polar world order. These initiatives aim at lessening the vulnerability to external economic pressures, boosting their global influence and bargaining power and fostering sustainable development and economic growth. However, the quest for de-dollarization is a multifaceted and ambitious enterprise that is hampered by significant challenges, including the need for deep economic integration, robust financial infrastructure, and enhanced coordination among BRICS+ nations, which must navigate intricate economic interdependencies, develop new financial frameworks, and harmonize policies to reduce dependence on the US dollar and promote financial stability, thereby necessitating a high degree of cooperation and collective action to overcome the technical, economic, and geopolitical barriers that stand in the way of achieving a more diversified and resilient global financial system. BRICS is dynamically working to reorganize their dependence on the US dollar in global trade by promoting local currency trade and developing alternative financial infrastructure, aiming to decrease global dependence on dollar. This rearrangement is driven by the aspiration for greater financial autonomy and reduced exposure to external monetary policy decisions. Admitting these facts, the major objectives of this study are evaluating BRICS' efforts towards de-dollarization and its implications for international trade and global financial architecture and examining the challenges and complexities associated with the BRICS nations' de-dollarization efforts to successfully navigate this transition.

The rest of the paper is organized as follows: Section 2 covers comprehensive survey of relevant literature. Methodology is discussed in Section 3. Section 4 underlines global monetary and financial landscape. BRICS' de-dollarization trajectory is explained in Section 5, while Section 6 comprises findings and discussion. Finally, Section 7 encloses concluding observations of this study.

2. Literature Review

With a robust economy, stable institutions, and openness to global trade and investment, the US dollar has maintained its position as the world's leading currency for over three-quarters of a century (Eichengreen, 2011). The dollar and euro currently dominate international trade invoicing, but the Chinese RMB is poised to become a major settlement currency in the long term, driven by government policy and market trends. The dollar-euro duopoly remains stable due to network effects and limited international currency options (Auboin, 2012). The US dollar has been the most preferred currency worldwide for foreign exchange reserves. Unless a significant and enduring shock that undermines the US dollar's value and appeal while simultaneously boosting alternatives, the dollar's status as the world's premier international currency will likely persist, providing stability and continuity in global finance for the foreseeable future (Bertaut, et al., 2025).

The BRICS financial schema assumes a critical role within the paradigm of global monetary reform, traversing the evolving dynamics of international geo- economy. This agenda seeks to recalibrate the existing international monetary architecture, endorsing a multi-polar system that mirrors the shifting global economic landscape. The acceptance of local currencies in transactions among BRICS+ nations is expected to diminish transaction costs and mitigate reliance on external currencies, thereby enhancing regional financial autonomy (Johnston, 2024b). The quest to de-dollarize has been gaining momentum worldwide for nearly a decade (Tripathi, 2025). It implies a shift away from the US dollar's dominance in global transactions, reserves, and trade. The imperative to strengthen the global financial framework against vulnerabilities is a pressing concern for upholding global economic order in the long term. The expected decline in trust in the SWIFT arrangement has come to an end, resulting in a potentially everlasting loss of confidence. Moreover, the shift towards de-dollarization is not a unilateral manoeuvre, but rather an endogenous response to discernible patterns, which will likely continue in shaping the global financial landscape. Moreover, the apparent abdication of the US' responsibility in upholding a stable global currency has sparked a search for alternatives. While a gold-backed BRICS currency has not succeeded to gain momentum. Consequently, national currencies are emerging as potential for transactions (Poenisch, 2025). As part of economic cooperation, BRICS+ are looking into ways to boost the use

of their local currencies for trade settlements, thereby minimizing the role of global currencies like the US dollar and Euro. Moreover, SWIFT's role in enforcing economic sanctions has made it a powerful tool for geopolitical leverage. Being cut off from SWIFT can have severe economic consequences, including trade disruptions and isolation from global markets. BRICS countries are fundamentally drafting a new course, seeking alternatives to the existing payment systems and currency frameworks, and diverging from the macroeconomic stability paradigm established by Bretton Woods's arrangement (Johnston, 2025). The BRICS is embracing a paradigm shift, pursuing innovative payment solutions and currency arrangements. The fault lines of geo-economic, technological, and monetary upheaval have converged, igniting a clarion call for multilateral reform. Amidst the turbulence, China, the economic juggernaut at the heart of BRICS, is forging ahead with visionary initiatives that harness the power of local currencies, setting the stage for a seismic shift in the global economic landscape (Johnston, 2024a). Increasing intra-BRICS trade can diminish the dominance of the US dollar in transactions, particularly in the short term, through bilateral agreements, local currency trade, and currency swaps, ultimately fostering long-term trade partnerships and diversified reserve holdings without dollar accumulation (Fliagin & Abdulganiyu, 2025). The New Development Bank (NDB) is a cornerstone of the collaborative efforts under the BRICS in global economic cooperation, pioneering a unique development financing model. Despite the complexities of economic convergence and policy alignment, the bank's initiatives are significant strides toward a more integrated future. The NDB's success is pivotal in shaping the BRICS economies' future and potentially establishing a common currency, marking a new era in global economic cooperation (Nach & Ncwadi, 2024).

Despite the BRICS' vocal advocacy for a multi-polar world, progress towards de-dollarization remains elusive. National interests, trade dependencies, and the looming threat of US sanctions have stifled collective action, revealing disconnect between rhetoric and reality (Toussaint, 2025). US President Donald Trump has warned that the US stipulates unwavering loyalty from the BRICS to either cease efforts to develop alternative currencies challenging the dollar's dominance, or risk facing crippling tariffs and losing access to the huge US market. It's time for BRICS nations to choose or face severe economic consequences, including 100% tariffs and exclusion from the US

market. The era of tolerating dollar-dethroning ambitions is over. Economies that rely heavily on the US dollar or euro for trade invoicing tend to experience greater price volatility in imports due to exchange rate fluctuations, thereby, their trade volumes more significantly impacted by changes in the exchange rates (Boz et al., 2022). This underscores the importance of exchange rate management for countries with significant foreign currency-denominated trade.

The BRICS de-dollarization initiative is a strategic endeavour to challenge the U.S. dollar's dominance in global finance, promoting economic independence and resilience against dollar-driven volatility. By advocating for local currency usage and establishing alternative financial institutions, BRICS seeks to reshape the global economic architecture, fostering a multi-polar financial system that enhances the financial sovereignty of developing nations and promotes a more inclusive and equitable international economic order (Arnold, 2024). In order to thrive in dynamic environment, BRICS Plus and other emerging economies should prioritize reducing dollar dependency, cultivating regional financial resilience, and skilfully managing geopolitical intricacies. A combination of flexibility, cooperation, and forward-thinking risk management will be essential for successfully traversing this complex terrain (Saaida, 2024). The pursuit of de-dollarization, while ambitious, is fraught with significant challenges and complexities. These impediments underline the need for profound economic integration, resilient financial architecture, and enhanced coordination among BRICS+ nations.

3. Methodology

The methodology proposes a robust and comprehensive approach to investigating the complex associations between de-dollarization initiatives and the evolving international economic paradigm, thereby providing a nuanced understanding of the complex dynamics at play. This study adopts a descriptive analytical framework to examine the factors shaping the de-dollarization agenda under the BRICS framework. This framework facilitates a thorough examination of the multifaceted implications of de-dollarization efforts, ultimately yielding a rich and contextualized analysis of the shifting international economic landscape. It embarks on a critical exploration of the evolution of the global

monetary and financial order, tracing the trajectory of the Bretton Woods institutions (the International Monetary Fund and the World Bank) and the SWIFT network, while also delving into the geo-economics of dominant currencies and the supremacy of the US dollar. Further, it meticulously maps the BRICS' concerted efforts towards de-dollarization, offering a nuanced understanding of the shifting paradigms of international trade and transactions, as the global financial landscape undergoes a profound transformation.

4. Global Monetary and Financial Landscape

4.1. The Evolution of IMF

The Bretton Woods conference (the United Nations Monetary and Financial Conference) held in July 1944 brought together 44 nations, shaping a new global financial order. This historic meeting gave origin to the International Monetary Fund (IMF) and the World Bank (WB) Group, establishing a framework for international finance and currency convertibility. The arrangement lasted until the system's collapse in 1971. The breakdown of the fixed exchange rate regime led to the emergence of a floating exchange rate system, which has persisted as the dominant framework for international currency exchange.

The IMF officially began operating in December 1945, after twenty-nine countries ratified its Articles of Agreement, marking its formal establishment. The IMF works to promote global economic stability and cooperation, aiming to achieve sustainable growth and improved living standards for its member countries through policy support and financial guidance that prioritizes economic resilience and job creation (International Monetary Fund, 2025a). The IMF exercises oversight of the global economic system covering global, regional, and country-specific monitoring. By scrutinizing countries' economic and financial policies, it identifies potential vulnerabilities and provides tailored policy recommendations to foster stability, mitigate risks, and sustain economic growth.

In 1969, the IMF introduced the Special Drawing Right (SDR) as an additional reserve asset, at a time when currencies were pegged to gold and the US dollar dominated as a

reserve asset, with the SDR's value initially tied to a specific amount of gold equivalent to one US dollar. Following the collapse of the fixed exchange rate system in 1973, the IMF redefined the SDR as a composite unit of account, pegged to the value of a diversified basket of major world currencies including the US dollar, euro, Chinese renminbi, Japanese yen, and British pound. Notably, the SDR is not a currency in its own rather a unique international reserve asset that can be exchanged for convertible currencies as required. As a unit of account, the SDR plays a crucial role in the financial operations of the IMF and various other international organizations, providing a stable reference point for financial transactions and accounting purposes (International Monetary Fund, 2025b). On August 1, 2022, the IMF has allocated the following weights to the five currencies comprising the SDR valuation basket, reflecting their significance in global trade and finance represented in Table 1.

Table 1: Currency Weights in SDR

Sr. No.	Currency	Weights (2022)	Fixed Number of Currency Units
1	US dollar	43.38	0.57813
2	Euro	29.31	0.37379
3	Chinese Renminbi	12.28	1.0993
4	Japanese Yen	7.59	13.452
5	Pound Sterling	7.44	0.08087

Source: International Monetary Fund (2025b)

The IMF's governance structure diverges from that of the United Nations General Assembly, as voting power and decision-making authority are weighted according to member countries' relative economic standings. Consequently, the IMF strives to adapt its governance framework to reflect the evolving global economic landscape, particularly the growing influence of emerging market and developing economies. The IMF's supreme decision-making body, the Board of Governors, comprises representatives from each member country (one governor and an alternate governor), typically the finance minister or central bank governor. With all IMF powers vested in it, the Board may delegate most authority to the Executive Board, reserving key decisions for it, and convenes annually. The Table 2 outlines the quota and voting shares held by IMF member countries. Total 191 member countries of the IMF have SDRs quota with US

tops the list with a quota of 17.42% and vote share of 16.49%, followed by Japan (6.47% and 6.14%), China (6.40% and 6.08%), Germany (5.59% and 5.31%), France (4.23% and 4.03%) and United Kingdom (UK) (4.23% and 4.03%). Other founding BRICS members' quotas and vote shares range between 2.75% (India) to 0.64% (South Africa) and 2.63% to 0.63% respectively.

Table 2: Voting Powers under the IMF

Sr. No.	Countries	SDR Quota (%)	Votes (%)
1	USA	17.42	16.49
2	Japan	6.47	6.14
3	China	6.4	6.08
4	Germany	5.59	5.31
5	France	4.23	4.03
6	UK	4.23	4.03
7	Brazil	2.32	2.22
8	Russia	2.71	2.59
9	India	2.75	2.63
10	South Africa	0.64	0.63

Source: International Monetary Fund (2025c)

4.2. The Evolution of World Bank

The second institution which was the outcome of the Bretton Woods conference was the International Bank for Reconstruction and Development (The World Bank) aims to rebuilding the countries destroyed by war and fostering the economic development (World Bank, 2025). The International Bank for Reconstruction and Development (IBRD) was originally established to fund Western Europe's post-war reconstruction, but its mandate later broadened to include global development projects, prompting a rebranding as the World Bank (Ursu, 2024). With currently 189 member countries, function as shareholders of the World Bank represented by a Board of Governors, the highest decision-making body, typically comprised of finance or development ministers from each member nation. The Board convenes annually at the joint annual meetings with the IMF, facilitating high-level discussions and strategic decision-making. The Boards of Executive Directors are composed of representatives appointed or elected by the member countries, to which powers are delegated by the Boards of Governors. Pursuant to the

IBRD Articles of Agreement, the five largest shareholders appoint an Executive Director each, while the remaining member countries elect additional representatives, resulting in a current Board composition of 25 Executive Directors. The current voting powers of executive directors of the IBRD are summarized in Table 3. United States with the voting share of 16.22% tops the chart followed by Japan and China with 6.98% and 5.84% share respectively. Within the BRICS grouping, India holds a 3.60% vote share, ranking second only to China.

Table 3: Voting Powers of the IBRD's Executive Directors

Sr. No.	Directors appointed by	Voting Power (%)
1	USA	16.22
2	Japan	6.98
3	China	5.84
4	Germany	4.16
5	France	3.81
6	UK	3.81
7	Brazil	3.46
8	Russia	3.09
9	India	3.6

Source: World Bank (2025)

4.3. Diplomacy of Cross-border Payment Infrastructure

The Society for Worldwide Interbank Financial Telecommunication (SWIFT) serves as a critical digital infrastructure for international finance, providing a secure platform for financial institutions to exchange information and conduct transactions. Since its inception (239 Banks and 15 Countries) in 1973 in Belgium, SWIFT has become an indispensable tool for global trade and transactions (Cipriani et al., 2023). It is a trusted global network that enables seamless and secure financial transactions for individuals and organizations. SWIFT's commitment to resilience, security, and innovation empowers frictionless transactions, robust cyber defences, and interoperability across global financial environment (SWIFT, 2025a). SWIFT enables the global exchange of value without directly transferring funds; instead, its secure messaging system facilitates the exchange of payment instructions between banks and financial institutions which then

execute the actual transactions. Today, SWIFT's huge network spans 11,500 banking and financial institutions across over 200 countries and 40,000+ payment routes, facilitating transactions equivalent to the global GDP every three days (SWIFT, 2025a). With a global footprint spanning 26 offices worldwide, SWIFT is headquartered in Belgium and operates as a central provider of financial messaging services. It is strategically overseen by central banks of the G10 nations, underscoring its critical role in the international financial landscape. More recently, SWIFT has become a potential tool for international diplomacy (Cipriani et al., 2023). In response to international community mandates, European Union (EU) Regulations and Belgian directives, SWIFT has imposed sanctions in the form of disconnecting banks and financial institutions from its network. These sanction's cases are reported in Table 4. Countries like Iran (2012), North Korea (2017), Belarus (2022) and Russia (2022 and 2025) have faced sanctions by SWIFT restricting their access to the global financial network.

Table 4: Global Financial Sanctions through SWIFT

Cases	Year	Sanctions
Case 1	2012	In response to intensified international mandate (the US) against Iran in 2012, the European Union enacted Regulation 267/2012, requiring SWIFT to cease services to sanctioned Iranian banks (including the Central Bank). SWIFT complied with the regulation and disconnected the concerned banks from its network.
Case 2*	2017	Belgium choose not to provide SWIFT network services to specific North Korean banks in 2017 based on the UN sanctions resulting in their removal from the network. Subsequently, SWIFT removed remaining banks from its network.
Case 3	2022	In alignment with international mandate for sanctions against Russia, SWIFT complied with EU regulations (EU Council Regulation (EU) 833/2014) by disconnecting targeted Russian financial institutions and their Russian-based subsidiaries from its network. Moreover, SWIFT also disconnected earmarked Belarusian entities and Belarus-based subsidiaries, adhering to separate EU directives (EU Council Regulation (EU) 765/2006).
Case 4	2025	The EU sanctions against Russia in March and July 2025, with EU Council Regulation (EU) 833/2014 and (EU) 2025/1494 directed SWIFT from servicing designated Russian entities. As a result, SWIFT restricted their access to its network by blocking transactions with them.

Source: SWIFT (2025b) and *Cipriani et al. (2023)

4.4. Understanding the Currencies' Geo-Economics

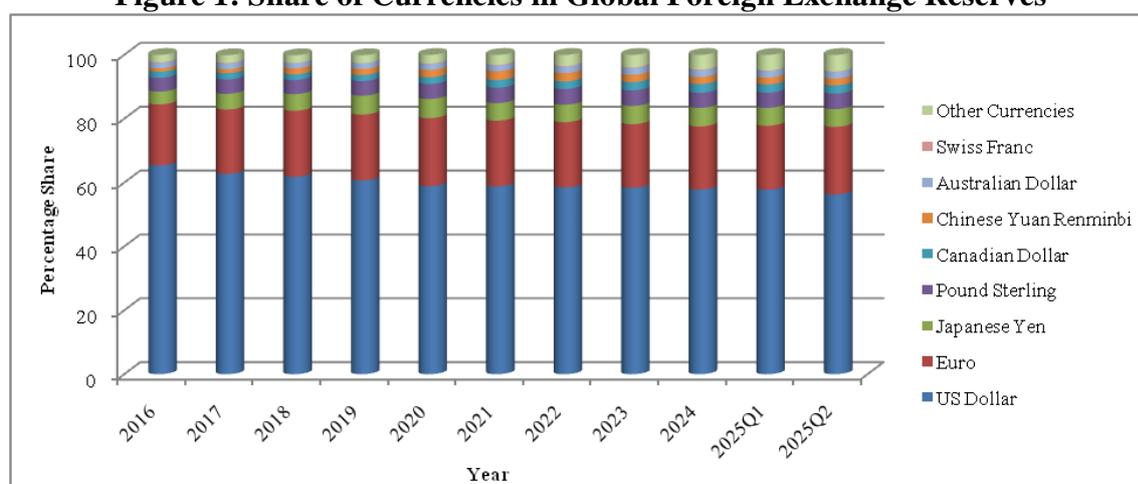
US dollars dominate global transactions including foreign exchange reserves, export invoicing and foreign exchange transactions. The data on global nominal foreign exchange reserves are summarized in Table 5, while a comparative breakdown of their

shares are illustrated in Figure 1. United States' dollar share in global foreign exchange reserves (allocated foreign exchange reserves) stood at USD 6.6 Trillion (USD 6629.98 Billion) in 2024, increased from USD 5.5 Trillion (USD 5501.9 Billion) in 2016; an increase of almost 21%. However, relative share has declined from 65% to 58% during the same period. This phenomenon can be attributed to two primary factors: the appreciation of reserve currencies relative to the US dollar and shifts in countries' reserve portfolio allocations. For instance other currencies (the Euro, Yen, Pound, etc.) have increased in value compared to the US dollar implying that when these currencies are held as reserves, their value increases, underscoring to the overall change. Secondly, economies may be adjusting their reserve holdings, preferring to hold more or less of certain currencies. This rebalancing act can also affect the overall composition and value of their reserves. Other major currencies like Euro, Yen, Pound, Canadian dollars, Yuan, Australian dollar, Swiss Franc's total allocated foreign exchange reserves have also increased. Euro is the second most preferred currency for official reserves holdings globally accounting for around 20% share, followed by Yen (5.8%), Pound (4.7%) and Canadian dollar (2.8%) during 2024. However, the most significant change has been seen for Chinese Yuan Renminbi, with an increase of 2.75 times in nominal terms and almost doubled in relative share during 2016-2024. Share of other currencies increased to roughly 5% in 2024-25 from below 3% till 2020 (2.3% in 2016, and 2.7% in 2020). The unallocated foreign exchange reserves for all currencies declined sharply to around 7% in 2024 from more than 21% in 2016. Moreover, China's Renminbi accounts for global foreign exchange reserves at 2%, share in export invoicing at 4% and share in foreign exchange transactions at 7% (Atlantic Council, 2025). The US dollar remains a dominant global vehicle currency for trade invoicing, whereas the euro's usage is more regionally concentrated (Brüggen et al., 2025).

Table 5: Global Nominal Foreign Exchange Reserves (Billion USD)

Indicator	Currency (Claims in)	2016	2020	2024	2025Q1	2025Q2
Allocated Foreign Exchange Reserves	US Dollar	5501.93	6990.85	6629.98	6725.2	6773.34
Allocated Foreign Exchange Reserves	Euro	1611.03	2526.41	2275.62	2327.97	2540.43
Allocated Foreign Exchange Reserves	Japanese Yen	332.76	715.35	667.01	651.25	670.07
Allocated Foreign Exchange Reserves	Pound Sterling	365.86	561.39	542.75	551.23	580.23
Allocated Foreign Exchange Reserves	Canadian Dollar	163.14	246.57	318.07	306.16	313.83
Allocated Foreign Exchange Reserves	Chinese Yuan Renminbi	90.78	271.6	249.89	247.21	255.37
Allocated Foreign Exchange Reserves	Australian Dollar	142.3	216.87	235.46	235.06	250.94
Allocated Foreign Exchange Reserves	Swiss Franc	13.69	20.74	20.48	21.2	19.54
Allocated Foreign Exchange Reserves	Other Currencies	196.35	314.63	532.89	572.42	621.71
Allocated Foreign Exchange Reserves	All Currencies	8417.85	11864.4	11472.2	11637.7	12025.5
Unallocated Foreign Exchange Reserves	All Currencies	2302.79	837.89	892.46	902.23	919.31
Total Foreign Exchange Reserves	All Currencies	10720.6	12702.3	12364.6	12539.9	12944.8

Source: IMF COFER Database

Figure 1: Share of Currencies in Global Foreign Exchange Reserves

Source: IMF COFER Database

5. BRICS' De-dollarization Trajectory

The BRICS comprising Brazil, Russia, India, China, and South Africa, constitutes a pivotal association of growing economies exerting considerable influence on the global stage, particularly in the realms of geo-economics and geo-politics (Patrick, 2024). BRICS account for a substantial portion of the world's population, territory, economic output, and trade, with staggering figures of 49%, 36%, 39%, and 23%, respectively, underscoring their growing global influence (Central Bank of Brazil, 2025). Originally envisaged as BRIC in 2006, the grouping expanded to include South Africa in 2010, thereby adopting its current nomenclature as BRICS. In 2017, the expansion of the BRICS to include more countries was envisioned making it as BRICS Plus (Egypt, Indonesia, Ethiopia, Iran, and the UAE). The BRICS expansion has sparked optimism among developing and emerging nations, who see it as an opportunity to gain greater representation and influence in the global order, reshape international frameworks to prioritize their interests, access new economic cooperation and financing options without stringent conditions, and reduce their dependence on Western powers, thereby asserting greater autonomy and self-determination in their development trajectories (Kanter, 2025). Through its strategic objectives, BRICS seeks to cultivating economic cooperation and development, strengthen its global presence and voice, and facilitate collaborative enterprises in trade, investment, and technological innovation (Bhowmick, 2024). In essence, the BRICS is viewed as a potential game-changer for the Global South, offering new opportunities for economic growth, political empowerment, and a more balanced global order.

Noteworthy initiatives, including the New Development Bank (NDB) and the Contingent Reserve Arrangement (CRA) in 2015, underscores the BRICS' commitment to shaping global governance, trade, and economic policies, thereby redefining the contours of global economic architecture. The NDB spearheads innovation, collaboration, and meaningful impact as a beacon of multilateral development for the Global South (NDB, 2023). It is a groundbreaking multilateral institution founded by the BRICS nations to catalyze infrastructure growth and sustainable development in emerging markets and developing countries thereby reducing dependence on the World Bank. The New Development Bank is empowered with an initial authorized capital of \$100 billion, comprising \$50 billion subscribed by the founding members of BRICS (NDB, 2023). Its

strategic focus is on key sectors that drive infrastructure growth and sustainable development, ensuring targeted and impactful interventions, however, NDB is committed to other areas such as clean energy and efficiency, transport infrastructure development, social infrastructure, digital infrastructure, water, sanitation and environmental protection among others. The Bank has made significant strides, approving 120 projects and committing USD 39 billion in financing to drive impactful development (NDB, 2023). The second BRICS' financial institution, the Contingent Reserve Arrangement (CRA) offers a safety net for member countries by providing liquidity support through currency swaps, helping them navigate balance of payments crises (PIB, 2015). The CRA is mandated to serve as a vital lifeline for BRICS members, offering a safety net in times of financial stress. By reducing dependence on the IMF, where emerging economies' voice is limited, the CRA will foster greater economic cooperation and strengthen their position within the BRICS framework. With a \$100 billion fund, the CRA offers a vital lifeline to member countries facing short-term liquidity challenges, including balance of payment difficulties (Central Bank of Brazil, 2025).

The BRICS nations are focusing on three key initiatives to de-dollarization: developing a unified currency, promoting local currency usage in international and intra-BRICS trade, and establishing integrated payment systems leveraging technological innovation. During the course of rising geopolitical tensions and the escalating use of economic sanctions, the BRICS is doubling down on its exploration of a unified currency, a shift that hunt for mitigating the risks and vulnerabilities intrinsic in the existing global financial architecture. The proposed common currency would be anchored to a diversified basket of BRICS' national currencies, fostering equilibrium and parity among member nations (BRICS, 2025). Further, platforms like BRICS-Pay would enable seamless transactions, bypassing traditional Western intermediaries like SWIFT framework. By tapping into modern technological advancements, this initiative would utilize block chain and central bank digital currencies as its foundational infrastructure, enabling real-time transactions. The mBridge system, a groundbreaking initiative has already demonstrated the potential of this approach (Manini, 2024; Bank for International Settlements, 2022). Moreover, BRICS Pay is revolutionizing cross-border transactions by connecting national payment systems and enabling local currency settlements. The Brazil-China currency swap Agreement (signed in May 2025 for an initial period of five years validity), is a major

example, with billions in trade being performed without dollar intermediation. Other initiatives include Brazil's pioneering Pix payment platform which is being showcased as a model for international cooperation (Mukherjee & Arkalji, 2026; Duarte et al., 2022). With ongoing negotiations to integrate Pix with Indian and Egyptian systems, the platform is poised to expand its footprint to 15 partner countries, solidifying Brazil's position in digital payment innovation. China is also driving a strategic initiative to boost the renminbi's global footprint, responding to increasing uncertainties concerning the US dollar's long-term prospects. This initiative spans investment products and critical infrastructure, including a global network of Yuan-clearing banks and Cross-Border Interbank Payment System (CIPS), an arrangement designed to rival SWIFT and enable efficient renminbi transactions worldwide (Bag, 2025). Owing to de-dollarization efforts, out of total intra-BRICS trade, 30% of transactions taking place in local currencies (BRICS, 2025).

While the aspiration to reduce dollar dependency is clear, entirely phasing out the dollar from trade and transactions might be a complex and challenging endeavour. The BRICS is facing strains due to diverging political interests, exemplified by India's partial withdrawal of support in 2025, stemming from concerns that China's growing influence could lead to Yuan dominance. Initially cautious, India has shifted gears to actively engage with the BRICS platform. India is reluctant to displace the dollar as the global reserve currency, it advocates for exploring local currency alternatives to intra-BRICS and international trade. The NDB is proactively addressing risk concerns through comprehensive studies. Its \$10 billion funding commitment in 2025, prioritizing local currency settlements, is set to catalyze a new wave of infrastructure projects, driving progress and innovation (BRICS, 2025). Despite challenges persist; the strides made by BRICS' members so far are remarkable. Noteworthy progress has been achieved, indicating resilience and determination among member nations. The impetus to de-dollarization is palpable, and the progress serves as a testimony to the mutual efforts and shared vision of the participating countries.

6. Findings and Discussion

Since World War II, the US dollar has maintained its position as the top global reserve currency, with a dominant share of 58% of foreign exchange reserves. It has long occupied a preeminent position in international transactions, functioning as the dominant currency for global trade, investment, and reserve accumulation. The dollar's enduring global supremacy stems from the US economy's growth & size, stability, and commitment to trade.

The International Monetary Fund (IMF) strives to foster sustainable economic growth and prosperity by promoting policy frameworks that underpin financial stability and monetary cooperation. The World Bank on the other end was initially established to rebuilding the Western European countries destroyed by war, however, shifted to global economic growth & development. The IMF and World Bank are often viewed as institutions that reflect Western interests, given their voting structures that tend to favour developed countries. Nevertheless, role of SWIFT in enforcing economic sanctions has significant implications for countries like Iran, Russia, and North Korea. Losing access to SWIFT can severely impact a nation's economy, causing trade and financial transaction disruptions, and potentially leading to global economic isolation. Mitigating vulnerabilities within the international financial framework is essential for sustaining global economic stability in the long run. The anticipated erosion of confidence in the SWIFT has indeed materialized, yielding potentially irreversible consequences.

The momentum towards de-dollarization is not an isolated phenomenon, but rather a systemic response to observable trends, which will likely continue to unfold. However, a potential downside is that these new payment arrangements could fragment the system, resulting in increased costs and reduced efficiency. When considering the introduction of a new currency for trade and transactions, it's more practical to use existing local currencies, since this approach can simplify transactions, reduce exchange rate risks, and increase efficiency, eventually facilitating smoother international trade and economic exchange and also serve as a viable alternative to the US dollar.

The BRICS expansion undoubtedly signifies a significant stride towards a multi-polar world, thereby paving the way for a new global order. Whilst the BRICS champion a

multi-polar order in theory, their collective push for de-dollarization is hindered by individual interests, reliance on international trade, and apprehensions about US retaliation. This divergence between aspiration and action underscores the complexities of multilateral cooperation. The quest for de-dollarization, though ambitious, is beset by formidable hurdles and intricacies, underscoring the imperative for deepened economic integration, robust financial frameworks, and seamless coordination among BRICS+ nations to navigate this complex landscape.

7. Concluding Observations

BRICS emerged as a response to the Western world's longstanding influence over global economic institutions and decision-making processes. The BRICS nations are spearheading a seismic shift in the global financial landscape, aggressively pushing for alternative payment systems, currencies, and financial institutions that directly challenge the dollar's long-standing dominance. The push for de-dollarization involves BRICS countries promoting regional currencies and financial structures to reduce dependence on the US dollar. BRICS nations are fostering a more diverse global financial system by encouraging trade in local currencies and creating alternative payment frameworks. Reducing dollar dependency might alter the geopolitical landscape, potentially curtailing US as monetary and financial authority.

The BRICS monetary agenda marks a strenuous attempt to restructuring the global monetary system, driven by shifting power dynamics and the rising aspirations of emerging economies seeking greater control in global economic governance. Deeper economic integration within BRICS through regional currency arrangements can promote currency harmonization, reduce reliance on the US dollar, and ensure economic stability among member countries. Embracing existing local currencies for trade and transactions is a pragmatic approach, as it streamlines processes, mitigates exchange rate risks, and boosts efficiency, ultimately fostering seamless international trade and economic cooperation while offering a viable alternative to the US dollar.

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From Dividend to Durability: India's Demographic Transition and the Rise of the Silver Economy

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Abstract

India's demographic story is often seen as a time-bound advantage, with a youthful population driving growth before ageing sets in. This paper argues that the demographic dividend need not be temporary if it is invested in building the foundations of a strong silver economy. Tracing India's transition from the post-1991 youth surge to the ageing society projected by mid-century, it portrays demographic change within its economic, social, and policy context. The paper examines emerging silver economy sectors—healthcare, housing, fintech, wellness, and care services—highlighting regional and market disparities. It emphasizes intergenerational linkages through which youth labour, savings, remittances, and entrepreneurship sustain elder well-being. Assessing India's policy response, the paper identifies progress alongside gaps in healthcare financing and pensions, and argues that coordinated action can convert ageing into a second, inclusive demographic dividend.

Keywords: Demographic dividend; Silver economy; Population ageing; Intergenerational transfers; Eldercare markets; Social policy; India; Active ageing; Second demographic dividend

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1. Introduction: Setting the Demographic Stage

In 1991, when India opened up its economy, it was also entering a rare demographic moment. A large and youthful workforce—nearly two-thirds of the population under the age of 35—came of age just as economic reforms gathered pace. Together, these forces powered a long phase of GDP growth through the 1990s and 2000s. This “youth bulge” worked quietly but decisively, supplying labour, expanding demand, and fuelling entrepreneurial activity across the economy (Bloom, Canning, and Sevilla, 2003). Three decades on, however, India is approaching a very different demographic horizon. By 2050, almost one in five Indians is expected to be over the age of 60, signalling a clear shift from a predominantly young society to an ageing one (United Nations, 2023).

This shift does not mark the end of the demographic dividend; it marks its transformation. The opportunity now lies in what is increasingly described as the silver economy—the growing range of goods and services that respond to the needs and aspirations of older adults, especially those who remain active, healthy, and economically engaged. Far from being limited to healthcare and pensions, the silver economy spans preventive and geriatric care, age-friendly housing and transport, leisure and tourism, financial products, digital platforms, and assistive technologies that support independent living and social participation (European Commission, 2018).

This paper advances a simple but policy-relevant idea: India’s youth dividend should be seen as seed capital—a powerful but time-bound resource whose value depends on how wisely it is invested. The economic gains generated during youth-heavy decades must now be directed toward building the physical, institutional, and technological foundations of an ageing society. Choices made today—on education and skills, public health, urban design, and digital inclusion—will shape whether population ageing becomes a fiscal strain or a new source of growth and employment.

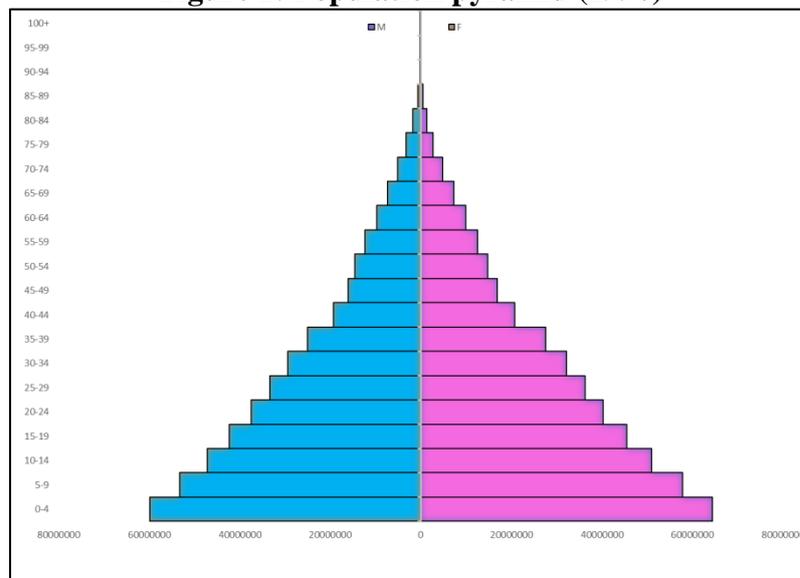
The paper develops this argument in three steps. It first places India’s demographic transition in historical perspective, showing how the youth dividend supported growth, while also producing uneven outcomes. It then maps the current landscape of ageing, highlighting the rise of silver markets alongside gaps in policy readiness. Finally, it sets out a forward-looking vision of a silver economy that builds on earlier demographic gains

to promote active ageing, intergenerational balance, and sustainable development. In doing so, the paper reframes ageing not as an impending crisis, but as the next frontier of India's development strategy.

2. India's Demographic Journey: Dividend to Dependency

India's demographic story is perhaps most clearly visible in the changing shape of its population pyramid. In the decades following Independence—and well into the 1990s—the pyramid had a familiar form: a wide base of children and young people that narrowed sharply with age. Demographers often describe this as an “eastern” profile. High fertility meant that each year brought a fresh cohort into the working-age population, even as improvements in public health steadily reduced mortality. This youth-heavy structure formed the backbone of India's demographic dividend, reinforcing the growth impulse that followed economic reforms after 1991 by expanding both the supply of labour and domestic demand (Bloom, Canning, and Sevilla, 2003).

Figure 1: Population pyramid (1990)

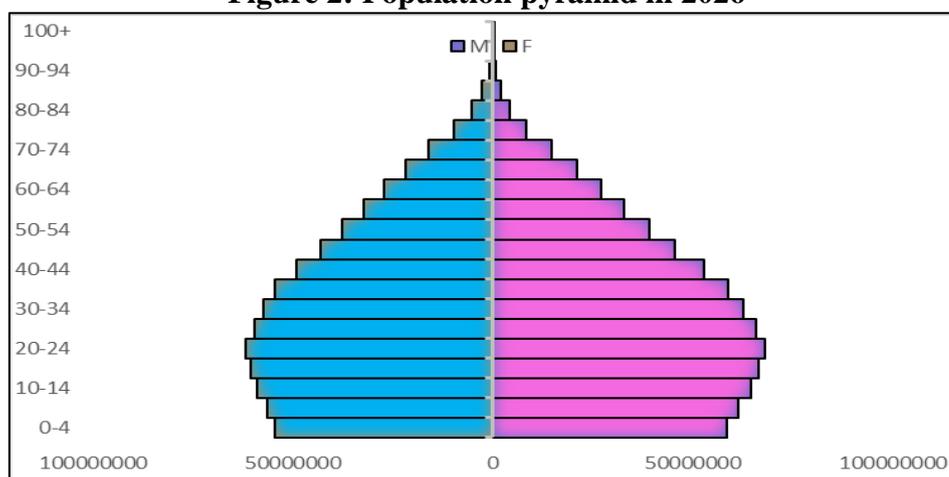


Source: PopulationPyramid.net (1990); United Nations (2023)

Over the next three decades, this structure began to change. Falling fertility and rising life expectancy gradually narrowed the base of the pyramid and thickened its middle. By the

mid-2020s, India entered what can be seen as the most favourable—but also the most fleeting—phase of its demographic transition. Around 2026, the total dependency ratio, which measures the combined burden of children and the elderly relative to the working-age population, is projected to fall to a historic low of about 40 percent (Government of India 2020). Economically, this moment is significant. Fewer dependents per worker allow households to save more, ease pressure on public finances, and create greater space for investment. India’s savings rates peaking during this period underline the idea that this is a narrow but powerful window for long-term investment.

Figure 2: Population pyramid in 2026



Source: PopulationPyramid.net (2026); United Nations (2023)

Beneath this aggregate dividend, however, a quieter ageing story is already unfolding. Ageing in India is neither uniform nor socially neutral. Rural areas—especially among women—are ageing faster, driven by male out-migration, longer female life expectancy, and limited access to secure incomes and healthcare. Elderly women in rural India are more likely to live alone, depend on informal support, and face heightened risks of poverty (Rajan, Mishra, and Sarma, 2020). Urban seniors, by contrast—particularly those with formal-sector employment histories—tend to be healthier, wealthier, and more integrated into financial and digital systems. These differences matter because they shape both the demand for silver economy services and the ability to pay for them.

As fertility continues to fall and longevity improves, India’s population pyramid is expected to narrow further at the base and expand at the top, gradually taking on a “contracting” shape by mid-century. The demographic challenge thus shifts—from managing child dependency to preparing for rising old-age dependency. Importantly, this is not a sudden rupture but a gradual rebalancing, one that gives policymakers time to act, provided the transition is anticipated rather than addressed in crisis.

Table 1: Key Descriptive: Population Transitions

Decade	Working-Age Share	Elderly Share	Dividend Window
2026	65%	12%	Peak Investment
2040	60%	18%	Transition
2050	55%	25%	Silver Dominance

Source: Author’s compilation for India based on United Nations (2023) population projections and demographic dividend frameworks developed by Bloom, Canning and Sevilla (2003) and Lee and Mason (2011)

The table captures the broad arc of India’s demographic transition. The year 2026 marks the high point of the working-age advantage—a phase best seen as the final stage of dividend accumulation. By 2040, the economy moves into a transition phase, where earlier investments must begin delivering returns through higher productivity, stronger healthcare systems, and age-friendly infrastructure. By 2050, with nearly one-quarter of the population elderly, the silver economy shifts from the margins to the center of economic growth, employment, and social stability.

Seen this way, India’s demographic journey is not a simple march from dividend to dependency. It is a redistribution of demographic resources across generations. Whether this shift becomes a source of strain or opportunity will depend on how effectively today’s low-dependency years are used to prepare for tomorrow’s ageing society.

3. Anatomy of India’s Silver Economy: Markets and Stories

India’s silver economy is not a single, neatly defined market but a broad constellation of sectors, business models, and lived experiences shaped by geography, income, and health

status (European Commission 2018; CII 2023). What connects these diverse strands is a common demographic reality: a rapidly growing population of older Indians whose needs and expectations are evolving faster than existing institutions can adapt (United Nations 2023). A closer look at key sectors—healthcare, housing, finance, and care services—reveals both substantial economic opportunity and persistent structural gaps that continue to constrain inclusive silver economy development (Rajan 2018).

3.1. Healthcare: From Hospitals to Homes

Healthcare sits at the heart of the silver economy—and also exposes its sharpest fault lines. As life expectancy rises and chronic illnesses become more common, demand for geriatric care has grown steadily. Yet India’s health system, long oriented toward acute and maternal care, remains poorly equipped for ageing populations. In response, private providers have begun to experiment with decentralized, home-based models of care. Companies such as Portea Medical, for instance, have expanded by offering nursing, physiotherapy, and post-hospitalization services at home, catering to seniors who prefer to age in familiar surroundings rather than in institutions.

At the same time, this expansion masks deep vulnerability. Nearly 40 percent of India’s senior citizens remain uninsured, leaving families exposed to high out-of-pocket health expenses and increasing the risk of poverty in old age (National Health Authority 2022). The result is a bifurcated healthcare market: a growing group of middle- and upper-income seniors accessing private services, alongside a much larger population dependent on overstretched public facilities or informal family care. Whether healthcare strengthens or constrains the silver economy will depend on how effectively this divide is addressed through insurance coverage, stronger primary care, and greater attention to geriatric specialization.

3.2. Housing: Growing Old at Home or Apart?

Housing has emerged as another critical frontier of the silver economy. Traditional family arrangements, which once absorbed much of the responsibility for elder care, are under

pressure from urbanisation, migration, and smaller household sizes. In response, demand has risen for senior living communities that offer independent housing alongside medical support, recreation, and security. Developers such as Ashiana Housing have helped popularise this segment, framing it around ideas of “active ageing” rather than dependency.

Yet the reach of this model remains limited. Estimates suggest that India may need nearly one million senior housing units by 2030—far more than current supply (Knight Frank 2023). Most existing projects are concentrated in cities and priced for higher-income groups, leaving rural and poorer seniors largely outside this market. The policy challenge is therefore not simply to expand senior housing, but to embed age-friendly design into mainstream housing through accessibility standards, public rental options, and retrofitting—so that ageing in place becomes possible for a much broader population.

3.3. Fintech and Wellness: Longevity in a Digital Economy

India’s digital transformation is quietly reshaping what old age looks like. Fintech platforms focused on pensions, annuities, and health savings are multiplying, while simpler, elder-friendly digital interfaces—particularly within UPI-based payments—are making it easier for seniors to manage money independently. Alongside this, the wellness economy is increasingly targeting older adults, offering services related to preventive care, fitness, mental health, and nutrition.

Together, fintech and wellness are estimated to form a ₹73,000 crore market in 2024, reflecting both rising purchasing power among some seniors and a growing emphasis on quality of life rather than mere survival (EY 2024). These sectors also play a quieter but important role in reducing dependency—helping older adults stay financially autonomous, socially connected, and engaged with services that matter to them.

3.4. Kerala and Bihar: Two Demographic Futures

The silver economy is unfolding unevenly across India, shaped by sharply different demographic paths. Kerala, with low fertility and high life expectancy, offers a glimpse of India's ageing future. It has built relatively strong systems of geriatric healthcare, social pensions, and community care, but now faces mounting fiscal pressure and labour shortages. Bihar, by contrast, remains one of India's youngest states. Its challenge is not ageing today, but the risk of growing old tomorrow without adequate investments in health, skills, and social security.

These contrasts highlight a crucial point: the silver economy is path-dependent. States that invest early in human development and social protection are far better placed to turn ageing into opportunity rather than crisis.

3.5. Scale and Employment: Beyond Welfare

From a macroeconomic perspective, the silver economy is already substantial. Industry estimates suggest that senior citizens could control assets worth as much as \$1.5 trillion in the coming decades, with implications for healthcare, housing, finance, and services (CII 2023). If mobilized productively, this concentration of assets could help sustain consumption and deepen capital markets even as workforce growth slows.

Just as important is the employment potential. Caring for an ageing population is labor-intensive by nature. Targeted investment in youth skills—especially in nursing, caregiving, health technologies, and age-friendly services—could generate up to 10 million eldercare jobs by mid-century (ILO 2022). In this way, the silver economy creates a virtuous intergenerational loop: young workers support today's elders while building skills and systems that will one day support their own ageing.

Taken together, these sectoral stories show that the silver economy is not a niche or purely welfare-driven domain. It is emerging as a structural pillar of India's next growth phase—one that requires coordination across markets, states, and social policy, rather than isolated or reactive interventions.

4. Intergenerational Linkages: Dividend Fuels Silver Growth

India's silver economy has not appeared out of thin air. It is being built—quite deliberately—on the foundations laid during the country's youthful decades. The same demographic dividend that once powered growth is now financing, staffing, and sustaining the systems that support an ageing population. At the heart of this process are intergenerational linkages, through which youthful labour, savings, and social norms are being reshaped to meet the needs of older Indians. Paying attention to these linkages helps explain how demographic change can unfold as continuity rather than disruption.

4.1. Youth Caring for Age: The New Labour Pipeline

Perhaps the most visible connection between young and old lies in the growing care workforce. As families become smaller and people live longer, caregiving is steadily shifting from unpaid household labour to paid and professional services (World Health Organization, 2015; Rajan and Mishra, 2011). Training programmes supported by institutions such as the National Skill Development Corporation (NSDC) have expanded certification in nursing assistance, geriatric care, and home health services (NSDC, 2022). Many of these roles are taken up by young men and women from semi-urban and rural backgrounds, for which elderly care offers a relatively stable and socially meaningful livelihood in a labour market marked by informality and underemployment (International Labour Organization, 2022).

This shift is also quietly altering migration patterns. While large numbers of young people continue to move to cities, rising demand for eldercare has begun to generate forms of reverse migration. Trained caregivers are increasingly returning to smaller towns to serve ageing populations closer to home. This helps ease pressure on urban labour markets while ensuring that silver economy services reach older people where they actually live—especially in states with rapidly ageing rural populations.

4.2. From Youth Earnings to Elder Security

Money flows provide a second, less visible but equally important intergenerational link. The years of demographic dividend have coincided with rising household savings and the expansion of formal retirement systems such as the Employees' Provident Fund and the National Pension System. The resources accumulated through these instruments increasingly represent long-term, patient capital that could be directed toward age-related infrastructure—financing healthcare facilities, assisted housing, and care technologies. Policy discussions around “silver bonds” reflect this growing recognition of ageing as a legitimate investment domain rather than a residual welfare concern (RBI, 2023).

At the household level, the link is even more direct. Youth earnings and remittances continue to anchor old-age security for millions of families, particularly in rural India. Migrant workers in cities often support ageing parents through regular transfers, helping cover everyday consumption, medical expenses, and social participation. These informal flows far exceed public old-age support, highlighting how the dividend generation is already financing the silver phase—quietly, informally, but at scale (Rajan and Mishra 2021).

4.3. Millennials Building for Their Parents

The intergenerational compact is also visible in India's start-up ecosystem. Many silver economy ventures are being founded—and funded—by millennials responding to the practical challenges their parents face. Platforms such as Emoha offer subscription-based eldercare services that combine emergency response, companionship, and care coordination for families living apart. Investment-oriented ventures like SilverAxis reflect a growing awareness among younger investors that longevity is not only a social concern but also a long-term economic opportunity.

These examples point to a broader shift. The silver economy is not being built solely by older entrepreneurs or state-led welfare institutions. It is being shaped by a generation that is confronting ageing early—designing services for their parents even as they anticipate their own later lives. In this sense, millennial capital—financial, technological, and

social—is already laying the groundwork for markets that will mature alongside the cohort itself.

4.4. From Joint Families to Paid Care Economies

Beneath these economic changes lies a deeper cultural transition. The traditional joint family, long the backbone of old-age support in India, is evolving rather than disappearing. Care responsibilities are increasingly supplemented—or partially replaced—by paid services, even as emotional bonds remain firmly familial. What emerges is a hybrid “paid care economy”, where families continue to organize and finance care, but delivery is professionalized.

This transition has far-reaching implications. It recognizes care as legitimate work, creates employment opportunities for youth—especially women—and reduces the moral stigma attached to seeking external support for ageing parents. At the same time, it raises pressing questions about affordability, regulation, and quality—areas where public policy will need to play a stronger role.

Taken together, these patterns show that India’s silver economy is being fueled by intergenerational transfers of labor, savings, and social norms forged during the dividend years. The task ahead is not to invent new linkages, but to formalize and scale the ones already in motion—through better skill certification, appropriate financial instruments, and clear care standards. Done well, this would ensure that the demographic dividend does not simply precede ageing, but actively prepares the ground for it.

5. Policy Landscape and Initiatives: Government as Enabler

India’s policy response to population ageing has taken shape gradually rather than through a single, coherent blueprint. For much of this period, the state has acted as a reactive enabler—stepping in to provide basic income support and welfare, while leaving families and markets to absorb most of the pressures created by longer lives. Looking at

this policy evolution over time helps clarify what India has achieved, as well as what remains unfinished.

5.1. Early Efforts: Securing Old Age Against Poverty

India's earliest responses to ageing were driven less by concerns about longevity and more by the risk of old-age poverty. The introduction of social pensions under the *National Social Assistance Programme* (NSAP) in 1995 marked an important shift, acknowledging that many older citizens—particularly those without family support or formal employment histories—required direct state assistance (Government of India 1995; Rajan 2018). Although modest in value, NSAP pensions established a basic nationwide safety net, especially significant in rural areas and within the informal sector, where formal retirement coverage remains limited (HelpAge India, 2012; Dutta et al., 2010).

Alongside this, savings-based instruments such as the Senior Citizen Savings Scheme were designed to offer secure returns to retirees who had accumulated financial assets. Together, these measures framed ageing largely as a question of income maintenance. While they helped reduce destitution, they paid far less attention to healthcare, housing, mobility, or social isolation—issues that would become more pressing as life expectancy continued to rise (Rajan, 2018).

5.2. Recent Momentum: Ageing as a Development Challenge

Over the past decade, policy thinking has begun to shift. Proposals for a dedicated Silver Economy Mission—though still evolving—signal a growing recognition that ageing is not merely a welfare concern, but a broader development challenge that cuts across sectors. These discussions place greater emphasis on market creation, skill development, and innovation in eldercare services, assistive technologies, and age-friendly infrastructure (NITI Aayog, 2022).

Ageing considerations are also being absorbed—often indirectly—into existing programmes. For example, irrigation and livelihood initiatives under the *Pradhan Mantri Krishi Sinchai Yojana* (PMKSY) have clear implications for senior farmers, who now constitute a growing share of the agricultural workforce as younger men migrate to cities (Government of India, 2015; Gulati, Roy, and Saini, 2021). In this context, improving water security and farm productivity functions as an ageing policy as well, allowing older adults to remain economically active for longer—an outcome consistent with broader productive ageing frameworks (World Health Organization, 2015).

Despite these developments, policy responses remain fragmented. Pensions, health insurance, housing, and skill development continue to be addressed through separate schemes, limiting their combined impact on the silver economy.

5.3. Learning from Elsewhere: Active Ageing Frameworks

International experience offers useful contrasts. The European Union, for instance, has adopted an explicit active ageing framework that links employment, health, lifelong learning, and social participation within a coordinated policy agenda. Initiatives such as age-friendly cities, incentives for later retirement, and community-based care are treated as complementary parts of a single strategy rather than stand-alone interventions (European Commission, 2018).

China provides another instructive comparison through its widely cited “9073” care model, under which 90 percent of older people are expected to age at home with community support, 7 percent to rely on community-based services, and only 3 percent to require institutional care. While implementation has been uneven, the model offers a clear policy hierarchy that aligns family care with state-supported community infrastructure (Feng et al., 2020).

India, by contrast, continues to rely heavily on families without articulating comparable care architecture. As household sizes shrink and migration intensifies, this implicit reliance places growing strain on families, while state and market responses remain piecemeal (Rajan and Mishra, 2011; Bloom et al., 2010). The lesson from China is not to

replace family care, but to support it through public investment and coordinated community-based systems, as reflected in its “9073” framework (Feng et al., 2020). Without such backing, familial responsibility risks are becoming an unfunded mandate rather than a social strength (United Nations, 2002).

5.4. Persistent Gaps: Realities on the Ground

Several structural challenges continue to limit the state’s enabling role. Rural isolation remains acute, particularly among elderly women living alone as younger family members migrate. Healthcare financing is another major fault line. Despite expanded public insurance coverage, out-of-pocket spending still dominates healthcare costs for older adults, steadily eroding savings and reinforcing intergenerational dependence (National Health Authority, 2022).

Pension gaps further complicate the picture. A large share of India’s workforce still reaches old age without adequate formal retirement income, relying instead on family transfers or continued work well into later life. These gaps constrain the purchasing power that could otherwise support silver economy markets, especially outside urban middle-class settings.

Taken together, India’s policy landscape reflects a state in transition—aware of the challenges posed by ageing and active in specific areas, yet still without a comprehensive silver economy strategy. Going forward, the government’s role will be less about adding new schemes and more about connecting existing ones: linking welfare with markets, rural ageing with urban planning, and today’s demographic dividend with tomorrow’s longevity economy.

6. Future Horizons: Vision for a Silver-Enabled India

Looking ahead to 2040, India finds itself at a pivotal moment where earlier demographic choices begin to show their long-term effects. If the investments made during the youth-heavy decades—in education, public health, digital systems, and financial institutions—

are sustained and aligned, they can deliver what economists call a *second demographic dividend*. This dividend does not come from adding more workers, but from higher productivity, accumulated assets, and longer, healthier working lives among older adults (Lee and Mason, 2011). In this scenario, ageing becomes a source of economic resilience rather than a strain on public finances.

A silver-enabled India would see older people contributing in many roles—not only as consumers, but also as workers, mentors, caregivers, and investors. Savings built up during peak earning years would help smooth consumption in later life, while better health would allow many seniors to remain socially and economically engaged. The silver economy, in this sense, is not a replacement for youth-led growth, but its natural extension—resting on the foundations laid during the demographic dividend.

6.1. Cities Built for All Ages

Cities will play a decisive role in turning this vision into reality. Urban India is ageing faster than rural India, and city governments are increasingly where experiments in the silver economy are taking shape. Early initiatives in cities such as Pune offer a glimpse of what age-friendly urban design can look like: safer pedestrian pathways, accessible public transport, nearby healthcare facilities, and public spaces that encourage mobility and social interaction. Although still limited in scale, these efforts reflect an important shift—from viewing older residents as passive recipients of welfare to recognising them as active participants in urban life (HelpAge India, 2021).

Embedding age-friendly principles into smart city programmes, housing regulations, and transport planning would benefit far more than older adults alone. Universal design improves accessibility for children, persons with disabilities, and caregivers as well, making a strong case for treating it as an efficiency-enhancing investment rather than a narrow welfare measure.

6.2. Governing the Silver Transition

Turning this vision into reality will require governance innovation as much as financial resources. A crucial first step is better institutional coordination. A cross-ministerial task force—bringing together health, housing, labour, urban affairs, finance, and skill development—could help break policy silos and place ageing firmly within a lifecycle perspective. International experience shows that whole-of-government approaches are essential to address population ageing effectively (United Nations, 2002; World Health Organization, 2015). Such coordination is necessary to align skills training, financing mechanisms, and service delivery around a coherent silver economy strategy.

Equally important is the role of younger generations. Beyond formal employment, youth-led eldercare cooperatives rooted in local communities offer a promising model that combines job creation with social care. By professionalising caregiving, setting quality standards, and retaining value within local economies, these cooperatives can strengthen care systems—especially in small towns and rural areas. In doing so, they also renew the intergenerational contract: young people gain dignified livelihoods, while older adults receive reliable and respectful care.

Ultimately, the future of India's silver economy will be shaped less by demographic destiny than by policy imagination. If the dividend years are treated as an end in themselves, ageing may come to be seen as a burden. But if they are understood as a period of preparation—economic, institutional, and social—then longer lives can become India's next development frontier. The choice, and the moment to act, lie firmly in the present.

7. Conclusion

India's demographic dividend is often spoken of as a fading advantage—something to be used up before the math of ageing turns against growth. This paper has argued for a different view. The dividend can be made durable. When the surplus created during youth-heavy decades is invested in health systems, skills, savings instruments, and age-friendly infrastructure, demographic transition stops being a zero-sum shift from growth

to burden. Instead, it becomes a cumulative process in which early gains strengthen resilience later on. The silver economy is where this continuity takes institutional shape. The nurses, caregivers, planners, and entrepreneurs trained during the dividend years are already building the systems that support today's older population. Their work sustains the elderly, while their savings and skills accumulate into security for their own later lives. This intergenerational loop holds the promise of a second demographic dividend—one driven not by adding more workers, but by healthier ageing, asset accumulation, and longer productive lives (Lee and Mason, 2011).

Turning this promise into reality, calls for deliberate policy action. Three priorities stand out. First, India should consider issuing dedicated “Silver Bonds” through the Reserve Bank of India, enabling long-term domestic savings—especially pension and provident funds—to be channelled into geriatric healthcare, assisted housing, and age-friendly urban infrastructure. Such instruments would match the long time horizons of retirement savings with the needs of ageing-related investments, while also deepening domestic capital markets (RBI, 2023).

Second, there is a strong case for establishing a permanent, cross-ministerial Silver Economy Task Force that brings together health, labour, housing, urban affairs, finance, and skill development. Ageing is a lifecycle issue, not a sectoral one, and fragmented, scheme-based responses will continue to fall short unless coordination becomes institutional rather than ad hoc.

Third, India should actively scale youth-led eldercare cooperatives, supported by skilling subsidies, standardized certification, and partnerships with local governments. These cooperatives can professionalize care, create employment at scale, and ensure service delivery in small towns and rural areas where market incentives are often weak. In doing so, they can renew the intergenerational contract—turning care from an informal obligation into dignified, productive work.

The deeper lesson is simple. Demographic change does not pit generations against one another; policy choices do. Young people who build today's eldercare systems are not only supporting another cohort—they are investing in the social and economic infrastructure of their own futures. If ageing is anticipated rather than managed in crisis,

India can show that demographic maturity need not signal economic decline. Instead, it can form the basis of a growth model in which longer lives are not feared, but productively embraced.

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Developing a novel SRP-FPO fuzzy model for the Structured Ranking Process of Fuzzy Multi-Criteria Portfolio Optimization Under Uncertainty

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Abstract

This paper aims to develop a systematic and transparent decision-making model for optimizing stock portfolios under uncertainty using fuzzy logic. The research intends to evaluate and choose Exchange-Traded Funds (ETFs) by integrating performance indicators and risk measurements through the SRP-FPO (Structured Ranking Process for Fuzzy Portfolio Optimization) model. The model introduces fuzzy weights for five criteria—CAGR, Volatility, Sharpe Ratio, Max Drawdown, and Liquidity—utilizing triangular fuzzy numbers. Normalized scores are compiled using SRP methodology to produce a ranked list of ETFs. The SRP-FPO framework effectively ranks ETFs by addressing ambiguous preferences and trade-offs, indicating alignment with actual market dynamics and investor anticipations. Using the SRP method, we created a ranked list of ETFs, with their positions determined by their combined scores. The new model improves the Structured Ranking Process (SRP) by integrating fuzzy logic into portfolio decision-making, offering a novel method for financial analytics. The model is applicable in Robo-advisory systems, sustainable investing, and individual portfolio design under risk uncertainty. This is the first formal fuzzy extension of SRP applied to financial portfolio

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optimization, known as Structured Ranking Process for Fuzzy Portfolio Optimization (SRP-FPO).

Keywords: ETF Evaluation, Fuzzy MCDM, Investment Decision-Making, Portfolio Optimization, Structured Ranking Process

1. Introduction

Portfolio optimization has improved due to advancements in both the theoretical and practical domains. Markowitz's work on mean-variance analysis laid the groundwork for later research. Konno and Yamazaki (1991) then expanded on this by using models based on mean-absolute deviation. Jorion (1992) used the standard methods of the time, but Michaud & Ma (2001) improved asset allocation techniques. While Davendralingam and DeLaurentis (2015) identified the relevance of robust portfolio selection for optimization-based system-of-systems architectures. While Guerard et al. (2024) update Markowitz's mean-variance efficiency for the US and Japan markets. Particle swarm optimization (PSO) is analyzed by Mba & Mai (2022). Konstantinov and Fabozzi develop a structural network theory for portfolio management. Thakkar and Chaudhari (2021) and Kolm et al. (2014) review PSO applications and current portfolio optimization trends. Meanwhile, Michaud and Ma (2001) provide asset allocation advice, and Li and Hoi (2014) study dynamic online portfolio selection. Pai & Michel (2009) optimize small portfolios with evolutionary k-means clustering, Bradshaw et al. (2009) constrained PSO methodologies. Armanianzas and Lozano (2005) were the first to develop multi-objective evolutionary techniques, whereas Konno and Yamazaki (1991) introduced the MAD model. The studies demonstrate the evolution of traditional portfolio optimization methods into computational intelligence approaches.

The emergence of evolutionary algorithms is attributed to Ponsich et al. (2012), who explored multi-objective methodologies, and Armanianzas & Lozano (2005), who pioneered multi-objective evolutionary methods. In addition, Bradshaw et al. (2009) and Pai & Michel (2009) enhanced evolutionary methods for portfolio diversification. Bio-inspired algorithms achieved significance due to Mba and Mai's (2022) integration of PSO to cryptocurrency. Davendralingam and DeLaurentis (2015) built robust

optimization methodologies for complex systems, while Fabozzi et al. (2007) examined portfolio management. Machine learning transformed the field of research, with Hieu (2020) and Jang & Seong (2023) utilizing deep reinforcement learning, while Ta et al. (2020) combined LSTM networks with Optimization. Contemporary surveys by Thakkar & Chaudhari (2021) and Priyadarshi & Kumar (2025) document these advancements, while Kolm et al. (2014) provide a historical perspective. This progression demonstrates the field's continuous integration of traditional finance theory with cutting-edge computational techniques. Zanjirdar's 2020 study provides a thorough analysis of optimization models. Contemporary methodologies are built on foundational works. Gunjan & Bhattacharyya (2023) recently conducted an exhaustive review of modern techniques, while Thakkar & Chaudhari (2021) documented progress in particle swarm optimization applications. With a Bayesian approach to global optimization, Black & Litterman (1992) revolutionized the fundamental principles of portfolio optimization, which continue to influence the field today. This discipline evolved through extensive examination by Best (2010) and the comprehensive frameworks offered by Fabozzi et al. 2007. Jin's (2025) use of Markowitz models, along with Chaweewanchon and Chaysiri's (2022) work on using machine learning for stock selection are examples of current research in mean-variance analysis. The development of computational methods has significantly impacted the field. Ma et al. (2020)'s deep learning techniques demonstrate how early neural network applications by Freitas et al. (2009) have advanced into sophisticated AI-driven models.

Yu et al. (2019) concept of Reinforcement learning is often highlighted as a powerful tool, particularly in the context of dynamic optimization, as shown by recent research. Ban et al. (2018) demonstrate the transformative potential of machine learning. Examining the intricate financial market uncovers advanced portfolio optimization based on theoretical principles. Furthermore, it suggests the potential integration of traditional financial theories with cutting-edge machine learning and optimization algorithms to develop sophisticated tools for risk assessment and return improvement across diverse market conditions. The findings suggest a significant evolution in the practices of management of assets.

The switch from mean-variance to machine learning has highlighted fundamental flaws in portfolio optimization theory and practice. Despite their theoretical soundness,

Markowitz's efficient frontier and the Black-Litterman framework sometimes fail to account for market reality. Challenges include regime changes, liquidity constraints, and abnormal return distributions. Second, evolutionary algorithms and bio-inspired optimization approaches can solve multi-objective problems, but they are computationally intensive and lack consistent evaluation criteria. As machine learning, particularly deep reinforcement learning and neural networks, gain popularity, model interpretability, over fitting, and robustness in volatile markets become commonplace. The purpose of this research is to establish a structured fuzzy decision framework for investment selection under uncertainty to overcome the limitations of standard portfolio optimization methods. The objectives mainly include: (1) to develop a Structured Ranking Process-based Fuzzy Portfolio Optimization (SRP-FPO) model that integrates fuzzy logic and multi-criteria decision-making to assess and rank investment alternatives during uncertain financial conditions; (2) to serve as a systematic multi-criteria evaluation framework for portfolio selection using key economic variables such as return, risk, liquidity, and volatility in quantitative and qualitative terms; (3) to empirically evaluate the proposed SRP-FPO model on real financial market data from Yahoo Finance and establish its value by generating transparent and interpretable portfolio rankings; and (4) to compare the proposed structured fuzzy ranking strategy with existing portfolio analysis methods with respect to decision transparency, computational simplicity, and ability to handle uncertainty in financial data.

In order to fulfil these objectives, we propose a five-stage Simple Ranking Process (SRP) intended to evaluate exchange-traded funds (ETFs) based on key financial metrics that include compound annual growth rate (CAGR), volatility, Sharpe ratio, maximum drawdown, and liquidity. In the first stage, historical data for five major ETFs—SPY, QQQ, TLT, IWM, and GLD is sourced from Yahoo Finance. Min-max normalization of data is followed by inverse weight ranking, highlighting CAGR and volatility as primary factors. Later, normalized values are integrated with criterion weights for the computation of weighted scores. IALO, heatmaps, Sankey diagrams, and parallel coordinate plots are used for the visual representation of the findings in the last phase, effectively illustrating performance trade-offs. This Python-based methodology serves as an effective tool in an investor's toolbox for an investing strategy that ascertains reproducibility, besides

providing a transparent, data-driven framework for well-informed portfolio optimization decisions.

This study demonstrates significant improvements in portfolio optimization and ETF selection. The framework offers a systematic Simple Ranking Process (SRP) that incorporates a range of financial measures, including CAGR, Sharpe Ratio, and volatility, into a transparent, criteria-weighted decision model, presenting a viable alternative to classic mean-variance optimization. This study verifies the SRP approach by examining five prominent ETFs (SPY, QQQ, TLT, IWM, and GLD). It demonstrates that SPY exhibits superior risk-adjusted returns (Sharpe Ratio: 0.94) and liquidity, while also emphasizing TLT's inefficiencies, as evidenced by its negative CAGR. The present investigation contributes to the field of visual analytics within finance through the introduction of innovative heatmaps, Sankey diagrams, and parallel coordinates plots. These visualizations facilitate investors' assessment of the interrelationships between return, risk, and liquidity. Furthermore, this research provides actionable insights for portfolio managers by employing composite scores to rank exchange-traded funds (ETFs), a methodology enabled by a reproducible Python-based workflow. These contributions link quantitative finance with decision science, providing theoretical rigor and practical applicability for data-driven investing strategies.

2. Theoretical Underpinning

This study uses Fuzzy TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) to assess alternatives among uncertainty, referencing decision-making research (Nădăban et al., 2016; Behzadian, 2012). According to Sun (2010) and Chu (2002), fuzzy set theory regulates linguistic and ambiguous data. It begins using evaluation criteria and options from domain-specific applications, including supplier selection (Junior et al., 2014) and risk assessment (Wang & Elhag, 2006). Second, we use fuzzy AHP (Kutlu & Ekmekçioğlu, 2012) to derive criterion weights, addressing subjectivity through pair-wise comparisons. Third, we create a fuzzy decision matrix and calculate the alternative's distance from fuzzy positive and negative ideal solutions (Zeng et al., 2013). We utilize validation techniques (Palczewski & Sałabun, 2019) and recent extensions (Pandey et al.,

2023) to rank alternatives based on closeness coefficients. We program the process for reproducibility and to conform to industrial applications (Yadav et al., 2018) and symmetry principles (Chou et al., 2019).

Fuzzy Analytic Hierarchy Process (AHP) improves conventional AHP by integrating fuzzy set theory to address uncertainty and ambiguity in decision-making, especially regarding subjective assessments (Chang, 1996). The method employs fuzzy numbers, typically triangular or trapezoidal, to represent linguistic preferences, allowing for more realistic pair-wise comparisons (Wang et al., 2008). The Extent Analysis Method for weight derivation (Zhu et al., 1999) and the consistency verification method (Kubler et al., 2016) represent major developments in the field. The implementation of Fuzzy AHP has been thoroughly documented across multiple domains, including energy efficiency optimization (Beşikçi et al., 2016), risk assessment (Yazdi et al., 2020), supplier selection (Ayhan, 2013), and healthcare quality evaluation (Singh & Prasher, 2019). Recent extensions, such as spherical fuzzy AHP (Kutlu Gündoğdu & Kahraman, 2020), improve the ability to model complex uncertainty. This improvement is particularly beneficial for multi-criteria group decision problems that involve imprecise human judgment.

Opricovic et al. (2004, 2011) proposed the VIKOR method, which stands for “Vise Kriterijumska Optimizacija I Kompromisno Resenje”, as an approach for MCDM that can be used for ranking and determining compromises. Mardani et al. (2016) found that it signifies competing criteria that offer solutions that maximize the group's benefit while minimizing personal discontent. This method provides a compromise solution index using normalized Manhattan (L_1) and Chebyshev (L_∞) distances, thus allowing trade-offs among different criteria (Jahan et al., 2011, 2013). Spherical fuzzy VIKOR (Kutlu Gündoğdu & Kahraman, 2019) and q-rung Ortho pair fuzzy VIKOR (Gao et al., 2020) are instances of fuzzy extensions that enhance the method's capability to manage uncertainty. Some of the applications include material selection (Girubha & Vinodh, 2012), healthcare management (Zeng et al., 2013), supplier selection (Alimardani et al., 2013), and sustainability assessments (Pourebrahim et al., 2014). VIKOR's adaptation in complicated decision-making settings can be seen by how it interacts with SWARA (Alimardani et al., 2013), TOPSIS (Shekhovtsov & Sařabun, 2020), and WASPAS (Vaid et al., 2022) in recent hybrid models. The method's rampant use in engineering,

environmental management, and company analytics is assured by its robustness in group utility maximization and conflict resolution.

3. Data Sources and Methodology

3.1. Data Sources with description

The financial data used in this study were collected from Yahoo Finance (<https://finance.yahoo.com/>), a reputable and publicly accessible financial data platform widely used in academic and industry research. The selection of the Simple Ranking Process (SRP) with fuzzy integration is appropriately justified, underlined by its ability to address the shortcomings of Blackbox multi-criteria decision-making (MCDM) methods, while also ensuring clarity and computational effectiveness's rank-based aggregation (Edwards, 1977) allows proper decision paths, in contrast to VIKOR and TOPSIS, which require advanced normalizing procedures for financial applications necessitating traceability. The fuzzy extension (Zimmermann, 2001) addresses inherent data uncertainties in ETF evaluation while dealing with mixed data types, such as crisp volatility metrics and linguistic liquidity assessments. This hybrid approach integrates methodological rigor with practical accessibility, reducing the high computational demands of AHP/ANP while dealing with rank reversal issues common in traditional TOPSIS applications. Empirical studies demonstrate their effectiveness in scenarios requiring: (1) intuitive trade-offs between conflicting financial criteria; (2) handling of heterogeneous data granularity; and (3) the inclusion of expert judgment under uncertainty, making it particularly suited for multi-criteria portfolio optimization problems that require the systematic integration of both quantitative metrics and qualitative assessments. The model's five-stage pipeline offers reproducible results while maintaining interpretability, thus avoiding the complexities associated with black-box systems, which are consistent with established practices in financial decision support systems (see Table 1).

Table 1: List of ETFs under Comparison

S/L	Description	Purpose
1	SPY (S&P 500 ETF)	Represents the broad U.S. equity market; used as a benchmark for portfolio performance and stability.
2	QQQ (NASDAQ-100 ETF)	Focuses on tech-heavy growth stocks; captures high-risk, high-reward innovation-led exposure.
3	TLT (20+ Year Treasury Bond ETF)	Provides exposure to long-term U.S. Treasury bonds; used for hedging and portfolio risk reduction.
4	GLD (Gold ETF)	Tracking gold prices serves as a safe-haven asset during market turbulence and inflation.
5	IWM (Russell 2000 ETF)	Represents U.S. small-cap stocks; offers diversification and higher growth potential at elevated risk.

Table 2: Evaluation Criteria Used in SRP Fuzzy Model

S/L	Criterion	Purpose
1	CAGR (Compound Annual Growth Rate)	Measures the annualized return of an ETF, indicating long-term growth potential.
2	Volatility	Captures the price fluctuation or risk; essential for assessing stability.
3	Sharpe Ratio	Assesses risk-adjusted return, combining return and volatility into a single metric.
4	Max Drawdown	Indicates the worst historical loss from peak to trough; critical for downside risk evaluation.
5	Liquidity	Reflects ease of trading through metrics like average volume and bid-ask spread. Higher liquidity implies lower transaction costs.

Table 3: Descriptive Statistics

	GLD	IWM	QQQ	SPY	TLT
count	250	250	250	250	250
mean	267.0643	214.6543	500.4814	577.5121	88.89237
std	29.19783	12.94129	32.13078	28.10956	3.416612
min	220.55	174.338	415.5933	495.0166	83.34763
25%	243.205	206.1441	478.1093	557.7018	86.13151
50%	256.795	216.216	503.0109	580.7546	88.06172
75%	300.78	223.3	523.1539	597.6407	90.83516
max	316.29	240.4764	568.14	637.1	97.81111

Source: Author analysis

3.2. Methodology

The proposed study comprises different stages and includes:

Stage 1: Five investment options (GLD, IWM, QQQ, SPY, and TLT) and five evaluation criteria (CAGR, Volatility, Sharpe Ratio, Max Drawdown, Liquidity) were identified, and a decision matrix (Table 2) was constructed using quantitative data. Data collected from

Yfinance (open source) include SPY (S&P 500), QQQ (NASDAQ-100), TLT (20+ Year Treasury Bonds), GLD (Gold), and IWM (Russell 2000) — representing large-cap, tech, bonds, commodities, and small-cap asset classes, respectively (refer to Table 3).

Stage 2: The criteria values were normalized and/or ranked to ensure comparability across different units and scales. This ensures that values are unit-free and comparable. Common normalization techniques include:

- For beneficial criteria (higher is better), we can compute normalized criteria values as:

$$x_{ij}^{\text{norm}} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)} \quad (1)$$

- For non-beneficial criteria (lower is better), we can compute normalized criteria values as:

$$x_{ij}^{\text{norm}} = \frac{\max(x_j) - x_{ij}}{\max(x_j) - \min(x_j)} \quad (2)$$

where, x_{ij} Is the value for ETF i and criterion j

Stage 3: Criterion weights were applied based on the ranks assigned in Table 1. More critical criteria, such as CAGR and Volatility, were given higher importance. In this stage, we convert ranks into weights (e.g., Rank 1 = most important), and the weighting Formula (Inverse Rank Weighting) can be computed as:

$$w_j = \frac{\frac{1}{\text{Rank}_j}}{\sum_{k=1}^n \frac{1}{\text{Rank}_k}} \quad (3)$$

where, w_j is the weight of the criterion j . Rank_j is the rank of the criterion j from Table 1

Stage 4: Weighted scores were computed for each ETF by multiplying the normalized values by the respective criterion weights and summing across all criteria.

Weighted Score per ETF:

$$S_i = \sum_{j=1}^n w_j \cdot x_{ij}^{\text{norm}} \quad (4)$$

where, S_i is the overall score for ETF i . w_j is the weight for the criterion j . x_{ij}^{norm} is the normalized value of the ETF i for criterion j .

Stage 5: The aggregated scores were used to generate the final SRP ranking. This allowed for a transparent and structured comparison, identifying the most efficient ETF aligned with investor objectives.

Table 4: Beneficial and non-beneficial Criterion

Criterion	Type	Normalization Used
CAGR	Beneficial	(1)
Sharpe Ratio	Beneficial	(1)
Liquidity	Beneficial	(1)
Volatility	Non-beneficial	(2)
Max Drawdown	Non-beneficial	(2)

Source: Author analysis

4. Analysis and Discussion

4.1. SRP Pipeline Architecture Diagram

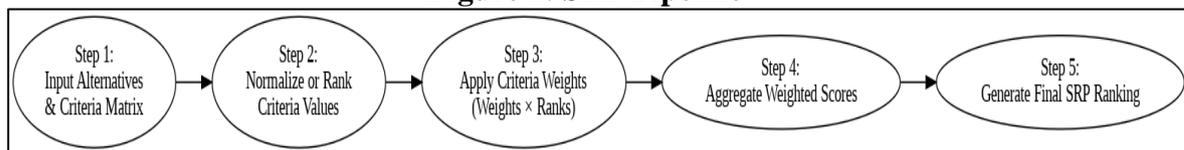
The pipeline for implementing SRP has been demonstrated to offer a comprehensive overview of the entire process—the Mermaid diagram. The SRP methodology consists of five sequential steps: defining the decision matrix, normalizing or ranking criterion values, applying weights, aggregating weighted scores, and generating final rankings. This method facilitates a clear, criteria-weighted assessment of options; promoting uniform and reliable decision-making in multi-criteria financial portfolio analysis (see Figure 1).

Step 1: Define Alternatives and Criteria

Table 1 represents a listing of alternatives (tickers) and the criteria (metrics) used in the analysis. It includes SPY (S&P 500), QQQ (NASDAQ-100), TLT (20+ Year Treasury Bonds), GLD (Gold), and IWM (Russell 2000) — representing large-cap, tech, bonds,

commodities, and small-cap asset classes, respectively. It establishes a unique correlation among five ETFs—GLD, IWM, QQQ, SPY, and TLT—and key investment performance metrics: CAGR, Volatility, Sharpe Ratio, Max Drawdown, and Liquidity. This architecture provides a practical basis for advanced decision-making methodologies, especially the Simple Ranking Process (SRP). The approach leads to consistent scoring, normalization, and rank aggregation by continuously associating each alternative with pertinent criteria. This method indicates that the SRP model integrates both expected and associated risks, offering investors the opportunity to make more informed and transparent portfolio decisions in the face of uncertainty (see Table 5).

Figure 1: SRP Pipeline



Source: Author analysis

Table 5: Alternatives and Criteria

Alternative	Criterion
GLD	CAGR
IWM	Volatility
QQQ	Sharpe
SPY	MaxDrawdown
TLT	Liquidity

Source: Author analysis

Table 6: Decision Matrix

Ticker	CAGR	Volatility	Sharpe	MaxDrawdown	Liquidity
GLD	0.112305	0.154036	0.771489	-0.22002	8336369
IWM	0.100172	0.231303	0.530251	-0.31912	30274302
QQQ	0.174705	0.233564	0.809474	-0.35119	48826555
SPY	0.160846	0.175168	0.943159	-0.24496	75397317
TLT	-0.10178	0.162078	-0.5843	-0.48351	26635893

Source: Author analysis

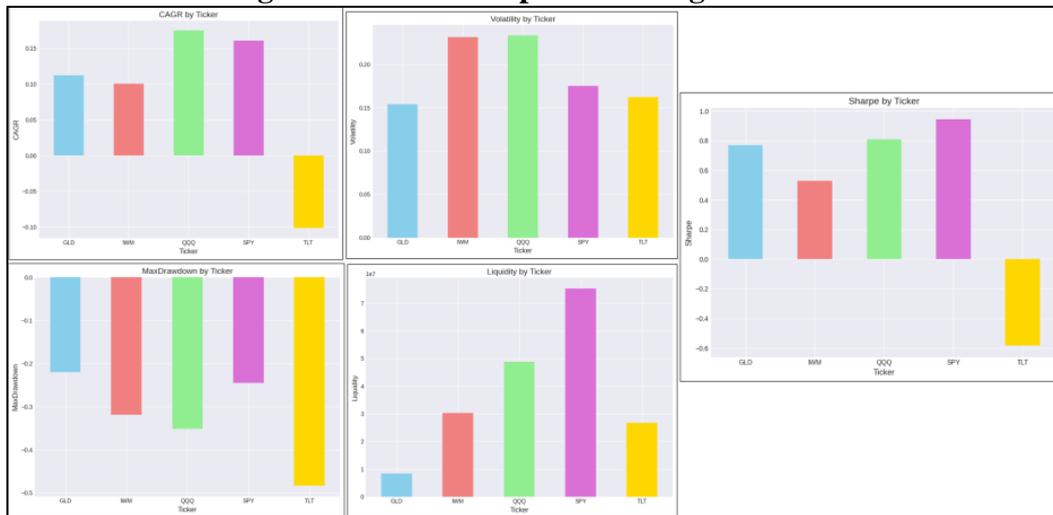
Next, we create a decision matrix based on actual metric values that correspond to each ticker and criterion. Table 2 presents the Decision Matrix for five ETFs evaluated against five critical financial metrics. SPY has been determined as the most balanced performer,

exhibiting a high CAGR of 0.1608, low volatility of 0.1751, and the highest Sharpe ratio of 0.9432, complemented by exceptional liquidity of 75M. QQQ illustrates significant growth (0.1747) and strong risk-adjusted performance (Sharpe: 0.8094), though it demonstrates the highest volatility (0.2335) and maximum drawdown (−0.3512), indicating increased downside risk. GLD offers a balanced risk-return profile, serving as a stabilizing asset. IWM provides moderate returns; however, it encounters elevated drawdown and volatility. TLT exhibits substantial underperformance, characterized by a negative compound annual growth rate (CAGR) and Sharpe ratio, demonstrating an unfavourable risk-return trade-off. These indicators together capture the various dimensions of portfolio selection and serve as the input decision matrix for the Structured Ranking Process–Fuzzy Portfolio Optimization (SRP-FPO) model. The matrix enables systematic ranking of investment alternatives under uncertainty by integrating quantitative financial indicators into a fuzzy multi-criteria evaluation framework (see Table 6).

Ticker bar graphs are created for each metric, allowing for a visual comparison of the tickers based on distinct criteria. The comparative performance charts of five ETFs demonstrate notable differences in return, risk, and liquidity characteristics. SPY excels in Sharpe ratio and CAGR, demonstrating exceptional risk-adjusted performance and steady growth. QQQ reflects this pattern, albeit with little increased volatility. GLD demonstrates modest returns accompanied by reduced volatility, serving as a viable hedge. IWM exhibits heightened volatility and drawdowns, rendering it riskier despite commendable returns. TLT exhibits subpar performance across all parameters, characterized by a negative compound annual growth rate (CAGR) and Sharpe ratio, signifying unfavourable return dynamics in the context of increasing interest rates. Liquidity is maximized for SPY and QQQ, hence improving tradability. These insights provide educated portfolio diversification by return-risk-liquidity trade-offs. The graphical research illustrates the comparative performance of selected ETFs using key financial indicators (CAGR, volatility, Sharpe ratio, maximum drawdown, and liquidity) obtained from market data via Yahoo Finance. These visualizations support the research objective of establishing a systematic multi-criteria evaluation framework by showing differences in return, risk, and market accessibility among investment options. Therefore, the results provide empirical support for the Structured Ranking Process–Fuzzy Portfolio

Optimization (SRP-FPO) framework, enabling a transparent ranking of portfolios under financial uncertainty (refer to Figure 2).

Figure 2: Ticker comparison using Bar Plots



Source: Author analysis

Step 2: Rank Each Criterion

We generate a table for ranks for each criterion by weight. The criteria ranking demonstrates the impact of performance and risk preferences on the multi-criteria assessment of exchange-traded funds (ETFs). The opportunities for investment growth for an extended duration is highlighted by a high compound annual growth rate (CAGR). Risk-adjusted returns are often measured using volatility and the Sharpe Ratio. The fourth-ranked Max Drawdown signifies capital preservation during a decline. Lower liquidity ratings indicate that strategic allocation decisions prioritize performance and stability over tradability. This prioritization framework thus supports weighted decision models; ensuring that investors focus on long-term, risk-averse returns rather than swift market access (refer to Table 7).

In addition, we generate a weighted ranking matrix heat map. This heat map highlights the weighted ranks, aimed at a clear understanding of the influence of criterion weights on the performance of each ticker across the criteria. The Multi-Criteria Influence Matrix demonstrates the relative importance of decision-making factors among five ETFs—GLD, IWM, QQQ, SPY, and TLT—according to their impact on the final ranking. GLD

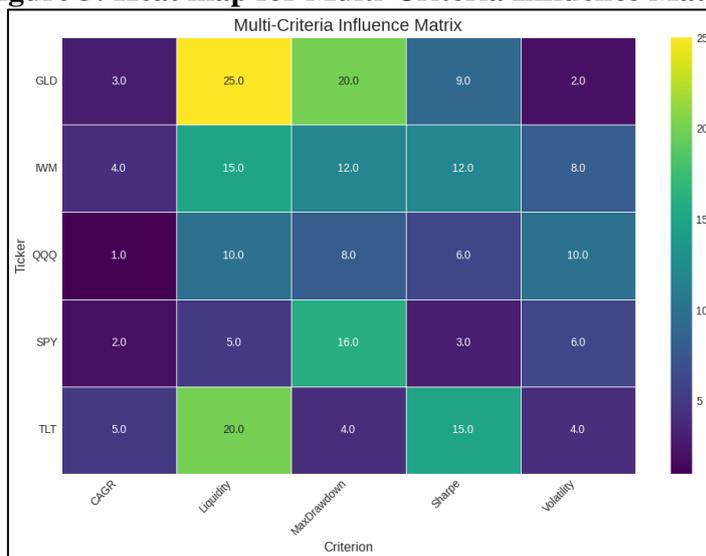
and TLT exhibit significant sensitivity to liquidity and drawdown, consistent with their defensive functions in portfolio construction. SPY highlights a balanced distribution of influence, featuring significant strength in drawdown and moderate levels of liquidity, therefore reinforcing its dominance in risk-adjusted performance. Despite giving higher returns, QQQ leads to reduced influence due to its volatility and drawdown exposure, while IWM shows a moderate profile across all criteria. The matrix exhibits the growing importance of multi-criteria frameworks for asset evaluation beyond uni-dimensional analysis. Using a structured decision environment, we learn how these key indicators impact each other while considering investing options. This matrix serves as the conceptual framework for the SRP-FPO fuzzy model; enabling systematic multi-criteria ranking of investment alternatives under financial uncertainty (see Figure 3).

Table 7: Criterion Rank

Criterion	Rank
CAGR	1
Volatility	2
Sharpe	3
MaxDrawdown	4
Liquidity	5

Source: Author analysis

Figure 3: Heat map for Multi-Criteria Influence Matrix



Source: Author analysis

Step 3: Apply criteria weights

The weighted rankings for each ticker and criterion for all ETFs are presented in the table. TLT attracted inflows due to its low volatility and modest drawdown, appealing to risk-averse investors, while SPP and QQQ exhibited robust returns, indicating their competitiveness in the market. Conversely, GLD remains stable with moderate return potential, whereas IWM faces difficulties due to its higher risk and lower Sharpe ratio. This visualization method enhances quantitative ranking and facilitates trade-off analysis, making it an essential tool for informed portfolio decisions in a complex investment environment (refer to Table 8).

Table 8: Weighted ranks for criteria

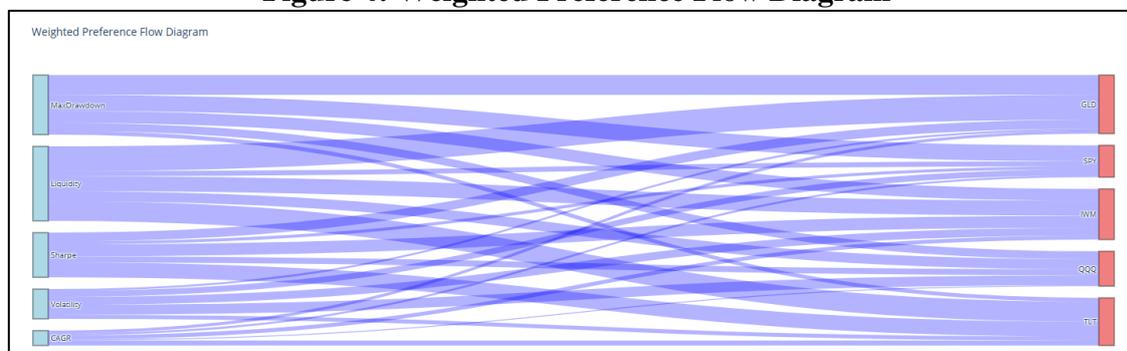
Ticker	CAGR	Volatility	Sharpe	MaxDrawdown	Liquidity
GLD	0.112305	0.154036	0.771489	-0.220021681	8336369
IWM	0.100172	0.231303	0.530251	-0.319116433	30274302
QQQ	0.174705	0.233564	0.809474	-0.351187189	48826555
SPY	0.160846	0.175168	0.943159	-0.24496388	75397317
TLT	-0.10178	0.162078	-0.5843	-0.48351142	26635893

Source: Author analysis

Next, we generate a Sankey diagram of the criteria's influence. It illustrates the impact of each criterion's weighted ranks on ticker evaluation. The Weighted Preference Flow Diagram illustrates the impact of Max Drawdown, Liquidity, Sharpe Ratio, Volatility, and CAGR on ETF rankings within a visually enhanced multi-criteria decision-making framework. The width of the flow lines indicates the choice or weight of each criterion-ETF linkage. SPY and QQQ have useful inflows across multiple performance parameters, illustrating return efficiency and risk minimization. Despite lower returns, Volatility and Max Drawdown enhance TLT's low-risk profile. Fragmented support for GLD and IWM implies niche strengths but poor balance. This Sankey-style graphic supports the parallel coordinates plot and improves the SRP framework's ability to visualize cost-benefit trade-offs for ETF selection under uncertainty. From the view of structured decision-making framework, the relative influence and weight distribution of each criterion can be understood. This also supports the research goal of implementing the SRP-FPO fuzzy

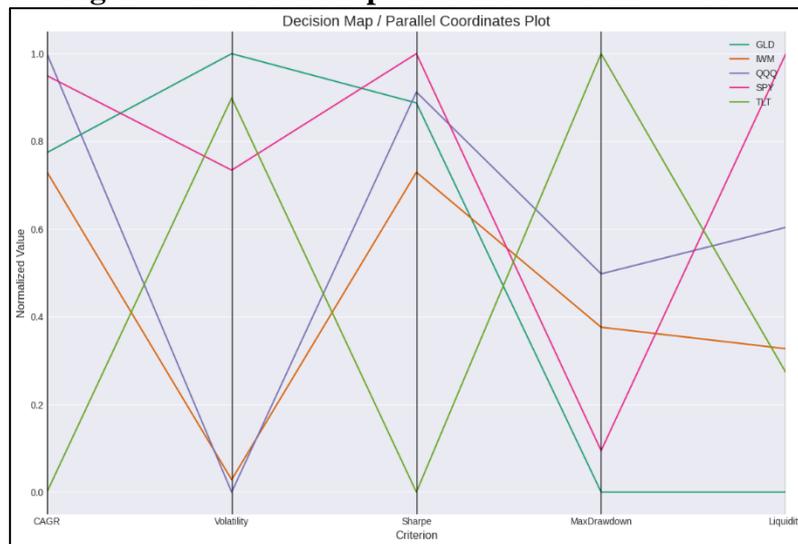
model to systematically integrate multi-criteria financial indicators for transparent portfolio ranking under uncertainty (see Figure 4).

Figure 4: Weighted Preference Flow Diagram



Source: Author analysis

We also create a Decision map / parallel coordinates plot. The decision map visualization is useful for showing the trade-offs between criteria for each ticker and how they perform across all criteria simultaneously on a normalized scale. The parallel coordinates plot presents a nuanced comparative analysis of five key ETFs—SPY, QQQ, TLT, IWM, and GLD—based on normalized values across critical investment metrics: CAGR, volatility, Sharpe ratio, maximum drawdown, and liquidity. SPY emerges as the most balanced and efficient asset, blending substantial return potential with robust risk-adjusted performance and liquidity, while QQQ also reflects this efficiency, but with increased drawdowns. TLT is effective in reducing volatility and drawdown; although it falls short in return creation, leaving it a prudent hedge. GLD and IWM exhibit disjointed profiles characterized by trade-offs between return and risk. The visualization underlines the SRP model's ability to include multi-criteria evaluation, revealing hidden patterns in cost-benefit trade-offs among various asset classes. The figure underscores the comparative trade-offs between investment options, providing for the simultaneous assessment of market accessibility, risk, and return within a multi-criteria framework. This visualization supports the research goal of using the SRP-FPO fuzzy model to methodically evaluate portfolio opportunities under uncertain financial conditions (refer to Figure 5).

Figure 5: Decision Map / Parallel Coordinates Plot

Source: Author analysis

Step 4: Aggregation of weighted scores

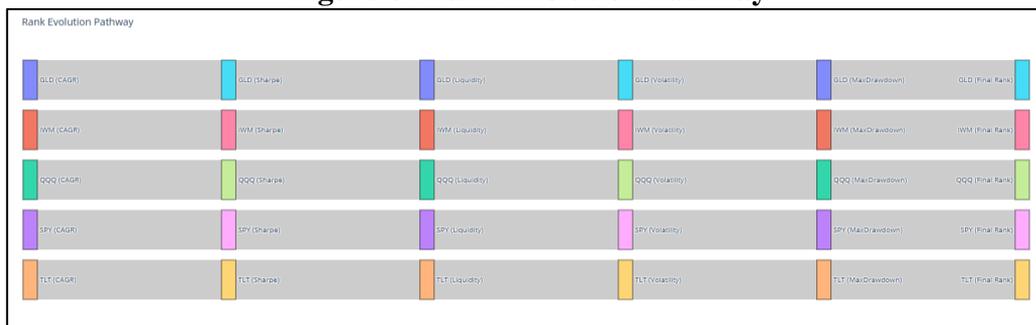
The next part of the analysis includes a table showcasing the final ranking of the tickers determined by the cost-benefit analysis, primarily the aggregate of weighted ranks. The Simple Ranking Process (SRP) model has been used for assessing five financial instruments—SPY (S&P 500 ETF), QQQ (NASDAQ-100 ETF), TLT (long-duration Treasury Bonds), IWM (Russell 2000 ETF), and GLD (Gold ETF)—by examining cost-benefit efficiency utilizing weighted rank sums. SPY gained the highest ranking with a score of 32, indicating outstanding performance in terms of return, risk, and cost metrics. Also, QQQ, with a second-place ranking, exhibited significant growth potential. TLT and IWM demonstrated moderate efficiency, likely influenced by their distinct risk-return profiles. GLD is placed at the lowest rank, suggesting minimal benefits about cost based on the selected criteria. The SRP results demonstrate the predominance of large-cap equity ETFs, specifically SPY and QQQ, for achieving optimal returns adjusted for risk in a diversified investment framework. The weighted rank sums integrate multiple evaluation criteria—CAGR, volatility, Sharpe ratio, maximum drawdown, and liquidity—to construct a systematic order among the investment alternatives. The results demonstrate the effectiveness of the proposed structure in providing an understandable and systematic multi-criteria portfolio ranking under financial uncertainty, which fulfills the primary research objectives (see Table 9).

Table 9: Final rank of tickers

Ticker	Weighted Rank Sum	Final Rank
SPY	32	1
QQQ	35	2
TLT	48	3
IWM	51	4
GLD	59	5

Source: Author analysis

Figure 6: Rank Evolution Pathway



Source: Author analysis

Step 5: Rank flow diagram

The Sankey diagram reflects the path of ranking of each ticker through the different criteria while reaching the goal of the final rank. It visualizes the rank evolution pathway for five ETFs across six evaluation criteria, culminating in a final SRP ranking. The multi-dimensional performance of each ETF—GLD, IWM, QQQ, SPY, and TLT—is demonstrated by a systematic transformation through ranks in CAGR, Sharpe, liquidity, volatility, and max drawdown. Observations indicate that GLD retains strong rankings across all metrics, which contributes to its favourable final rank. In contrast, TLT and SPY constantly lag, signalling their role in suboptimal trade-offs in terms of risk-adjusted returns. The illustration emphasizes the process by which certain ETFs achieve final dominance by optimizing returns and stability, allowing investors with an evidence-based pathway to optimize portfolio selection using SRP methodology. It highlights the incremental development of the criteria within the Structured Ranking Process, emphasizing the role of unique outcome indicators to the comprehensive portfolio ranking. This supports the research objective of using the SRP-FPO fuzzy framework to

provide an understandable and systematic ranking of investment alternatives under financial uncertainty (refer to Figure 6).

4.2. Risk-adjusted returns

Another important determinant, the Sharpe ratio, ranks SPY as the best risk-adjusted return, with QQQ and GLD following closely. TLT ranks bottom with a negative Sharpe ratio, indicating poor risk-reward performance. It also enables portfolio managers to select capital-efficient assets such as SPY and QQQ while avoiding low-yield, high-risk instruments such as TLT to obtain the greatest performance. These metrics collectively capture the various aspects of portfolio evaluation by integrating return potential, risk exposure, downside stability, and market tradability. The table provides an empirical basis for the SRP-FPO fuzzy multi-criteria framework, supporting the research's for systematically ranking investment alternatives under financial uncertainty (see Table 10).

Table 10: Risk-adjusted returns

Ticker	CAGR	Volatility	Sharpe	MaxDrawdown	Liquidity
SPY	0.160464	0.175139	0.942077	-0.244964	7.54E+07
QQQ	0.175586	0.23353	0.813342	-0.351187	4.88E+07
GLD	0.106739	0.154086	0.739091	-0.220022	8.32E+06
IWM	0.098396	0.231151	0.523748	-0.319116	3.03E+07
TLT	-0.101583	0.162136	-0.583224	-0.483511	2.67E+07

Source: Author analysis

5. Conclusion and Implications

This study employs the Simple Ranking Process (SRP) to analyze five popular ETFs—GLD, IWM, QQQ, SPY, and TLT—based on five investment criteria: CAGR, Volatility, Sharpe Ratio, Maximum Drawdown, and Liquidity. Figure 1 shows the five-step analysis: creating a criteria matrix, normalizing values, applying weights based on prioritized relevance (Table 1), and aggregating decision matrix scores (Table 2). SPY performed best with strong returns, minimal volatility, and high liquidity. However, volatility hurt QQQ's performance. TLT remained the weakest given its negative CAGR and significant drawdowns. These insights help business and portfolio managers enhance return while

limiting risk, strengthening data-driven ETF selection strategies linked with financial goals and market conditions.

Some of the major implications of the proposed model can be:

- **Strategic Portfolio Allocation:** The better risk-adjusted returns of SPY and QQQ provide investors and asset managers with the opportunity for the maximization of long-term goals with minimized drawdowns.
- **Product Positioning and Advisory:** Using Sharpe-based rankings, financial advisors can customize investment recommendations, warning against underperformers like TLT and highlighting SPY and QQQ for moderate-to-aggressive risk profiles.
- **Liquidity-Driven Trading Strategy:** High liquidity trends of SPY and QQQ may encourage bulk trading for Institutional investors.
- **Risk Mitigation Planning:** ETFs like TLT with negative Sharpe ratios and big drawdowns reflect signs for diversification into safer assets or risk buffers.
- **Data-Driven Investment Products:** Multi-criteria performance analysis frameworks (CAGR, volatility, Sharpe) can be integrated development of fund houses, to create smart-beta or thematic ETFs.

Data Collection Statement

The financial data used in this study were collected from Yahoo Finance (<https://finance.yahoo.com/>), a reputable and publicly accessible financial data platform widely used in academic and industry research. The selected assets include SPY (S&P 500 ETF), QQQ (NASDAQ-100 ETF), TLT (20+ Year Treasury Bond ETF), GLD (Gold ETF), and IWM (Russell 2000 ETF). Historically, closing prices, returns, and associated metrics were retrieved for portfolio performance evaluation under uncertainty. Data extraction and pre-processing were conducted using the Python library yfinance (<https://finance.yahoo.com/>). Supplementary analysis and statistical computations were performed using standard libraries, including pandas, numpy, and matplotlib.

Conflict of Interest

The author declares no conflict of interest related to this study.

Author Contribution Statement

The author solely conducted all aspects of this research, including conceptualization, methodology, data analysis, manuscript writing, and final approval of the version to be published.

Disclosure Statement

The author received no financial support or sponsorship from any organization for the conduct and publication of this study. The research was carried out independently.

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Appendix A: Raw Decision Matrix

The initial decision matrix contains the financial indicators used to evaluate the ETF alternatives.

Criteria classification

- a. Benefit criteria
 - CAGR

- Sharpe Ratio
- Liquidity
- b. Cost criteria
 - Volatility
 - Maximum Drawdown

Table A1: ETF Alternatives

Ticker	CAGR	Volatility	Sharpe	MaxDrawdown	Liquidity
SPY	0.160464	0.175139	0.942077	-0.244964	7.54E+07
QQQ	0.175586	0.23353	0.813342	-0.351187	4.88E+07
GLD	0.106739	0.154086	0.739091	-0.220022	8.32E+06
IWM	0.098396	0.231151	0.523748	-0.319116	3.03E+07
TLT	-0.101583	0.162136	-0.583224	-0.483511	2.67E+07

Source: Author analysis

Appendix B: Normalization Procedure

To ensure comparability across criteria, the decision matrix is normalized.

Benefit Criteria

$$N_{ij} = \frac{X_{ij}}{\max(X_j)} \quad (\text{B1})$$

Cost Criteria

$$N_{ij} = \frac{\min(X_j)}{X_{ij}} \quad (\text{B2})$$

where,

X_{ij} = value of alternative i under criterion j

N_{ij} = normalized value

Appendix C: Fuzzy Membership Transformation

Normalized values are converted into linguistic categories using fuzzy logic proposed by Lotfi A. Zadeh.

Table C1: Fuzzy Score

Normalized Value	Linguistic Variable	Fuzzy Score
0.0–0.2	Very Low	1
0.2–0.4	Low	2
0.4–0.6	Medium	3
0.6–0.8	High	4
0.8–1.0	Very High	5

Source: Author Analysis

These fuzzy values capture uncertainty and qualitative interpretation of financial performance indicators.

Appendix D: Criterion Ranking Matrix

After fuzzy transformation, ETFs are ranked under each criterion.

Table D1: Criterion Ranking Matrix

Ticker	CAGR Rank	Sharpe Rank	Liquidity Rank	Volatility Rank	Drawdown Rank
SPY	2	1	1	2	2
QQQ	1	2	2	4	4
GLD	3	3	5	1	1
IWM	4	4	3	5	3
TLT	5	5	4	3	5

Source: Author analysis

Appendix E: Weighted Rank Aggregation

The final ranking is obtained using the Structured Ranking Process (SRP) aggregation method based on weighted ranks introduced by Ralph W. Edwards.

$$WR_i = \sum_{j=1}^n w_j R_{ij} \tag{E1}$$

where:

WR_i = weighted rank score of alternative i

w_j = weight of criterion j

R_{ij} = rank of alternative i under criterion j

Appendix F: Final Ranking Outcome

The results demonstrate that SPY achieves the highest overall ranking, reflecting superior risk-adjusted performance and liquidity characteristics.

Table F1: Final Ranking Outcome

Ticker	Weighted Rank Sum	Final Rank
SPY	32	1
QQQ	35	2
TLT	48	3
IWM	51	4
GLD	59	5

Source: Author analysis

A Comparative Analysis of Stock Market Performance in USA, China, Japan, and India (2020–2025): Risk, Return, and Global Investment Insights

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Abstract

This paper presents a comparative analysis of the equity market performance of four major global economies: USA, China, Japan, and India, over a five-year period from June 2020 to June 2025. Using MSCI country-specific indices as proxies, the study evaluates and contrasts these markets based on weekly return data through various performance metrics. These metrics include descriptive statistics, return measures, risk-adjusted indicators (such as the Sharpe Ratio and Jensen's Alpha), exchange rate impacts, rolling volatility, and maximum drawdown analysis. The results reveal that India delivered the highest average and risk-adjusted returns with the lowest volatility. In contrast, China displayed negative returns and the highest market instability. The U.S. and Japan demonstrated relatively stable performance with moderate drawdowns and positive correlation with other markets. Furthermore, the study accounts for exchange rate fluctuations to assess USD-adjusted returns for global investors, highlighting the considerable erosion in Japanese returns due to currency depreciation. This study contributes to the global portfolio management literature by providing performance differentials, risk-adjusted returns, and currency-adjusted outcomes, thereby acting as a guide for investment strategies and diversification decisions across developed and emerging markets in light of recent shifts and evolving trends in global equity markets.

Keywords: Stock market, Comparative Analysis, Risk & Returns, Emerging and Developed Markets, MSCI Indices

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1. Introduction

With globalization and advances in financial technology, investing across international markets have become significantly more accessible to both institutional and retail investors. This has opened up opportunities for investors to invest across different markets, taking advantage of higher returns and diversification. In this case, understanding of different markets becomes important so that one can make an informed decision about where to invest their funds. This paper aims to solve this problem by comparing the stock markets of four major economies - USA, China, Japan, and India.

The five-year period from June 2020 to June 2025 is particularly significant for such a comparison. This period captures the recovery from the COVID-19 pandemic shock, divergent monetary policy cycles across major economies, escalating geopolitical tensions, and a sharp divergence in economic outcomes. During this period, the Indian equity market delivered a holding period return of 140.6% and a CAGR of 19.2%, making it one of the strongest performing major markets globally. The U.S. market returned 95.4% (CAGR: 14.3%) and Japan returned 84.2% (CAGR: 13.0%). In contrast, China posted a negative return of -23.7%, reflecting the impact of its property sector crisis, regulatory tightening, and subdued domestic consumption. These divergent outcomes make this period an exceptionally rich one for comparative analysis.

Prior research has documented performance differentials across global markets. Gupta et al. (2020), analyzing seven markets from 2007 to 2017 using descriptive statistics and VAR models, found that India's market outperformed both the U.S. and other Asian markets in terms of returns. Similarly, Magas (2007), in a longitudinal study of international equity investing spanning 1997 to 2007, confirmed the theoretical benefits of global diversification but cautioned that rising market correlations and persistent currency risks could erode these benefits over time. However, both of these studies predate the COVID-19 pandemic and do not account for the structural shifts that have reshaped global equity markets since 2020. This study addresses that gap by providing an updated, post-COVID comparative analysis for the period 2020 to 2025.

The selection of these four specific markets is also deliberate and justified on several grounds. Regarding country selection, rather than covering a large number of markets

superficially, this study deliberately limits its scope to four markets in order to enable a more rigorous and multi-dimensional analysis - covering return measures, risk-adjusted metrics, exchange rate impact, rolling volatility, and maximum drawdown within a single framework. Within this constraint, the four markets are chosen to represent a genuinely diverse sample. The USA and Japan represent developed economies, while China and India represent the two largest emerging economies by GDP. This ensures that the comparison spans both ends of the development spectrum. Beyond the developed-emerging divide, each market also brings distinct characteristics. Japan is widely known for its unique market behaviour driven by decades of near-zero interest rates, yen carry trade dynamics, and high domestic institutional ownership, making it an important case to include. China, on the other hand, represents the high-risk end of the emerging market spectrum and has gone through significant structural challenges over the last five years including a property sector crisis, regulatory tightening on private enterprise, and geopolitical tensions making it an important stress test case. India represents the high-growth emerging market with strong domestic consumption and rising retail investor participation. The USA anchors the sample as the world's largest and most liquid equity market.

This paper addresses the following research questions: (1) Which market delivered the highest risk-adjusted returns during 2020–2025? (2) How do exchange rate fluctuations affect returns for USD-based global investor? (3) What are the downside risk characteristics of each market in terms of rolling volatility and maximum drawdown? To answer these questions, MSCI country indices are used as proxies for each market, ensuring methodological consistency across all four economies. The analysis employs descriptive statistics, Sharpe Ratio, Jensen's Alpha, exchange rate-adjusted returns, 12-week rolling volatility, and maximum drawdown analysis. The key findings indicate that India delivered the highest risk-adjusted returns across all measures, while China underperformed significantly. Japan's strong local currency returns were substantially eroded by yen depreciation when viewed from a USD perspective.

The rest of this paper is organised as follows: Section 2 reviews the existing literature. Section 3 identifies the research gap and states the objectives of the study. Section 4 describes the methodology, including data sources, index selection, and the analytical framework. Section 5 provides details on the indices used. Section 6 presents the results

and discussion across all parameters. Section 7 concludes with key findings and investment implications.

2. Literature Review

The existing research on global stock markets provides valuable insights into comparative performance, market integration, and the return dynamics of developed versus emerging economies. The studies reviewed here are organised around three themes that are directly relevant to this paper: comparative market performance across countries, the integration of global markets and its implications for risk and return, and the performance characteristics of emerging versus developed markets.

2.1. Comparative Market Performance

A significant body of research has examined how stock markets of different countries perform relative to each other. Gupta et al. (2020) analyzed seven stock markets from 2007 to 2017 using descriptive statistics and VAR models and concluded that Indian markets outperformed both U.S. and other Asian markets in returns. This finding is particularly relevant to the present study, which examines whether Indian market outperformance is continued and strengthened during recent 2020 to 2025 period. Similarly, Mukherjee (2007), in a comparative study of six major exchanges, found increasing integration between Indian markets (BSE/NSE) and global counterparts such as NYSE and TSE, while also documenting return differentials across these markets. Gajera (2020), expanding the analysis to 16 global indices, confirmed that despite geographic and economic differences, significant correlation exists in daily returns across markets; a finding that raises question of whether correlated markets can still deliver meaningfully different risk-adjusted returns, which this study directly examines.

Collectively, these studies establish that performance differentials across global markets are real and measurable. However, they are largely limited to the pre-COVID period and do not employ a unified index framework across all four markets covered in this study.

The use of MSCI indices for all four countries in the present study addresses this methodological limitation by ensuring that the comparison is made on a consistent basis.

2.2. Market Integration and Its Implications for Risk and Return

A separate but related set of research focuses on the degree to which global markets have become integrated, and what this means for investors. Lobo and Wong (2006), employing a Fractionally Integrated Vector Error Correction Model with multivariate GARCH, revealed complex interdependence patterns among the U.S., Indian, and Chinese markets. Their research identified U.S. market dominant role in influencing other markets while also showing reciprocal effects between Indian and Chinese markets. Ademmer et al. (2022) provided more recent evidence of growing interconnectedness, showing that spillovers from U.S. market to both eurozone and emerging economies had intensified following the 2008 financial crisis. Yi and Tan (2009), examining post-liberalization integration in Singapore and Malaysia, found that market linkages were more pronounced when measured against regional and global benchmarks rather than individual country indices, suggesting that systematic risks are better captured through composite indices.

These integration findings carry a direct implication for the present study. If markets are increasingly correlated, then return differentials across them must reflect genuine differences in risk-adjusted performance rather than simply different exposures to unrelated local factors. This is precisely what this study examines through Sharpe Ratio and Jensen's Alpha; whether India and other markets delivered returns that were superior not just in magnitude but also after accounting for the level of risk taken and the global market benchmark. The growing integration documented by these studies also reinforces the relevance of maximum drawdown analysis, since Ademmer et al. (2022) showed that shocks can transmit rapidly across borders, making downside risk assessment increasingly important for global investors.

2.3. Developed vs Emerging Market Dynamics and Currency Risk

A third important area of literature examines the performance characteristics specific to emerging versus developed markets, and the role of currency risk in international

investing. Magas (2007), in a longitudinal study of international equity investing from 1997 to 2007, confirmed the theoretical benefits of global diversification while noting that increasing market correlations and persistent currency risks could diminish these advantages over time. This observation is directly tested in the present study, where exchange rate-adjusted returns are computed for all four markets to assess whether the benefits of investing in high-return markets like India are preserved after accounting for currency movements. Roszkowska and Langer (2019) demonstrated that emerging markets like Poland offered greater potential for abnormal returns compared to advanced markets like the U.S., particularly when accounting for size and profitability factors. This raises the question of whether emerging markets like India and China delivered similar outperformance during 2020 to 2025, or whether the COVID and post-COVID environment disrupted this pattern.

At a more specific level, Nagarkar and Rao (2017), in a sector-level study of pharmaceutical companies in India, found that domestic firms consistently outperformed multinational corporations in terms of financial returns. While this study focuses on a specific sector rather than the broader market, it reinforces the broader point that returns differentials, whether at the sector or market level are driven by structural differences in business models, growth drivers, and risk exposures. The present study extends this logic to the aggregate market level, comparing index-level performance across four economies.

3. Research gap and objectives

While the above studies provide valuable insights into global equity market performance, there are several gaps remaining that this study seeks to address. First, most existing comparative studies are limited to the pre-COVID period. The 2020 to 2025 period represents a structurally distinct phase in global markets; characterised by pandemic-driven dislocations, aggressive monetary policy shifts, rising geopolitical tensions, etc. No existing study has examined the comparative performance of these four markets specifically within this period.

Second, existing studies rarely employ a unified index framework across all four markets simultaneously. The use of different indices or data sources across studies makes direct

comparison difficult. The present study uses MSCI indices for all four countries, which are constructed using the same methodology - market capitalization weighting covering approximately 85% of the free float-adjusted market, ensuring that the comparison is genuinely like-for-like.

Third, most studies examine either return metrics or risk metrics, but do not combine them with currency-adjusted outcomes and downside risk measures in a single framework. The present study addresses this by integrating return analysis (HPR, CAGR), risk-adjusted return measures (Sharpe Ratio, Jensen's Alpha), exchange rate-adjusted USD returns, and downside risk analysis (rolling volatility and maximum drawdown) within a single comparative study, aiming to provide a comprehensive understanding.

Given this background, the objectives of this paper are: (1) to compare the risk and return profiles of the equity markets of USA, China, Japan, and India over the period June 2020 to June 2025 using MSCI indices; (2) to evaluate risk-adjusted performance using Sharpe Ratio and Jensen's Alpha across the four markets; (3) to assess the impact of exchange rate fluctuations on USD-adjusted returns for global investors; and (4) to analyse downside risk through 12-week rolling volatility and maximum drawdown analysis. Through these objectives, this study aims to provide a practical guide for investors and researchers seeking to understand recent trends and performance differentials across these four major equity markets.

4. Methodology

Stock markets of these four economies are compared using Indices. To ensure uniformity and similarity in comparison, MSCI index of all four countries was selected.

Time Frame & Data Collection – Analysis is performed on the weekly data of 5 years from 30 June 2020 to 30 June 2025, which helps in analyzing the recent trend in the market. Historical data related to prices is collected from 'Investing.com'. Other historical data, such as risk-free rate, MSCI ACWI price, and exchange rate, used in the specific sections are also extracted from 'Investing.com'.

The data was analyzed based on various parameters such as:

4.1. Statistical Description

This section includes mean, median, maximum, minimum, percentiles, standard deviation, and mean deviation, coefficient of variation, skewness, kurtosis, Jarque-Bera test, and correlation. Weekly returns for each index are computed as:

$$R_t = (P_t / P_{t-1}) - 1 \quad (1)$$

where R_t is the return in week t , P_t is the closing price at end of week t , and P_{t-1} is the closing price at end of the previous week.

Coefficient of Variation (CV) is computed as:

$$CV = \text{Standard Deviation} / \text{Mean Return} \quad (2)$$

CV measures the risk per unit of return. A lower CV indicates a more efficient return profile relative to risk.

Jarque-Bera (JB) test statistic is used to assess normality of the return distribution:

$$JB = n \times [(S^2 / 6) + (K^2 / 24)] \quad (3)$$

where n is the number of observations, S is the skewness, and K is the (raw kurtosis minus 3). The p-value is obtained from a chi-squared distribution with 2 degrees of freedom. A p-value below 5% indicates the distribution is non-normal.

Pearson's correlation coefficient is used to measure the linear relationship between the weekly returns of two markets:

$$\rho(X, Y) = \text{Cov}(X, Y) / (\sigma_X \times \sigma_Y) \quad (4)$$

where $\text{Cov}(X, Y)$ is the covariance between the weekly returns of markets X and Y , and σ_X , σ_Y are their respective standard deviations.

4.2. Return Analysis

General Return Measures: Holding Period Return (HPR) measures the total return generated over the full five-year study period:

$$HPR = (Ending\ Price / Beginning\ Price) - 1 \quad (5)$$

Annualized Return (CAGR) standardizes the holding period return to an annual basis:

$$CAGR = (Ending\ Price / Beginning\ Price)^{(1/n)} - 1 \quad (6)$$

where n is the number of years (5 years in this study).

Risk-Adjusted Returns: The following Risk-adjusted returns measures are estimated:

- **Sharpe Ratio:** Sharpe Ratio measures the risk premium earned per unit of total risk (standard deviation). Generally, the higher the Sharpe ratio, the more attractive the risk-adjusted return. The formula is:

$$Sharpe\ Ratio\ (Weekly) = (Rp - Rf) / \sigma_p \quad (7)$$

where:

R_p = mean weekly return of the index

R_f = weekly risk-free rate, derived by dividing the annualized 10-year government bond yield of the respective country by 52

σ_p = standard deviation of weekly returns

For risk-free rate, 10-year government bonds of respective countries are taken into account. For fair comparison, average return of government bond (over last 5 years) is taken, instead of picking the data at the start or end of the analyzed period, as during last 5 years, interest rate has increased significantly especially for the USA, where the rate in June 2020 was around 0.66% that rose to 4.23% which is significant to deteriorate the fair comparison. The weekly Sharpe Ratio is annualized using:

$$Sharpe\ Ratio\ (Annual) = Sharpe\ Ratio\ (Weekly) \times \sqrt{52} \quad (8)$$

- **Jensen Alpha:** Jensen Alpha is used to measure the excess return earned by an index (in our case) over and above the returns implied by the capital asset pricing

model (CAPM). If the alpha is positive, it means that the asset outperforms the market or benchmark.

For computing market returns and beta coefficients, we adopted the MSCI All Country World Index (ACWI) as our primary benchmark. Unlike the MSCI World Index, which covers only developed markets (DMs), the ACWI provides comprehensive exposure to both developed (23 countries) and emerging markets (24 countries), including all four focus markets of this study (USA, Japan, China, and India).

So, Beta (β) for each country index is estimated by regressing the weekly index returns against the weekly returns of the MSCI All Country World Index (ACWI):

$$\beta = \text{Cov}(R_i, R_m) / \text{Var}(R_m) \quad (9)$$

where R_i is the weekly return of the country index and R_m is the weekly return of the MSCI ACWI. Beta is estimated using ordinary least squares (OLS) regression.

CAPM-implied expected return is:

$$E(R_i) = R_f + \beta \times (R_m - R_f) \quad (10)$$

Jensen's Alpha is then computed as:

$$\alpha = R_i - E(R_i) = R_i - [R_f + \beta \times (R_m - R_f)] \quad (11)$$

where R_i is the actual mean weekly return of the index. The weekly alpha is annualized as:

$$\text{Annual Alpha} = (1 + \text{Weekly Alpha})^{52} - 1 \quad (12)$$

Exchange Rate Risk Assessment: To assess performance from the perspective of a USD-based offshore investor, local currency returns are adjusted for exchange rate fluctuations using the following formula:

$$\text{USD-Adjusted Return} = (1 + \text{Local Currency Return}) \times (1 + \text{FXChange}) - 1 \quad (13)$$

where $FxChange$ represents the percentage depreciation of the local currency against the USD over the study period (June 2020 – June 2025), calculated as:

$$FxChange = (E_0 / E_T) - 1 \quad (14)$$

where E_0 is the exchange rate (local currency per USD) at the start and E_T at the end. Since rates are expressed as "local currency per 1 USD", a rise means local currency depreciation. So this correctly captures the depreciation from USD investor's perspective.

4.3. Risk Analysis

- **12-Week Rolling Volatility:** Rolling volatility is computed as the standard deviation of weekly returns over a trailing 12-week (approximately 3-month) window:

$$12\text{-week rolling volatility} = STDEV(R_{t-11}, R_{t-10}, \dots, R_t) \quad (15)$$

where R_t is the weekly return at time t . This rolling measure captures how volatility evolves over the study period, unlike the single overall standard deviation which provides only a static snapshot.

- **Maximum Drawdown Analysis:** A maximum drawdown (MDD) represents the largest observed decline in the value of an investment from its peak to its subsequent lowest point, before a new peak is attained. It quantifies the maximum downside risk of an investment portfolio across a given period (in our case, it's 5 years). The drawdown at each point in time is calculated as:

$$Drawdown = (P_t - Peak_t) / Peak_t \quad (16)$$

where P_t is the index price at time t and $Peak_t$ is the highest index price observed from the start of the period up to time t (running maximum). The Maximum Drawdown is:

$$MDD = \min(Drawdown) \text{ for all } t \text{ in the study period} \quad (17)$$

The recovery period is measured as the number of calendar days from the trough date to the date when the index first returns to its pre-drawdown peak value.²

5. About the Index

The use of MSCI Indices will ensure consistency and fair comparison as selection methodology is quite similar for all. The MSCI USA Index measures the performance of the large and mid cap segments of the US market. With 547 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in the US.

The MSCI China Index captures large and mid-cap representation across China A shares, H shares, B shares, Red chips, P chips, and foreign listings (e.g. ADRs). With 558 constituents, the index covers about 85% of this China equity universe. The MSCI Japan Index is designed to measure the performance of the large and mid-cap segments of the Japanese market. With 183 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in Japan.

The MSCI India Index is designed to measure the performance of the large and mid-cap segments of the Indian market. With 158 constituents, the index covers approximately 85% of the Indian equity universe.

Table 1: Index Description

Country	Index	Method	No. of Constituents	Highest Weight Sector
USA	MSCI USA	Market Cap.	547	Information Technology (32.95%)
CHINA	MSCI China	Market Cap.	558	Consumer Discretionary (28.91%)
JAPAN	MSCI Japan	Market Cap.	183	Industrials (24.11%)
INDIA	MSCI India	Market Cap.	158	Financials (29.64%)

Source: Author analysis

6. Results and Discussion

6.1. Statistical Description

The summary of descriptive statistics of returns of four stock markets of USA, China, Japan, and India for the period of five years from June 2020 to June 2025 is shown in

² The complete dataset and calculations are available with the author, available upon request.

Table 2. It includes mean, median, maximum, minimum, percentile, standard deviation, mean deviation, coefficient of variation, skewness, kurtosis, and Jarque-Bera test.

Table 2: Statistical Description of Weekly Returns

Statistical Tool	MSCI			
	USA	CHINA	JAPAN	INDIA
Mean	0.29%	-0.04%	0.26%	0.36%
Median	0.43%	-0.23%	0.29%	0.56%
Max	7.60%	16.90%	8.34%	7.68%
Min	-9.15%	-9.60%	-10.28%	-5.69%
95%percentile	4.10%	5.93%	3.84%	3.16%
5%percentile	-3.37%	-6.08%	-2.95%	-3.39%
Standard deviation	0.0238	0.0373	0.0235	0.0202
Mean deviation	1.81%	2.90%	1.78%	1.59%
Coefficient of variation	8.3067	-105.6479	8.9322	5.6348
Skewness	-0.0924	0.3684	-0.2949	-0.3015
Excess kurtosis	1.1589	1.4283	1.6205	0.5584
No. Of observation	260	260	260	260
Jarque-Bera test	14.919	27.981	32.218	7.316
P-value	0.06%	0.00%	0.00%	2.58%

Source: Author Compilation

It was seen for the sampled period in Table 2 that the Indian Stock Market has the highest mean return of 0.359% whereas China has posted a negative mean return of -0.035%. The max, min, and percentiles show the range of deviation, which is an indication of volatility. Based on that, China has highest max and min figures showing high volatility, and same can be seen in standard deviation. India has been least volatile with a standard deviation of 0.0202 and China was most volatile with 0.0373 during this period. Mean deviation is very similar to standard deviation, which shows that on an average return will deviate by this much percent from the mean return. So, in case of India on average, an individual return will deviate $\pm 1.591\%$ from the mean return of 0.359%, which is lowest among other compared countries. Skewness shows the symmetry of the distribution, so if skewness is zero, it means data is normally distributed. China is positively skewed, whereas all others are negatively skewed. Among all, USA is closest to normal distribution.

Kurtosis explains the peakness or flatness of a distribution compared to normal distribution. If kurtosis is positive, it means distribution has peakness; otherwise, negative kurtosis means flatness of distribution. All four countries have peakness compared with normal distribution, but it is lowest in case of India, standing at 0.5584. The Jarque-Bera test show that data is not normally distributed, which is generally the case with index and stock price data.

Table 3: Correlation Matrix [all are based on weekly figures]

RETURN CORRELATION	USA	CHINA	JAPAN	INDIA
USA	1			
CHINA	0.263	1		
JAPAN	0.528	0.321	1	
INDIA	0.47	0.269	0.457	1

Source: Author Compilation

Table 3 presents the return correlation matrix of four countries' stock exchanges. All the countries have a positive correlation with each other. That means the stock indices are moving in the same direction; if one index is going in a positive direction, then the other on average will also go towards positive direction. Japan has the highest positive correlation with USA of 0.528. Secondly, India and USA have a positive correlation of 0.470. Generally, it is believed that the Japanese market behaves differently in comparison to other markets because of its unique characteristics, but this correlation trend shows that Japan has shown a high degree of positive correlation with other markets during this period.

6.2. Return Analysis

6.2.1. General Return Measures

Returns are the primary objective of any investment. Holding period return tells the total return generated during the period (in our case, 5 years). As per Table 4, India has offered the highest return of 140.6% in past five years, whereas China has posted negative return during this period. After observing the return of China on annual basis, the major downturn in China was during 2021 to 2023 with negative returns of -27.7%, -18.5%, and

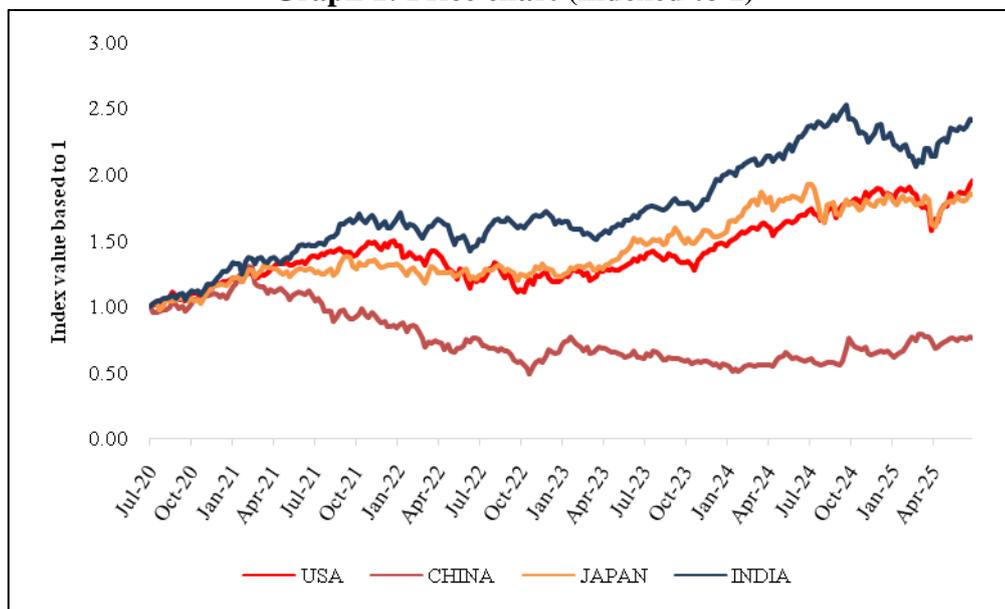
-26% respectively. A similar trend can be seen in annual CAGR, where Indian markets have grown at a rate of 19.2% CAGR.

Table 4: Return Measures

Particulars	USA	CHINA	JAPAN	INDIA
HOLDING PERIOD RETURN	95.40%	-23.70%	84.20%	140.60%
ANNUAL RETURNS (CAGR)	14.30%	-5.30%	13.00%	19.20%

Source: Author Compilation

Graph 1: Price chart (indexed to 1)



Source: Author Compilation

6.2.2. Risk-Adjusted Returns

Sharpe Ratio

Risk is another major component that needs to be paired with return while comparing, as normally all investors are risk-averse, who want to generate maximum return for a given level of risk. As per Table 5, India delivered the highest risk-adjusted performance among the four markets during the study period (2020–2025), with an annual Sharpe Ratio of 0.82, followed by Japan (0.78) and USA (0.69). This indicates that, after adjusting for risk, the Indian and Japanese markets offered superior returns per unit of volatility.

Table 5: Sharpe Ratio

Country	Weekly			Weekly	Annual
	Mean Return	Risk-free return	Standard Deviation	Sharpe Ratio	Sharpe Ratio
USA	0.29%	0.06%	0.0238	0.0958	0.6909
CHINA	-0.04%	0.05%	0.0373	-0.0231	-0.1665
JAPAN	0.26%	0.01%	0.0235	0.1079	0.7783
INDIA	0.36%	0.13%	0.0202	0.1132	0.8165

Source: Author Compilation

Jensen Alpha

As per Table 6, USA has the biggest beta of 1.08, showing the highest beta relative to the MSCI ACWI Index, mainly due to its dominant weight in the benchmark (around 64%). In contrast, India displayed low beta, reflecting limited co-movement with global trends. One reason for this is also the very small weightage in the index. Same can be seen in R-squared values, which are 93%, 16%, 38%, and 31% respectively for USA, China, Japan, and India. Low R-squared of China and India can also be interpreted as movements in these markets are coming from non-global drivers, which can be used for portfolio diversification. So overall, India has significantly outperformed the market with a Jensen Alpha of 8.65% (annual). This low correlation of Indian market and high return can be a good way to diversify the portfolio, reducing the risk because of low correlation with overall global market and high return, considering the emerging economy and stability.

Table 6: Jensen Alpha

Country	Weekly					Weekly	Annual
	Index Return	Risk Free Rate	Market Return	Beta	CAPM	Jensen Alpha	Jensen Alpha
USA	0.29%	0.06%	0.26%	1.0827	0.28%	0.01%	0.51%
CHINA	-0.04%	0.05%	0.26%	0.7122	0.20%	-0.24%	-11.51%
JAPAN	0.26%	0.01%	0.26%	0.6859	0.18%	0.08%	4.33%
INDIA	0.36%	0.13%	0.26%	0.5326	0.20%	0.16%	8.65%

Source: Author Compilation

6.2.3. Exchange Rate Risk Assessment

All return data used for this paper were initially computed in local currencies - MSCI USA in USD, MSCI China in HKD, MSCI Japan in JPY, and MSCI India in INR. Therefore, to assess exchange rate risk from the standpoint of a global (USD-based) investor, we have converted local returns in USD terms.

Table 7: Exchange Rate Risk Assessment

Particulars	USA (USD)	CHINA (HKD)	JAPAN (JPY)	INDIA (INR)
Mean	1	7.802	132.097	79.786
Standard Deviation	0	0.034	18.091	4.572
Max	1	7.85	160.83	87.627
Min	1	7.75	103.2	72.4
Return adjustment for exchange rate risk				
FX Change (Currency Depreciated by)	0.00%	-1.24%	-26.06%	-12.06%
Total Returns of Index	95.40%	-23.72%	84.16%	140.63%
USD Adjusted Returns	95.40%	-24.67%	36.17%	111.63%

Source: Author Compilation

As per Table 7, JPY exhibited the highest volatility ($\sigma = 18.091$), mainly because of interest rate divergence between Japan and USA (as the U.S. maintained high interest rates while Japan kept rates near zero, leading to yen depreciation). HKD remained stable ($\sigma = 0.034$) due to its USD peg. INR showed moderate volatility ($\sigma = 4.572$). The same can be viewed in FX Change, where JPY has depreciated by 26.06% in the last five years. USD has appreciated against all currencies (except itself), reducing foreign investor returns. USD adjusted return of Japan has drastically dropped from 84.16% to 36.17%. India returns have also fallen, but it still offers the highest return of 111.63%, making it remain highly attractive to USD-based investors.

6.3. Risk Analysis

6.3.1. 12-Week Rolling Volatility

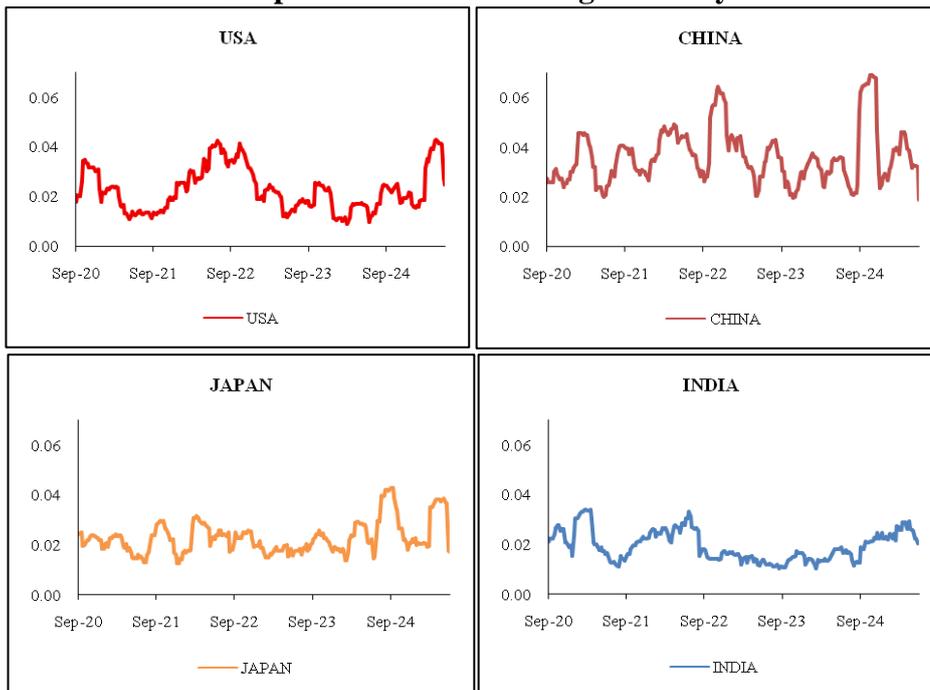
Observing Graph 2 showing 12-week rolling volatility, China seems to be most volatile, then USA, Japan, and India, respectively. Even the overall volatility also shows a similar result. China has a standard deviation of 0.0373, USA 0.0238, Japan 0.0235, and India 0.0202. So, India exhibited the lowest rolling 12-week volatility among all four indices during 2020–2025, suggesting a relatively stable return pattern despite being from an emerging market.

6.3.2. Maximum Drawdown Analysis

In USA (MSCI USA), the index peaked in late December 2021 before entering a sustained decline. The trough occurred in mid-October 2022, with a maximum drawdown

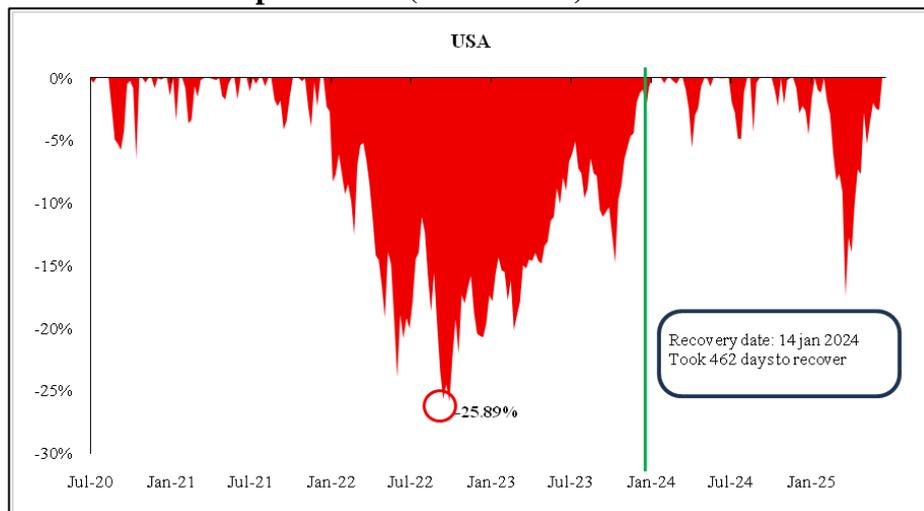
of -25.89% from the peak. Recovery to the pre-drawdown level was achieved by mid-January 2024, resulting in a 462-day recovery period. This protracted drawdown aligns with the Federal Reserve's aggressive monetary tightening cycle and elevated inflation during 2022–2023.

Graph 2: 12-Weeks Rolling Volatility



Source: Author Compilation

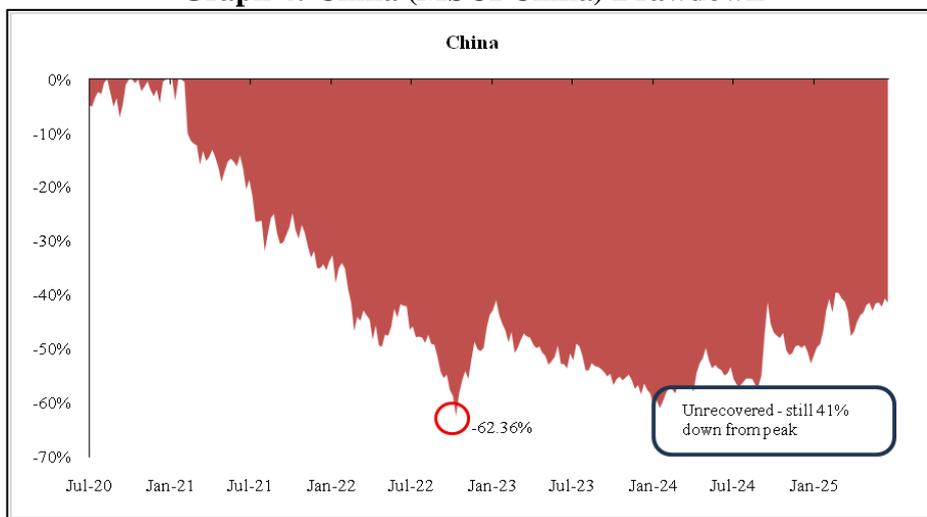
Graph 3: USA (MSCI USA) Drawdown



Source: Author Compilation

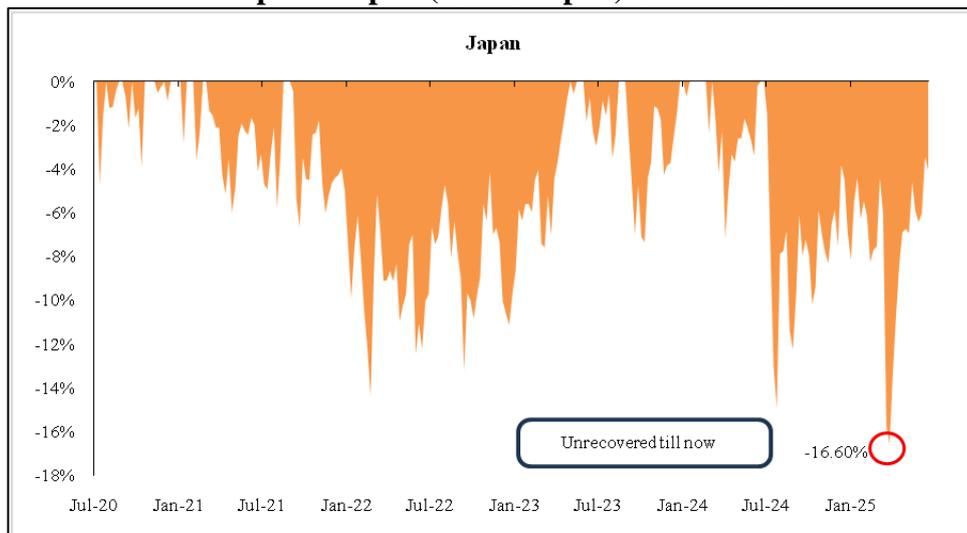
The Chinese market (MSCI China) reached its peak in the first week of February 2021, followed by a decline where the index bottomed in late October 2022 with a historic drawdown of -62.36%. Even after 980 days as of June 2025, the market remains 41.36% below its peak. The Chinese market performed very poorly in the last five years in comparison to other markets because of reasons like suppressed demand, property sector crisis, and geopolitical reasons.

Graph 4: China (MSCI China) Drawdown

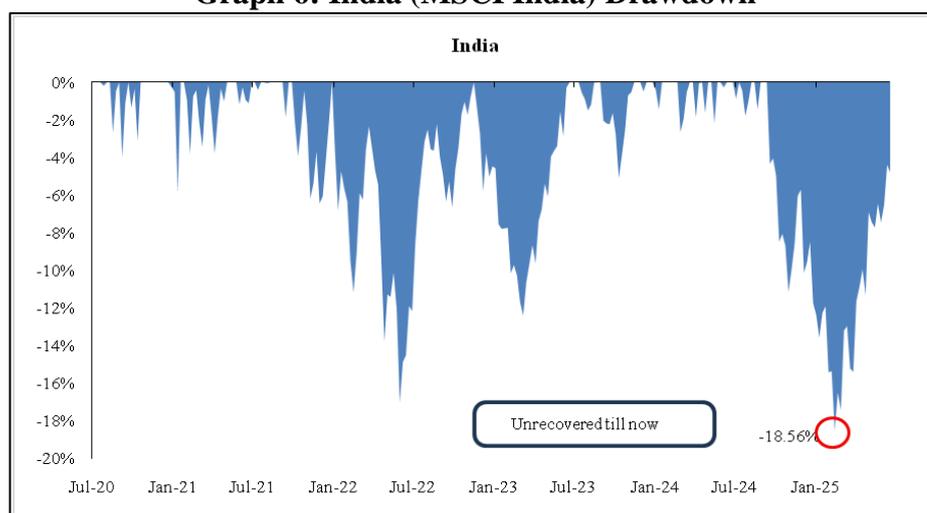


Source: Author Compilation

Graph 5: Japan (MSCI Japan) Drawdown



Source: Author Compilation

Graph 6: India (MSCI India) Drawdown

Source: Author Compilation

The MSCI Japan index peaked on 7 July 2024 before declining to a trough of -16.60% by April 2025. As of June 2025, the market remained 4.06% below its peak. Japan reached its drawdown very recently, around 3 months ago, so non-recovery in this short period is not substantial. Similarly, the Indian market (MSCI India) reached its peak in late September 2024, followed by a drawdown of -18.56% in late February 2025. Although this fall has not fully recovered, it is still 4.80% down, which is not substantial considering it's only 4 months from the drawdown point. So overall, USA, Japan, and India performed quite well with comparatively low down risk, whereas China has performed poorly during the last five years.

Table 8: Maximum Drawdown Summary

Country	Max Drawdown	Trough Date	Recovery Date	Days to Recover	% down as of June 2025
USA	-25.89%	09-10-2022	14-01-2024	462	-
China	-62.36%	23-10-2022	Unrecovered	-	-41.36%
Japan	-16.60%	06-04-2025	Unrecovered	-	-4.06%
India	-18.56%	23-02-2025	Unrecovered	-	-4.80%

Source: Author Compilation

7. Conclusion

This paper analyzed the equity markets of four major economies, namely USA, China, Japan, and India, using representative indices over a five-year period (June 2020 to June 2025). The key findings are as follows: (1) India exhibited the highest mean return and

the lowest volatility (standard deviation), while China recorded a negative mean return and the highest volatility among the four markets. (2) Japan showed a relatively high correlation with other markets, particularly with the USA, with a correlation coefficient of 0.528 during the period. (3) The annualized returns (CAGR) for the USA, China, Japan, and India were 14.3%, -5.3%, 13.0%, and 19.2%, respectively. (4) Risk-adjusted return measures also support these findings, with India achieving both the highest Sharpe Ratio and the highest Jensen's Alpha among the selected markets. (5) Exchange rate fluctuations had a considerable impact on USD-based investor returns. Japan's local return of 84.16% declined to 36.17% after adjusting for the USD-JPY exchange rate. In contrast, India's return fell from 140.63% to 111.63%, yet remained the highest among all the analyzed markets. (6) The maximum drawdown analysis revealed that the USA experienced a -25.89% drawdown, taking 462 days to recover. China had the most severe drawdown at -62.36%, which remained unrecovered as of June 2025. Japan and India experienced more moderate drawdowns of -16.60% and -18.56%, respectively.

So overall, the Indian equity markets have delivered exceptional performance during the analyzed period, characterized by high returns and relatively low volatility. Several structural and economic factors contribute to this performance. Firstly, India remains the fastest-growing major economy, with a projected GDP growth of 6.2% according to the International Monetary Fund (IMF). Unlike China, India has demonstrated resilience with no major geopolitical disruptions, thereby reducing country-specific risk. Another key driver of high returns has been the increased participation of domestic retail investors (both directly and through mutual funds), which has provided support and cushion during downturns. Furthermore, foreign institutional investors have also shown strong interest in Indian equities, drawn by the country's growth prospects and attractive return potential.

China's equity market performance over the last five years has been extremely poor, attributed to several key factors. Real GDP growth fell to between 2% and 5% after the COVID-19 shock, driven by weak household consumption because of the absence of direct household stimulus during and after the COVID-19 pandemic. Local government debt reached nearly 45% of GDP, limiting fiscal flexibility. The property sector saw a sharp downturn, with construction activity declining by more than 50%. At the same time, a shift toward state-led industrial policy and tighter regulatory control reduced private sector confidence and foreign investment inflows. China relies heavily on exports, which

heightened sensitivity to global trade tensions. These structural and policy-driven factors collectively constrained market performance during the period.

While past performance does not guarantee future returns, it remains a valuable barometer for assessing market behaviour and guiding investment decisions. This paper has tried to present the same by clearly analyzing and demonstrating this through a comparative analysis of equity markets during the period 2020 to 2025.

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Conflict of Interest

The author declares no conflict of interest in connection with the research, authorship, or publication of this paper.

Data Availability

The data used in this study were sourced from Investing.com and the MSCI website, both of which are publicly accessible.

Ethics Approval

This study uses publicly available secondary data and does not involve human subjects, animal research, or any sensitive personal information. Therefore, formal ethics approval is not applicable.

Author's Contribution

This paper is solely authored by Aaditya Kumar Bagri. The author was responsible for conceptualisation, data collection, analysis, and writing of the manuscript in its entirety.

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Cross-border Crowdfunding for SMEs in India: Opportunities and Challenges

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Abstract

This paper examines the hypothesis that cross-border crowdfunding can serve as a meaningful alternative finance instrument for Indian SMEs by easing persistent credit constraints and widening access to global capital. While traditional banking channels remain the primary source of external finance for most SMEs, collateral requirements, information asymmetries, and risk-averse lending practices continue to limit the flow of credit to young and growth-oriented firms. Cross-border crowdfunding offers a potential complement by allowing SMEs to raise funds from international investors through digital platforms, creating opportunities for diversified capital, market validation, and global visibility. The study employs a conceptual research methodology, relying exclusively on secondary data, including academic literature, regulatory documents, industry reports, and documented international crowdfunding cases. A thematic synthesis approach is used as the analytical tool to identify recurring patterns in the opportunities and challenges associated with this financing mechanism. The paper is structured as follows. The introduction outlines the SME financing landscape and positions cross-border crowdfunding within the broader discussion on alternative finance and capital structure. The literature review synthesizes existing research on SME credit constraints, crowdfunding models, cross-border investment flows, and regulatory frameworks. The results and analysis section presents the thematic analysis, highlighting key opportunities, such as access to foreign capital, diversification of funding sources, and enhanced

signaling effects, alongside challenges related to regulatory complexity, currency risk, investor protection norms, and capability requirements for global campaigns. The conclusion summarizes the findings and offers policy recommendations for strengthening the institutional environment needed for Indian SMEs to leverage cross-border crowdfunding effectively.

Keywords: Cross-border Crowdfunding; SMEs; India; Alternative finance; Opportunities and Challenges; Regulatory Environment

1. Introduction

Small and Medium Enterprises (SMEs) constitute the backbone of the Indian economy, contributing substantially to employment generation, innovation, and regional development. Despite their significance, SMEs frequently encounter major hurdles in securing external finance. Traditional mechanisms such as bank loans often remain difficult to access due to stringent collateral requirements, limited credit histories, procedural delays, and risk-averse lending practices. These structural constraints have encouraged interest in alternative sources of finance that can supplement domestic credit and better accommodate the needs of emerging enterprises.

Crowdfunding has emerged as one such instrument, enabling enterprises to raise capital digitally from a dispersed pool of individuals and institutions. Over time, various models of crowdfunding, including donation-based, reward-based, debt-based, and equity-based formats, have gained prominence across global markets (Belleflamme et al., 2014; Cumming & Johan, 2019). In recent years, attention has also shifted toward cross-border crowdfunding, which allows firms to access international investors rather than relying solely on domestic contributors. This model broadens the scope of fundraising and opens possibilities for higher capital mobilization, diversified funding sources, and improved global visibility for Indian SMEs (Crowdfunding Capital Advisors, 2021).

Despite its potential, the adoption of cross-border crowdfunding in India remains limited. Regulatory uncertainty, foreign exchange considerations, investor protection norms, and varying standards across jurisdictions pose significant barriers. At the same time, many

SMEs lack the institutional readiness, digital capabilities, and global outreach required to effectively engage international investors. These constraints raise an important question: to what extent can cross-border crowdfunding help bridge the financing gaps faced by Indian SMEs, and under what conditions might it serve as a viable complementary instrument to traditional finance?

This paper explores that question by examining the opportunities and challenges associated with cross-border crowdfunding for Indian SMEs. It synthesizes existing literature and international evidence to assess how this emerging mechanism fits within the broader SME financing landscape. The discussion also highlights conditions under which Indian SMEs may be better positioned to access foreign investor networks and navigate regulatory complexities.

The remainder of the paper proceeds as follows. The next section reviews existing literature on crowdfunding, cross-border financing, and SME financial constraints. This is followed by a conceptual discussion of the key opportunities and challenges associated with cross-border crowdfunding in the Indian context. The paper concludes with policy suggestions and practical implications for strengthening India's readiness to participate in global crowdfunding markets.

2. Literature Review

The concept of cross-border crowdfunding has gained scholarly attention as an innovative financing mechanism for SMEs aiming to overcome capital structure gaps. Cumming and Johan (2019) argue that cross-border crowdfunding enables firms to access international investor networks, enhancing both capital availability and strategic resources such as expertise, partnerships, and market insights. Belleflamme, Lambert, and Schwienbacher (2014) highlight that equity and debt-based models are particularly suited for growth-oriented SMEs, as they allow larger funding volumes and structured repayment or equity arrangements.

Empirical studies suggest that while crowdfunding in domestic markets provides financial inclusion and early-stage capital, cross-border campaigns offer additional

benefits such as global visibility, enhanced brand credibility, and potential market validation from international backers (Crowdfunding Capital Advisors, 2021; Grand View Research, 2023). However, cross-border crowdfunding also introduces complexities. Currency exchange risks, legal and regulatory compliance across jurisdictions, and the need to cultivate trust with foreign investors are consistently cited as critical barriers (IOSCO, 2015; Statista, 2023).

In the Indian context, the nascent regulatory environment constrains the scalability of cross-border crowdfunding. SEBI guidelines for equity-based crowdfunding provide a legal framework domestically, but SMEs must still navigate additional international compliance requirements and foreign exchange regulations (SEBI, 2022; RBI, 2019). Literature indicates that SMEs with established operational structures, export orientation, or innovative offerings are better positioned to leverage these mechanisms, whereas early-stage or resource-limited SMEs face challenges in regulatory compliance, campaign design, and investor engagement (Lessard, 2020).

Despite growing interest, there is a gap in the literature regarding the strategic integration of cross-border crowdfunding into SME financing models. Most studies focus on market potential or technical feasibility but do not explicitly address the decision-making framework for SMEs in developing economies. This study contributes by providing a conceptual framework that synthesizes opportunities, challenges, and strategic considerations, offering guidance for SMEs and policymakers to leverage cross-border crowdfunding effectively in India.

3. Methodology

This study adopts a conceptual research design to examine cross-border crowdfunding as an alternative financing instrument for Indian SMEs. Conceptual research is particularly suited for exploring emerging phenomena where empirical evidence is limited and where the aim is to synthesize existing knowledge into a coherent analytical framework (Kothari, 2004; Saunders et al., 2019).

The paper relies on an extensive review of secondary sources, including peer-reviewed journal articles, industry reports, regulatory guidelines, and authoritative publications on crowdfunding and SME finance. Sources were selected to provide comprehensive coverage of both the global crowdfunding ecosystem and the specific context of Indian SMEs. This approach allows the identification of key opportunities, challenges, and strategic considerations relevant to cross-border crowdfunding without relying on primary survey data.

Analytical tools employed include comparative analysis, thematic synthesis, and conceptual mapping. Comparative analysis examines differences between domestic and cross-border crowdfunding models, their suitability for SMEs and regulatory considerations across jurisdictions. Thematic synthesis identifies recurring themes in the literature regarding investor engagement, currency and regulatory risks, and strategic benefits of global funding. Conceptual mapping integrates these insights into a framework that links cross-border crowdfunding mechanisms with SME financing needs and growth objectives.

Ethical considerations were observed in the treatment and citation of all sources to ensure proper academic integrity. While the study does not involve primary data collection, the framework is designed to be transferable and applicable for SMEs considering cross-border crowdfunding as a strategic financing option.

By employing a structured conceptual approach, this study contributes to the literature by consolidating fragmented insights and offering a defensible framework that highlights both opportunities and challenges for Indian SMEs, thus guiding future research and policy development in the domain of alternative finance.

4. Results and Analysis

Cross-border crowdfunding presents a compelling alternative financing mechanism for Indian SMEs, offering both opportunities and challenges. This section synthesizes insights from the literature, regulatory frameworks, and industry reports to conceptualize the potential impact of cross-border crowdfunding on SME growth and capital access.

4.1. Opportunities:

4.1.1. Access to Global Investor Base: Cross-border crowdfunding enables SMEs to tap into international investor networks, expanding the pool of potential backers beyond domestic limitations (Belleflamme, Lambert & Schwienbacher, 2014; Crowdfunding Capital Advisors, 2021). Global investors often seek innovative projects and may provide larger capital inflows compared to domestic sources. For SMEs engaged in technology, renewable energy, and other high-growth sectors, such international exposure can also yield strategic partnerships, mentorship, and industry insights, enhancing overall business development.

4.1.2. Diversification of Funding Sources: By reducing reliance on traditional bank loans or domestic venture capital, cross-border crowdfunding allows SMEs to diversify their capital structure (Ennico, 2016; SEBI, 2022). Diversification lowers financial vulnerability and enables SMEs to pursue growth initiatives with greater flexibility. Equity and debt-based cross-border crowdfunding models, in particular, provide scalable funding options aligned with SMEs' strategic and operational objectives.

4.1.3. Market Validation and Customer Engagement: Crowdfunding campaigns act as de facto market tests, enabling SMEs to gauge demand for their products or services before full-scale market entry (Lessard, 2020; Dresner, 2014). Early engagement with international backers also fosters brand loyalty and creates advocacy networks, which can enhance visibility and credibility in foreign markets.

4.1.4. Brand Visibility and International Recognition: Successful cross-border crowdfunding campaigns provide SMEs with international exposure, building credibility with both investors and potential business partners (Kickstarter, 2024; Indiegogo, 2024). This visibility can attract additional institutional investors, media attention, and strategic collaborations, facilitating scalable growth beyond domestic boundaries.

4.2. Challenges:

4.2.1. Regulatory Complexity: Indian SMEs face a multi-layered regulatory environment when raising capital internationally. Compliance with SEBI regulations, foreign securities laws, and cross-border tax rules creates legal and operational challenges (SEBI, 2022; RBI, 2019). The absence of harmonized international crowdfunding regulations further complicates cross-border fundraising efforts.

4.2.2. Currency Exchange Risks: Transacting across multiple currencies exposes SMEs to exchange rate volatility, which can significantly affect the net funds received (Reserve Bank of India, 2019). Hedging strategies are essential to mitigate these risks but may increase costs and administrative complexity.

4.2.3. Cultural and Communication Barriers: SMEs must tailor campaigns to resonate with culturally diverse investors, adapting messaging, visuals, and engagement strategies (Belleflamme et al., 2014). Misalignment with investor expectations or communication norms can reduce investor trust and participation.

4.2.4. Market Competition and Saturation: The increasing popularity of global crowdfunding platforms intensifies competition for investor attention (Grand View Research, 2023). SMEs must differentiate their offerings and present compelling value propositions to succeed in saturated markets.

4.3. Conceptual Synthesis:

The literature indicates that while cross-border crowdfunding offers transformative potential for Indian SMEs, its benefits are contingent on strategic alignment with business objectives, regulatory compliance, and effective investor engagement. Conceptual mapping of the literature suggests that SMEs with scalable products, export-oriented operations, and robust governance structures are better positioned to capitalise on global crowdfunding opportunities. The framework also underscores the importance of

institutional support, capacity-building, and knowledge-sharing to enable broader adoption among SMEs.

5. Recommendations

Based on insights from the literature and regulatory guidelines, Indian SMEs can adopt several strategies to effectively leverage cross-border crowdfunding as an alternative financing instrument. The following recommendations focus on maximizing opportunities while mitigating potential challenges.

5.1. Strengthen Regulatory Awareness and Compliance: Navigating cross-border crowdfunding requires a clear understanding of domestic and international legal frameworks. SMEs should actively engage with SEBI guidelines, RBI foreign exchange norms, and relevant foreign securities regulations (SEBI, 2022; RBI, 2019). Policy harmonization and simplified compliance procedures suggested in prior studies can further enhance participation (U.S. SEC, 2021). Building regulatory literacy within SME management teams is crucial to reduce legal risks and enable sustainable fundraising.

5.2. Employ Currency Risk Mitigation Strategies: Given the exposure to exchange rate fluctuations, SMEs should adopt financial instruments such as forward contracts, currency options, or swaps to hedge against currency volatility (Belleflamme, Lambert & Schwienbacher, 2014; Ennico, 2016). This approach allows SMEs to protect their funding inflows and plan growth strategies with greater financial certainty.

5.3. Enhance Cultural Competence and International Communication: Successful cross-border campaigns require cultural awareness and effective communication tailored to target investor demographics (Lessard, 2020; Grand View Research, 2023). SMEs should invest in multilingual content, culturally relevant messaging, and professional marketing support to resonate with diverse international audiences. Collaborations with platforms experienced in global

campaigns can provide guidance on investor expectations and engagement strategies.

5.4. Focus on Differentiation and Value Proposition: In a competitive crowdfunding environment, SMEs must clearly articulate unique product features and business advantages (Crowdfunding Capital Advisors, 2021). Leveraging storytelling, high-quality visuals, and strategic branding enhances campaign visibility and investor appeal. Literature emphasizes that innovation and narrative clarity are key to standing out on global platforms (Dresner, 2014).

5.5. Promote Transparency and Governance Practices: Investor trust is central to successful cross-border fundraising. SMEs should adopt robust reporting, governance, and accountability measures, including regular updates on project progress and transparent fund utilization (U.S. SEC, 2021; Crowdcube, 2024). Conceptual studies highlight that transparent operations and strong governance increase investor confidence and facilitate long-term relationships.

5.6. Leverage Platform Collaboration and Knowledge Sharing: Partnerships with established crowdfunding platforms can enhance credibility and provide practical support in marketing, compliance, and investor engagement (Seedrs, 2024; Indiegogo, 2024). Literature suggests that such collaborations are instrumental in overcoming entry barriers for SMEs and in disseminating best practices for global fundraising campaigns.

6. Conceptual Summary:

The literature indicates that the successful adoption of cross-border crowdfunding by Indian SMEs depends on a strategic alignment of regulatory compliance, financial risk management, cultural competence, and investor relations. By implementing these literature-backed recommendations, SMEs can maximize funding potential, enhance brand recognition, and achieve sustainable growth in global markets.

7. Conclusion

Cross-border crowdfunding represents a significant alternative financing avenue for Indian SMEs, offering the potential to bridge capital structure gaps and reduce reliance on traditional financial institutions. Conceptual analysis of the literature indicates that such crowdfunding enables SMEs to access a diverse international investor base, obtain market validation, and enhance brand visibility, all of which can contribute to long-term growth and competitiveness (Belleflamme, Lambert & Schwienbacher, 2014; Crowdfunding Capital Advisors, 2021).

However, literature also highlights inherent challenges, including regulatory complexities, currency exchange risks, cultural and communication barriers, market competition, and investor protection concerns (SEBI, 2022; RBI, 2019; Lessard, 2020). Effective navigation of these challenges requires SMEs to develop regulatory literacy, adopt risk mitigation strategies, and cultivate transparent governance and investor relations practices. Additionally, strategic collaboration with global crowdfunding platforms and investment in differentiated campaign design are critical to securing investor confidence and campaign success (Crowdcube, 2024; Seedrs, 2024).

This conceptual study underscores that the benefits of cross-border crowdfunding are contingent upon deliberate, informed, and strategic action by SMEs. By aligning operational practices with regulatory requirements, managing financial and cultural risks, and leveraging knowledge from established platforms, Indian SMEs can unlock significant funding opportunities, enhance global visibility, and strengthen their competitive position in international markets.

In summary, cross-border crowdfunding is not merely a funding mechanism but a strategic tool that, when effectively employed, can transform the financing landscape for Indian SMEs. Future research can further investigate sector-specific applications, regulatory evolution, and comparative analyses with domestic crowdfunding to provide more granular insights into its practical adoption and impact.

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