INTERNATIONAL JOURNAL OF FOREIGN TRADE AND INTERNATIONAL BUSINESS UPGRADATION

Advances in Foreign Exchange Risk Management and Emerging Opportunities for Enhancing Investment Efficiency and Profitability in Multinational Enterprises

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Article Info

P-ISSN: 3051-3340
E-ISSN: 3051-3359
Volume: 05
Issue: 01
Received: 16-02-2024
Accepted: 11-03-2024
Published: 12-04-2024
Page No: 45-64

Abstract
Foreign exchange (FX) risk remains one of the most persistent sources of earnings volatility, cash flow uncertainty and valuation risk for multinational enterprises (MNEs). Over the past decade, the practice of FX risk management has moved well beyond the traditional use of forward contracts to cover booked transactions. Advances in exposure measurement, the widening menu of derivative and non-derivative instruments, the centralisation of treasury functions, reforms to hedge accounting standards and the arrival of data-driven treasury technology have together transformed what firms can measure, what they can hedge and how efficiently they can do so. This paper reviews these advances, synthesises the theoretical and empirical literature linking hedging to firm value, and identifies emerging opportunities through which MNEs can convert better FX management into higher investment efficiency and profitability. Drawing on capital market imperfections theory, the paper argues that the principal value of FX risk management lies not in reducing volatility for its own sake but in protecting the internal funds and the planning certainty that allow firms to pursue positive net present value investments without costly external financing. The paper proposes an integrated framework that combines exposure analytics, a layered mix of financial and operational hedges, centralised execution and governance, and performance measurement against explicit benchmarks. It concludes with a research agenda and practical recommendations for treasury and finance leaders, with particular attention to firms operating in or exposed to volatile emerging market currencies.

DOI: https://doi.org/10.54660/.IJFTIBU.2024.5.1.45-64

Keywords: foreign exchange risk, currency hedging, multinational enterprises, investment efficiency, operational hedging, treasury technology, hedge accounting, firm value

1. Introduction

Multinational enterprises earn revenues, incur costs, hold assets and raise finance in many currencies at once. Every movement in exchange rates therefore alters the home currency value of their cash flows and balance sheets. For most of the post Bretton Woods era, academic finance debated whether such risk should be managed at all, since in a frictionless world shareholders can diversify currency risk themselves. Practice, however, has consistently gone the other way: large surveys and disclosures show that the majority of large MNEs actively manage FX exposure, and the scale of the market they rely on continues to grow.

The size of that market illustrates how central currency risk has become to global business. The Bank for International Settlements (BIS) 2022 Triennial Central Bank Survey found that global FX trading averaged about US$7.5 trillion per day in April 2022, up 14% from US$6.6 trillion in 2019, with FX swaps the most traded instrument at roughly US$3.8 trillion per day (BIS, 2022) [73]. The survey followed a period marked by the pandemic, rapid monetary tightening and geopolitical conflict, a reminder that macroeconomic and policy shocks can transmit rapidly into corporate currency exposures.

At the same time, the case for managing FX risk has become more sophisticated. Modern theory holds that hedging creates value when market imperfections, such as costly external finance, financial distress costs, convex taxes and agency problems, make volatility expensive (Smith & Stulz, 1985; Froot, Scharfstein & Stein, 1993) [105, 214]. In this view, the purpose of FX management is to align the supply of internal funds with the demand for investment, so that profitable projects are not abandoned because a currency shock has temporarily drained cash. This links FX risk management directly to investment efficiency, the central theme of this paper.

Recent scholarship has repositioned FX management within a broader agenda of multinational treasury design, cross-border strategic finance and consolidated financial control, in which tiered treasury structures, CFO-led partnership finance and automated consolidation are treated as foundations for value creation rather than back office functions (Bola-Sadipe *et al*., 2023; Dada *et al*., 2021a; Isiekwu *et al*., 2021; Lawal & Oduleye, 2018b; Lawal & Oduleye, 2019a; Okoli *et al*., 2024) [78, 80, 112, 128, 129, 169].

The paper makes three contributions. First, it organises recent advances in FX risk management into five streams: measurement, instruments, organisation, accounting and technology. Second, it synthesises evidence on how these practices affect firm value, investment and profitability. Third, it identifies emerging opportunities and proposes an integrated framework that managers can use to translate FX management into measurable improvements in capital allocation. The remainder of the paper is structured as follows. Section 2 describes the research method. Section 3 presents the results and discussion, comprising the literature synthesis, the conceptual model, the discussion of findings and their implications. Section 4 concludes, noting the limitations of the study and directions for future research.

2. Research Method

2.1. Research Design

This study adopts an integrative literature review design combined with conceptual model development. Integrative reviews are suited to topics in which theory, empirical evidence and practitioner knowledge have developed in parallel and need to be brought together into a coherent framework. FX risk management fits this description: the theoretical case for hedging, the econometric evidence on value and exposure, and the practical advances in instruments, treasury organisation, accounting and technology are documented in different bodies of literature that are rarely synthesised together.

2.2. Sources and Search Strategy

The review drew on three groups of sources. The first comprised foundational and empirical studies on exchange rate exposure, corporate hedging and firm value published in leading finance journals. The second comprised authoritative institutional and standard-setting sources, including the Bank for International Settlements Triennial Central Bank Survey and the hedge accounting standards issued by the IASB and FASB. The third comprised a curated body of applied research on corporate treasury, strategic finance, financial analytics, audit and risk governance, banking and payments, procurement and supply chain management, trade compliance and enterprise technology, drawn from a consolidated reference list of applied management and engineering scholarship. Searches combined terms relating to foreign exchange exposure, currency hedging, treasury management, risk governance, financial analytics, investment efficiency and multinational enterprises.

2.3. Inclusion Criteria

Sources were retained if they (a) were published in or before 2024, consistent with the reference year of this paper; (b) addressed FX risk directly or addressed a closely related capability that shapes how MNEs measure, manage, finance, govern or account for currency risk; and (c) were available as peer-reviewed articles, conference proceedings, theses, preprints or official institutional publications with sufficient bibliographic detail for verification. Entries with incomplete bibliographic information were excluded. In total, 237 sources were retained and cited.

2.4. Analysis and Synthesis

Retained sources were coded thematically against the research objectives. Directly related studies were coded to the core themes of exposure measurement, hedging instruments, operational hedging, organisation and governance, accounting, and technology. Semi-related studies were coded to the enabling themes that condition FX outcomes, namely forecasting and planning, capital allocation and investment appraisal, banking and payment infrastructure, procurement and supply chains, regulation and compliance, sustainability, and organisational behaviour. The themes were then synthesised into the literature synthesis in Sections 3.1 to 3.4 and abstracted into the conceptual model in Section 3.5. Table 1 summarises the review protocol.

Table 1: Summary of the review protocol

Element	Description
Review type	Integrative literature review with conceptual model development
Time span	Foundational works from 1984 to studies published in 2024
Source types	Peer-reviewed journals, conference proceedings, theses, preprints, standard setters and central bank publications
Inclusion criteria	Published in or before 2024; directly or closely related to FX risk, treasury, financial analytics, risk governance or cross-border operations; verifiable bibliographic detail
Sources retained	237
Analytical approach	Thematic coding into core and enabling themes, followed by narrative synthesis and model building

Source: Author's review protocol.

3. Results and Discussion

This section presents the results of the review and discusses their significance. Sections 3.1 to 3.4 report the literature synthesis, covering conceptual foundations, advances in practice, evidence on value and investment efficiency, and emerging opportunities. Section 3.5 presents the conceptual model derived from the synthesis, Section 3.6 discusses the findings, and Section 3.7 sets out their theoretical, managerial and policy implications.

3.1. Conceptual Foundations

3.1.1 Types of FX Exposure

The literature distinguishes three principal forms of currency exposure (Adler & Dumas, 1984) [11]. Transaction exposure arises from contractual cash flows already committed in a foreign currency, such as receivables, payables and debt service. Translation (or accounting) exposure arises when the financial statements of foreign subsidiaries are consolidated into the reporting currency. Economic (or operating) exposure captures the sensitivity of the firm's future cash flows and competitive position to real exchange rate changes, including effects on pricing power, demand and the cost base relative to foreign competitors. Table 2 summarises these categories and the tools typically used to address them.

Table 2: Classification of FX exposures and typical management responses

Exposure type	Definition	Time horizon	Typical management tools
Transaction	Change in home currency value of contracted foreign currency cash flows	Short term (up to 12 to 18 months)	Forwards, FX swaps, options, netting, invoicing currency choice, leading and lagging
Translation	Change in reported equity and earnings on consolidation of foreign operations	Reporting period	Net investment hedges, foreign currency debt, cross currency swaps
Economic (operating)	Change in present value of future operating cash flows due to real exchange rate movements	Medium to long term	Operational hedging, geographic diversification of production and sourcing, pricing strategy, long dated derivatives
Contingent	Exposure dependent on uncertain events such as bids, tenders or acquisitions	Event dependent	Currency options, deal contingent forwards

Source: Author's synthesis based on Adler and Dumas (1984), Bartram, Brown and Minton (2010) and practitioner literature.

3.1.2 Why Hedging Can Create Value

Under the Modigliani and Miller assumptions, corporate hedging cannot create value because investors can replicate or undo it at no cost. The value of risk management therefore rests on imperfections. Smith and Stulz (1985) [214] show that hedging can lower expected taxes when the tax function is convex, reduce expected costs of financial distress, and mitigate managerial risk aversion. Froot, Scharfstein and Stein (1993) [105] provide the argument most relevant to investment efficiency: when external finance is more expensive than internal funds, cash flow shocks force firms to cut valuable investment. By smoothing internally generated cash in states of the world where investment opportunities remain attractive, hedging allows firms to invest closer to their first best level.

This framework yields two important implications. First, the optimal hedge depends on the correlation between exposures and investment opportunities, not merely on the size of the exposure. A firm whose investment opportunities shrink when its home currency strengthens may optimally hedge less than one whose opportunities are unaffected. Second, the benefits of hedging are greatest for firms facing binding financing constraints, which suggests that the marginal value of improved FX management may be especially high for mid sized MNEs and for firms based in emerging markets with shallow capital markets.

3.1.3 The Exposure Puzzle

Early empirical work found that measured stock price sensitivity to exchange rates is surprisingly small for most firms, even those with substantial foreign operations (Jorion, 1990) [121]. Bartram, Brown and Minton (2010) [74] offer a resolution of this so called exposure puzzle: firms reduce their net exposure through a combination of pass through of currency changes to customers, operational hedging and financial hedging. Their work underlines that the observed exposure of a firm is an outcome of management choices, and that low measured exposure may itself be evidence of effective risk management rather than an absence of risk.

3.2. Advances in FX Risk Management Practice

3.2.1 Advances in Exposure Measurement

Measurement has progressed from static gap reports of booked positions toward forward looking, probabilistic and cash flow based metrics. Key developments include:

- **Value at Risk and Cash Flow at Risk:** Market risk techniques originally developed for trading books have been adapted to corporate settings. Cash Flow at Risk (CFaR) and Earnings at Risk (EaR) estimate the potential shortfall in operating cash flow or earnings at a given confidence level, linking FX risk directly to budget, covenant and investment targets.
- **Time varying volatility and correlation models:** GARCH family and regime switching models capture volatility clustering and the tendency of currency correlations to shift in crises, allowing firms to size hedges according to current rather than historical average risk.
- **Forecast exposure analytics:** Integration of enterprise resource planning (ERP) and sales forecasting data allows treasuries to quantify forecast exposures, measure forecast accuracy by entity and currency, and apply hedge ratios that decline with forecast uncertainty and horizon.
- **Economic exposure modelling:** Regression based sensitivity analysis, scenario analysis and simulation of competitive responses help firms estimate the operating exposure that does not appear on the balance sheet. Studies of listed firms consistently report that exchange rate sensitivity differs markedly across industries and over time, reinforcing the need for firm specific measurement (Bartram, Brown & Minton, 2010) [74].

Advances in predictive budgeting, cash flow and working capital modelling, machine learning revenue forecasting and Python-based risk forecasting provide the forecast inputs on which modern exposure measurement depends (Adesuyi *et al*., 2022; Agu *et al*., 2023b; Dada *et al*., 2021b; Medon & Oduleye, 2024; Oduleye & Medon, 2023a; Tonoyan *et al*., 2021a; Tonoyan *et al*., 2021b; Tonoyan *et al*., 2022c; Unamma, 2022; Unamma *et al*., 2018b) [10, 18, 81, 145, 158, 215, 216, 219, 229, 231].

3.2.2 Advances in Hedging Instruments

Forwards and FX swaps remain the workhorse instruments, but the toolkit has widened. Currency options and option structures (collars, participating forwards, knock in and knock out structures) allow firms to protect against adverse moves while retaining some upside, which is valuable when exposures are uncertain or when competitive dynamics penalise firms that are locked into rates their rivals are not. Non deliverable forwards (NDFs) have deepened access to hedging in currencies with capital controls, while cross currency swaps support the matching of debt to the currency of the assets it funds. Deal contingent forwards, which pay out only if a transaction closes, have become a standard tool in cross border mergers and acquisitions.

3.2.3 Operational and Natural Hedging

Operational hedging matches the currency of costs to the currency of revenues through the location of production, sourcing and financing decisions. Allayannis, Ihrig and Weston (2001) [47] find that operational strategies such as geographic dispersion are not, on their own, a substitute for financial hedging, but that combining the two is associated with higher firm value. Kim, Mathur and Nam (2006) [122] report that operational and financial hedging are complements: operational hedges address long term economic exposure, while derivatives manage short term transaction exposure. Recent supply chain restructuring, including nearshoring and the diversification of suppliers away from single country concentration, has created an opportunity to design operational footprints that are deliberately currency balanced.

Research on procurement and supply chain management reinforces the operational hedging argument: dual sourcing of critical equipment under exchange rate volatility, strategic sourcing and contract design, supplier relationship management and supply chain resilience frameworks all shape the currency composition and stability of the cost base (Agbabiaka *et al*., 2019; Akin-Oluyomi *et al*., 2024; Akinleye & Adeyoyin, 2022b; Akokodaripon *et al*., 2023; Anene, 2021; Asibor *et al*., 2019; Asibor *et al*., 2021; Babayemi *et al*., 2020; Ike *et al*., 2021; Ogunwole *et al*., 2021; Okonkwo *et al*., 2019; Okonkwo *et al*., 2024a; Okonkwo *et al*., 2024d; Okonkwo *et al*., 2024e; Tonoyan *et al*., 2024a) [12, 24, 29, 32, 53, 65, 66, 72, 109, 161, 172, 175, 176, 185, 221].

Data-driven procurement, spend analytics, supplier risk assessment and digital procurement transformation further allow MNEs to monitor where currency-sensitive costs sit across the supply network and to redirect sourcing when currency regimes shift (Akin-Oluyomi *et al*., 2023b; Akinleye, 2023; Akinleye & Adeyoyin, 2021; Akinleye & Adeyoyin, 2022a; Akinleye *et al*., 2023; Bello *et al*., 2023; Ebisi *et al*., 2023; Ebisi *et al*., 2024; Efobi *et al*., 2023; Nnabueze *et al*., 2021; Okojie *et al*., 2020; Okoruwa *et al*., 2024) [23, 26, 27, 28, 76, 86, 88, 91, 152, 166, 186].

In energy, infrastructure and industrial operations, studies of ERP-based and geospatially informed procurement, predictive procurement planning, regulatory-compliant sourcing, port logistics and demurrage control, inventory visibility, lean supply chains and blockchain-enabled logistics show how disciplined supply management stabilises the foreign currency cost base of capital-intensive operations (Ahiaeke Patrick *et al*., 2020; Ahiaeke Patrick *et al*., 2021; Aifuwa *et al*., 2020; Akinlade *et al*., 2024; Ekwunife *et al*., 2024; Ike *et al*., 2022; Okonkwo *et al*., 2018a; Okonkwo *et al*., 2018b; Okonkwo *et al*., 2020; Okonkwo *et al*., 2021a; Okonkwo *et al*., 2021b; Okonkwo *et al*., 2023a; Okonkwo *et al*., 2023b; Okonkwo *et al*., 2024b; Okonkwo *et al*., 2024c; Okonkwo *et al*., 2024f) [20, 21, 22, 25, 92, 110, 173, 174, 177, 178, 179, 180, 181, 182, 183, 184].

3.2.4 Organisational Advances: Centralisation and Governance

A major structural trend is the centralisation of FX management within regional treasury centres or in house banks. Centralisation enables multilateral netting of intercompany flows, pooling of exposures before external hedging, consolidated execution at better prices and consistent policy enforcement. Netting alone can eliminate a large share of gross intercompany flows, reducing both transaction costs and the notional amount of derivatives required. Governance has advanced in parallel, with board approved hedging policies that specify permitted instruments, hedge ratio bands by horizon, counterparty limits and benchmarks against which treasury performance is assessed. Evidence from Hecht and Lampenius (2023) [107] shows that hedge ratios respond to prior hedging outcomes, which highlights the importance of clear benchmarks to discourage reactive or selective hedging driven by recent gains or losses.

Studies of internal audit, risk-based control and compliance analytics show that hedging governance is most effective when embedded in a wider risk governance architecture covering control quality, compliance risk, operational resilience, capital adequacy and asset liability management (Agu *et al*., 2023a; Akomolafe & Agu, 2018; Akomolafe & Agu, 2019a; Akomolafe & Agu, 2019b; Akomolafe & Agu, 2019c; Akomolafe *et al*., 2023a; Akomolafe *et al*., 2023b; Ashore-Onisemo & Unamma, 2022a; Mensah *et al*., 2019b; Mensah *et al*., 2023; Okwesa *et al*., 2023) [17, 33, 34, 35, 36, 37, 38, 60, 146, 149, 187].

Audit analytics and fraud detection frameworks developed for donor-funded and healthcare programmes, together with privacy-preserving architectures for regulated analytics and governance models for non-profits, illustrate how cross-entity financial oversight can be strengthened in organisations with many funding sources and currencies (Abetoh & Atakpa, 2022; Abetoh & Atakpa, 2024; Atakpa & Abolaji, 2022; Atakpa *et al*., 2024) [1, 2, 69, 71].

3.2.5 Accounting Advances

Hedge accounting reforms have reduced a long standing barrier to economically sensible hedging. IFRS 9 replaced the rigid 80 to 125 percent effectiveness test of IAS 39 with an objective based assessment aligned with risk management strategy, allowed hedging of risk components and aggregated exposures, and changed the treatment of the time value of options and forward points to reduce profit and loss volatility (IASB, 2014) [111]. In the United States, ASU 2017-12 made

similar simplifications (FASB, 2017) [104]. These changes narrow the gap between economic and accounting outcomes, making it easier for firms to hedge forecast exposures and to use options without generating artificial earnings volatility.

The reliability of hedge accounting and exposure reporting rests on sound reporting infrastructure, including automated close controls, reconciliation design, data integrity in financial datastores, tax and regulatory reporting systems and single-source-of-truth data frameworks (Akinola *et al*., 2020; Ashore-Onisemo & Unamma, 2022b; Bola-Sadipe *et al*., 2019; Bola-Sadipe *et al*., 2022; Dogbatsey & Ebhojie, 2018; Dogbatsey *et al*., 2019; Ebhojie *et al*., 2023a; Kinyanjui *et al*., 2024; Medon & Oduleye, 2022; Okeke *et al*., 2023; Okoli *et al*., 2022a; Okwesa & Ashore-Onisemo, 2023; Unamma *et al*., 2019a) [31, 61, 77, 79, 83, 84, 85, 123, 143, 165, 170, 187, 233].

3.2.6 Technological Advances

Treasury technology has arguably changed practice more than any other factor in recent years. Cloud based treasury management systems (TMS) integrate with ERP and banking platforms through application programming interfaces (APIs), providing near real time visibility of cash and exposures across entities. Electronic multi dealer trading platforms have increased price transparency and reduced execution costs, and automated workflows now link exposure capture, hedge execution, confirmation, settlement and hedge accounting documentation. Machine learning methods are increasingly applied to improve cash flow forecasts, which are the foundation of forecast exposure hedging, and to detect anomalies in exposure data. These developments reduce operational risk, shorten the time between exposure recognition and hedging, and allow smaller treasury teams to manage more complex currency portfolios.

Wider research on enterprise analytics supports this direction, documenting gains from executive financial dashboards, real-time KPI monitoring, AI-enabled finance frameworks, variance and cost analytics, data-led cost governance, governance dashboards and human-in-the-loop decision systems (Adelanwa *et al*., 2023a; Adelanwa *et al*., 2023b; Adelanwa *et al*., 2024; Adesuyi *et al*., 2023a; Aliliele *et al*., 2024; Iziduh *et al*., 2020; Lawal & Oduleye, 2023b; Oduleye & Medon, 2021; Oteri & Chibwaye, 2022; Rukh *et al*., 2024; Sanni & Atima, 2021a; Sanni & Atima, 2021b; Sanni *et al*., 2022; Seyi-Lande *et al*., 2022; Tonoyan *et al*., 2022b; Tonoyan *et al*., 2024b; Unamma *et al*., 2021a) [4, 5, 6, 9, 44, 113, 134, 157, 199, 203, 208, 209, 212, 213, 218, 222, 234].

Because treasury platforms process high value payments and confirmations, their adoption must be accompanied by controls for technology risk, including risk-based business intelligence architecture, AI-enabled IT general controls, API governance, continuous auditing, data protection impact assessment and fairness auditing of automated decision models (Aliliele *et al*., 2023b; Fadero *et al*., 2021; Mbonu *et al*., 2018; Mbonu *et al*., 2020a; Mbonu *et al*., 2021; Mbonu *et al*., 2021a; Mbonu *et al*., 2022; Mbonu *et al*., 2022a; Unamma & Ashore-Onisemo, 2023) [45, 101, 137, 138, 139, 140, 142, 230].

Table 3: Summary of major advances and their contribution to efficiency

Area of advance	Key developments	Contribution to investment efficiency and profitability
Measurement	CFaR and EaR, dynamic volatility models, forecast exposure analytics, economic exposure modelling	Links FX risk to budgets and investment plans; avoids over and under hedging
Instruments	Options and structures, NDFs, cross currency swaps, deal contingent forwards	Asymmetric protection; access to restricted currencies; lower cost of protecting M&A and capex
Operational hedging	Currency matched production, sourcing and financing; supply chain diversification	Reduces long term economic exposure that derivatives cannot cover cost effectively
Organisation	Treasury centres, in house banks, multilateral netting, policy and benchmarks	Lower transaction costs and hedge notionals; disciplined, consistent decisions
Accounting	IFRS 9 and ASU 2017-12 hedge accounting simplification	Aligns reported earnings with economic hedging; reduces disincentive to hedge
Technology	Cloud TMS, APIs, electronic trading, automation, machine learning forecasts	Real time visibility, better forecasts, lower execution and operational costs

Source: Author's synthesis.

3.3. Evidence on FX Risk Management, Firm Value and Investment Efficiency

3.3.1 Hedging and Firm Value

The most cited empirical study, Allayannis and Weston (2001) [46], finds that US non financial firms facing currency risk that use foreign currency derivatives trade at a higher Tobin's Q than comparable non users, with a hedging premium of roughly 4.9 percent on average. Subsequent studies across countries generally report positive but more modest associations, and several caution that part of the premium may reflect characteristics of firms that choose to hedge rather than the hedging itself. Guay and Kothari (2003) [106] show that the derivative positions of many firms are small relative to their overall risk, suggesting that derivatives alone are unlikely to explain large valuation differences. Jin and Jorion (2006) [114], studying oil and gas producers, find no significant hedging premium, indicating that value effects are context dependent. The emerging consensus is that hedging adds value when it addresses genuine frictions and is well integrated with strategy, and that indiscriminate hedging adds little.

3.3.2 Hedging, Investment and Financing

Consistent with Froot, Scharfstein and Stein (1993) [105], a body of research finds that hedging firms exhibit lower sensitivity of investment to internal cash flow, higher debt capacity and lower costs of capital. By reducing the probability that a currency shock pushes the firm toward covenant breaches or distress, hedging can support higher leverage and the associated tax shield. It can also reduce the cost of debt because lenders price lower cash flow volatility. These channels connect FX management to investment efficiency: firms that hedge sensibly are less likely to underinvest in bad currency states and less likely to overinvest from windfall gains in good ones, because cash flows that drive investment decisions more closely reflect underlying business performance.

A related stream emphasises that financial analytics, strategic planning models and decision systems allow finance leaders to translate risk information into capital allocation choices and sustainable profitability (Lawal & Oduleye, 2018a; Lawal & Oduleye, 2019b; Lawal & Oduleye, 2021a; Lawal & Oduleye, 2021b; Lawal & Oduleye, 2023a; Medon & Oduleye, 2023; Mensah *et al*., 2019a; Oduleye & Medon, 2023b) [127, 130, 131, 132, 133, 144, 148, 159].

Investment-focused studies show that predictive risk monitoring, financial due diligence, technical due diligence in cross-border acquisitions, capital budgeting aligned with project execution and quantitative risk allocation in public-private partnerships all improve the quality of investment decisions exposed to foreign currency risk (Aminu-Ibrahim *et al*., 2019; Aminu-Ibrahim *et al*., 2024; Eboh & Aliliele, 2023; Eboh & Aliliele, 2024; Filani *et al*., 2023; Ike *et al*., 2024a; Nwangwu *et al*., 2021; Nwangwu *et al*., 2023; Okoli *et al*., 2020) [51, 52, 89, 90, 103, 108, 154, 155, 168].

3.3.3 Practitioner Evidence

Surveys of practitioners reinforce these findings while highlighting complexity. Arize *et al*. (2024) [58], surveying managers at 200 large multinational companies, conclude that hedging operating exposure is a complex undertaking rather than a simple mechanical exercise. Evidence on how firms adjust hedge ratios after prior gains and losses further shows that institutional context and governance shape hedging outcomes (Hecht & Lampenius, 2023) [107]. Recent analysis of 2023 EUR/USD and EUR/GBP data indicates that transaction risk continues to be a material risk for multinational companies, and that the suitability of external hedging strategies depends heavily on each firm's risk management objectives (Rantanen, 2024) [202].

Table 4: Selected empirical evidence on FX risk management outcomes

Study	Focus	Main finding
Jorion (1990) [121]	Stock price exposure of US multinationals	Measured exposure is small and varies with foreign operations
Allayannis & Weston (2001) [46]	Derivatives use and Tobin's Q	Hedgers show a valuation premium of about 4.9 percent
Allayannis, Ihrig & Weston (2001) [47]	Financial versus operational hedging	Operational hedging adds value mainly in combination with financial hedging
Guay & Kothari (2003) [106]	Size of derivative positions	Positions are modest relative to total firm risk
Kim, Mathur & Nam (2006) [122]	Operational and financial hedging	The two strategies are complements
Bartram, Brown & Minton (2010) [74]	Resolving the exposure puzzle	Pass through, operational and financial hedging jointly reduce net exposure
Hecht & Lampenius (2023) [107]	Hedge ratio behaviour	Hedge decisions respond to prior benchmark outcomes
Arize *et al*. (2024) [58]	Survey of 200 large MNEs	Hedging operating exposure is complex and judgement intensive

Source: Author's compilation from the cited studies.

3.4. Emerging Opportunities

The advances described above create several opportunities for MNEs to raise investment efficiency and profitability. These opportunities are not mutually exclusive; their combined effect is greatest when they are pursued together within a coherent framework.

3.4.1 Data Driven, Investment Linked Hedging

Real time exposure data and improved forecasting allow firms to move from calendar driven hedging toward hedge programmes that are explicitly linked to the capital budget. Treasuries can identify the cash flows that fund planned investment, measure the probability that currency movements would force those investments to be deferred, and size hedges accordingly. This is the practical implementation of the Froot, Scharfstein and Stein logic and represents the single most direct route from FX management to investment efficiency.

3.4.2 Incorporating FX Risk into Capital Budgeting

Many firms still evaluate foreign projects using point forecasts of exchange rates and a single discount rate. Simulation based capital budgeting, which models joint distributions of exchange rates, local inflation and project cash flows, allows decision makers to see the distribution of home currency net present value, to compare projects on a risk adjusted basis and to identify where operational design choices (local sourcing, local financing, pricing clauses) reduce exposure more cheaply than derivatives. Embedding FX analytics into investment appraisal improves capital allocation even before any hedge is executed.

Evidence from multinational project governance indicates that currency risk is best managed when it is embedded in project governance, contracting and evaluation frameworks for large cross-border infrastructure and energy programmes (Amayo *et al*., 2023a; Amayo *et al*., 2024b; Amayo *et al*., 2024c; Obukadata *et al*., 2022; Zhou *et al*., 2024) [48, 49, 50, 156, 237].

3.4.3 Cost Optimisation Through Netting, Pooling and Execution

For many MNEs, the most immediate profitability gains come from cost reduction. Multilateral netting, exposure pooling in treasury centres, competitive electronic execution and transaction cost analysis can materially lower bid offer spreads, bank fees and derivative notionals. These savings accrue every year and directly improve margins, while also freeing credit lines with banking counterparties.

Analytical approaches drawn from retail, marketing and healthcare finance, such as multi-site performance benchmarking, geospatial market entry analysis, asset valuation, route and logistics profitability, brand portfolio economics, marketing return on investment and big data cost optimisation, offer transferable tools for evaluating the profitability of foreign operations (Anene *et al*., 2023; Ozowara *et al*., 2022; Sanni & Attah, 2023a; Sanni *et al*., 2020a; Tonoyan *et al*., 2022a; Tonoyan *et al*., 2023) [54, 200, 210, 211, 217, 220].

3.4.4 Smarter Use of Options and Dynamic Hedging

Hedge accounting reforms and better pricing transparency make options more attractive for exposures that are uncertain

in timing or amount, or where competitors are unhedged. Layered programmes that combine forwards for highly probable flows with options for less certain flows, and that adjust hedge ratios according to forecast confidence and volatility regimes, can reduce the cost of protection while preserving the ability to benefit from favourable moves.

3.4.5 Strategic Operational Hedging

Ongoing reconfiguration of global supply chains creates an opportunity to build currency balance into the operating footprint. Decisions on plant location, supplier selection, invoicing currency and local currency borrowing can be evaluated partly on their contribution to reducing economic exposure. Because economic exposure is long dated and difficult to hedge financially, structural alignment of revenues and costs is often the most cost effective protection available.

3.4.6 Opportunities in Emerging Market Currencies

Emerging and frontier market currencies, including many in Africa, Latin America and South Asia, are characterised by higher volatility, episodic devaluations and, in some cases, limited deliverable hedging markets. The growth of NDF markets, local currency bond markets and development finance instruments has improved access to protection. MNEs can also use local currency financing, price indexation clauses and careful management of repatriation timing to manage these exposures. Firms that build capability in these markets can invest with greater confidence where competitors are deterred by currency risk, turning risk management into a source of competitive advantage.

Developments in banking and credit markets in emerging economies, including digital lending, transaction banking, trade finance product design, relationship banking, credit decisioning, customer data platforms and partnership ecosystems, shape the availability and cost of the hedging and financing facilities that MNEs rely on (Agboada *et al*., 2018b; Agboada *et al*., 2020; Agboada *et al*., 2022; Ashore-Onisemo *et al*., 2020; Ezeako *et al*., 2019; Kinyanjui *et al*., 2021; Mensah *et al*., 2022; Okafor *et al*., 2021; Okafor *et al*., 2024b; Okoli *et al*., 2022b; Oluwo *et al*., 2022; Oluwo *et al*., 2024; Pedro *et al*., 2024; Ukadike, 2022; Ukadike & Ibeh, 2023; Uzondu *et al*., 2020) [13, 14, 15, 63, 97, 124, 147, 163, 164, 171, 190, 191, 201, 226, 228, 235].

Work on emerging and frontier economies, including agribusiness finance and diversification under economic volatility, payment portal adoption, Nigeria-China economic interdependence, oil diplomacy diversification, business continuity in African financial services, women's leadership in African business and entrepreneurship training, documents the macroeconomic and institutional conditions under which MNEs manage currency risk in these markets (Agyei *et al*., 2019; Anichukwueze *et al*., 2019; Dada *et al*., 2024; Fadero *et al*., 2020; Liadi, 2023b; Liadi, 2023c; Michael & Ogunsola, 2019a; Ukadike & Ibeh, 2020) [19, 55, 82, 100, 135, 136, 150, 227].

3.4.7 Payments Innovation and Settlement Efficiency

Developments in cross border payments, including faster payment rails, wider adoption of payment versus payment settlement and experimentation by central banks with tokenised and wholesale digital settlement, have the potential to reduce settlement risk, shorten the time between exposure creation and settlement, and lower costs. These initiatives remain at varied stages of maturity, so treasuries should monitor them closely and adopt incrementally rather than restructure around technologies that are not yet established.

Research on distributed ledger and AI-enabled cross-border payment systems examines interoperability, liquidity optimisation for remittances, smart contract supplier payments and dispute resolution, resilience under geopolitical risk, regulatory adaptation and macroeconomic effects in emerging economies (Adesuyi *et al*., 2023b; Adesuyi *et al*., 2024; Akomolafe *et al*., 2022; Akomolafe *et al*., 2023; Akomolafe *et al*., 2024a; Akomolafe *et al*., 2024b; Anichukwueze *et al*., 2021; Kumuyi *et al*., 2023; Okafor *et al*., 2024a; Olaogun *et al*., 2023; Osuji *et al*., 2021) [7, 8, 37, 39, 41, 42, 56, 126, 162, 189, 198].

A further operational concern is financial crime: as payment volumes grow and treasury operations digitise, fraud detection, anti-money laundering analytics, real-time transaction monitoring and regulatory technology become integral to the integrity of FX settlement and payment flows (Atakpa, 2021; Atakpa & Abetoh, 2022; Atakpa & Fobellah, 2023; Bello *et al*., 2024; Elebe *et al*., 2023; Fadayomi *et al*., 2021; Fadayomi *et al*., 2024; Unamma *et al*., 2021b) [67, 68, 70, 75, 93, 98, 99, 232].

3.4.8 Integration with Enterprise Risk Management and Sustainability

FX risk interacts with commodity, interest rate, inflation and geopolitical risks. Integrated enterprise risk management that models these risks jointly avoids hedging risks that offset naturally and identifies concentrations that would otherwise be missed. In addition, sustainability linked financing and greater investor scrutiny of governance encourage transparent disclosure of hedging policies and outcomes, which can lower the perceived riskiness of the firm and its cost of capital.

Sustainability-oriented studies link financial planning, green bond financing, revenue assurance, ESG-integrated procurement, KPI accountability and inclusive energy financing to long-term value, suggesting that FX strategy and sustainable finance strategy should be designed together (Abioye *et al*., 2023; Ashore-Onisemo *et al*., 2021; Komi & Adeniji, 2024a; Nnabueze *et al*., 2023; Nnabueze *et al*., 2024; Okojie *et al*., 2023; Sakyi *et al*., 2022b; Sakyi *et al*., 2023; Sakyi *et al*., 2024a; Sakyi *et al*., 2024b) [3, 64, 125, 151, 153, 167, 204, 205, 206, 207].

Cross-border trade law and regulatory compliance also condition FX exposure, through customs and trade facilitation, digital trade regulation, export promotion under the African Continental Free Trade Area, technology transfer compliance and the legal barriers faced by firms entering import-export markets (Jones & Ominyi, 2020; Jones & Ominyi, 2022a; Jones & Ominyi, 2022b; Jones & Ominyi, 2023; Jones & Ominyi, 2024a; Jones & Ominyi, 2024b) [115, 116, 117, 118, 119, 120].

Legal and governance research on cross-border mergers, post-merger compliance integration, anti-bribery regimes, AI and model risk governance, force majeure in energy supply chains, multi-jurisdictional supply chain governance and automated compliance monitoring highlights the regulatory dimension of operating in many currency areas (Annan, 2022; Ashore-Onisemo *et al*., 2024; Ominyi, 2020; Ominyi & Anichukwueze, 2020; Ominyi & Anichukwueze, 2021; Ominyi & Anichukwueze, 2023; Ominyi *et al*., 2021; Ominyi *et al*., 2024b; Uchechi, 2018; Uchechi *et al*., 2020; Uchechi

et al., 2022; Uzougbo *et al*., 2024) [57, 59, 192, 193, 194, 195, 196, 223, 224, 225, 236].

3.5. Conceptual Model

Synthesising the literature, this paper proposes a conceptual model of value-creating FX risk management in multinational enterprises (Figure 1). The model traces a causal chain from antecedents, through FX management capabilities and value-creating mechanisms, to firm-level outcomes. Antecedents comprise the firm's transaction, translation and economic exposures, its financing constraints and the market and regulatory context in which it operates. FX management capabilities comprise exposure analytics and forecasting, the mix of financial hedges, operational hedging, centralised treasury, governance and benchmarks, and treasury technology. These capabilities create value through four mechanisms: stabilising the internal funds available for investment, lowering expected distress and financing costs, lowering transaction and hedging costs, and increasing planning certainty. The outcomes are investment efficiency, profitability, firm value and earnings stability. The strength of these relationships is moderated by the hedge accounting regime, derivative market depth, capital controls, firm size and governance quality, and a feedback loop links performance evaluation back to policy and capabilities.

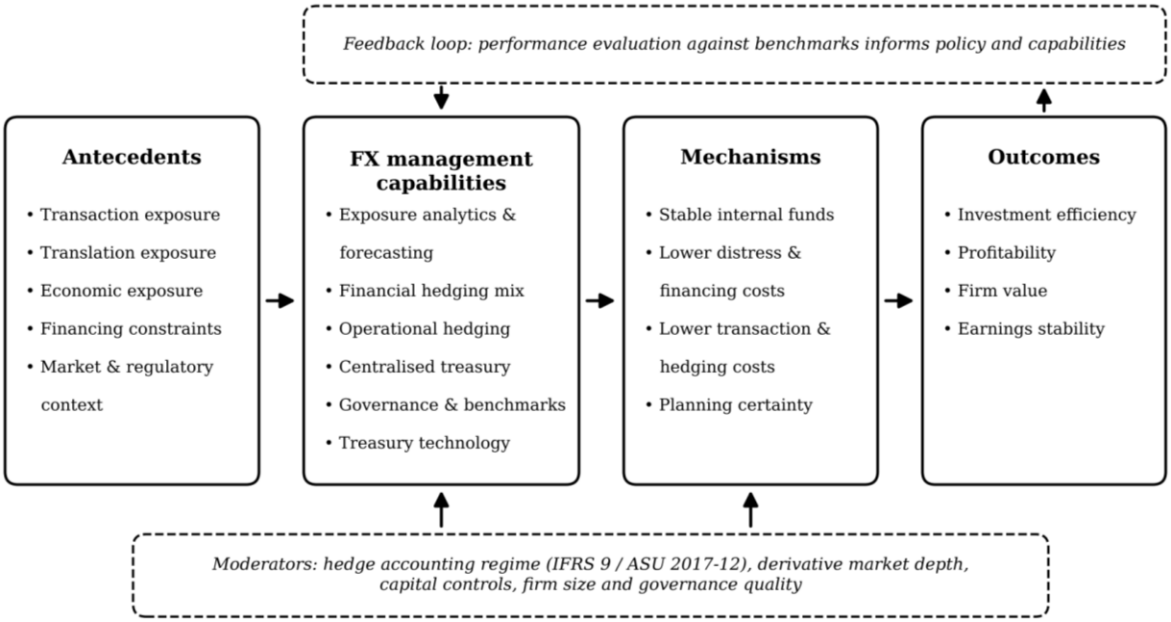


Fig 1: Conceptual model of value-creating FX risk management in multinational enterprises

The model yields four propositions that can be tested in future research. Proposition 1: MNEs with stronger exposure analytics and forecasting capabilities exhibit lower sensitivity of investment to currency-driven cash flow shocks. Proposition 2: the combination of operational and financial hedging is associated with higher investment efficiency than either strategy alone. Proposition 3: centralised treasury structures with explicit benchmarks reduce hedging costs and discourage selective hedging. Proposition 4: the positive effect of FX management on investment efficiency is stronger for financially constrained firms and for firms exposed to volatile emerging market currencies.

3.5.1 Operationalising the Model

To make the model usable in practice, it is operationalised as an integrated framework consisting of five linked components. The framework is designed to ensure that FX risk management is judged by its contribution to investment efficiency and profitability rather than by hedge gains or losses in isolation.

Table 5: Integrated framework for linking FX risk management to investment efficiency

Component	Core activities	Key performance indicators
1. Objectives	Define what is protected: cash for investment, covenants, earnings guidance or competitive position; set risk appetite at board level	Approved policy; documented risk appetite; alignment with capital plan
2. Exposure analytics	Capture transaction, translation and economic exposures; measure CFaR and EaR; integrate forecasts from ERP	Forecast accuracy; exposure coverage; CFaR against tolerance
3. Strategy mix	Combine operational hedges, netting, forwards, options and financing choices according to exposure certainty and horizon	Hedge ratios within bands; cost of hedging; residual exposure
4. Execution and control	Centralised execution, competitive pricing, automation, counterparty limits, hedge accounting documentation	Transaction cost savings; error rates; hedge effectiveness
5. Performance evaluation	Assess outcomes against passive benchmarks and against investment and earnings stability goals; feed lessons back into policy	Variance of investment versus plan; earnings volatility; value added versus benchmark

Source: Author's proposed framework.

Two design principles underpin the framework. First, the hedge should follow the business: exposures and hedge ratios must reflect the actual uncertainty of forecast cash flows and the strategic importance of the investments they fund. Second, performance should be judged against a pre agreed benchmark rather than in hindsight. Evaluating treasury on whether hedges made or lost money encourages speculative behaviour; evaluating it on whether the firm achieved stable funding for its investment programme at reasonable cost encourages the disciplined behaviour that theory associates with value creation.

3.6. Discussion of Findings

3.6.1 Interpretation of the Findings

The synthesis supports three main conclusions. First, the theoretical rationale for FX risk management has shifted from volatility reduction toward the protection of investment capacity. Capital market imperfections theory, particularly the coordination of investment and financing, provides the clearest link between hedging and value, and the empirical evidence on hedging premiums, debt capacity and investment-cash flow sensitivity is broadly consistent with it, albeit with modest and context-dependent effect sizes. Second, the most important recent advances are not new derivatives but improvements in the information, organisation and accounting environment within which hedging decisions are made. Better forecasts, centralised netting, objective-based hedge accounting and integrated treasury technology allow firms to hedge the right exposures at lower cost. Third, the semi-related literature on financial analytics, procurement, payments, compliance and governance shows that FX outcomes depend on capabilities that sit well outside the treasury function.

These conclusions help reconcile apparently conflicting findings in the literature. Studies that find small or insignificant valuation effects of derivatives use are not necessarily evidence that FX management is unimportant. As the exposure puzzle literature shows, low residual exposure may reflect effective combinations of pass-through, operational hedging and financial hedging. The conceptual model in Section 3.5 therefore suggests that research should evaluate FX management as a bundle of capabilities and assess it through its effects on investment and financing behaviour rather than through derivative usage alone.

3.6.2 Barriers to Implementation

Several obstacles constrain the realisation of these opportunities. Economic exposure remains hard to measure and its estimates are sensitive to model assumptions. Forecast quality varies widely across business units, and hedging inaccurate forecasts can create rather than reduce risk. Derivatives markets for some emerging market currencies are thin, expensive or subject to regulatory restrictions, and sudden policy changes can impair hedge effectiveness. Technology investments require data governance, integration effort and skills that many firms lack. Behavioural biases, including the temptation to hedge selectively based on market views or recent outcomes, can undermine policy discipline. Finally, the empirical evidence on hedging and value faces endogeneity concerns, so managers should be cautious in assuming that the valuation premiums reported in the literature will automatically accrue to their own firms.

Studies of financial governance in small and medium enterprises, cognitive biases in financial decision-making, auditing of AI-powered financial systems, lean process redesign, operational dashboards and governance alignment in joint ventures underline that organisational discipline and behavioural factors determine whether risk policies are followed in practice (Agboada *et al*., 2018a; Alieme *et al*., 2022; Ashore-Onisemo & Iziduh, 2024; Ebisi *et al*., 2021; Eyetsemitan *et al*., 2020; Eyetsemitan *et al*., 2021; Ezeako *et al*., 2024; Falemi *et al*., 2024; Oguntegbe *et al*., 2023) [16, 43, 59, 87, 94, 95, 96, 102, 160].

3.7. Implications

3.7.1 Theoretical Implications

The paper extends capital market imperfections theory by specifying the organisational and informational capabilities through which hedging protects investment, and by identifying moderators that explain why the value of hedging varies across firms and institutional settings. It also integrates the operational hedging and exposure puzzle literatures into a single causal model, and positions semi-related research on analytics, procurement and governance as enabling conditions rather than separate fields.

3.7.2 Managerial Implications

For practitioners, the recommendations are clear: define hedging objectives in terms of investment and strategic goals, invest in exposure data and forecasting, combine operational and financial hedges, centralise execution under strong governance, and measure success against explicit benchmarks. Firms that do so are better placed to turn currency volatility from a constraint on investment into a manageable, and sometimes advantageous, feature of operating globally.

Specifically, chief financial officers and treasurers should link the hedging programme to the capital budget, evaluate foreign projects using simulation rather than point forecasts of exchange rates, review the currency composition of the supply base during sourcing decisions, and invest in data quality and forecast accuracy before investing in more complex instruments.

3.7.3 Policy Implications

For regulators and central banks, particularly in emerging markets, the findings highlight the value of deep and transparent local derivatives markets, predictable foreign exchange regimes and efficient cross-border payment infrastructure. Policies that broaden access to hedging instruments, including for medium-sized firms, and that align local accounting standards with IFRS 9 can lower the cost of managing currency risk and encourage productive foreign investment.

4. Conclusion

4.1. Summary of Findings

FX risk management in multinational enterprises has advanced substantially in measurement, instruments, organisation, accounting and technology. The central lesson of both theory and evidence is that these advances create value when they are used to protect the firm's capacity to invest and compete, rather than to minimise volatility for its own sake or to generate trading gains. The emerging opportunities identified here, namely investment linked hedging, FX informed capital budgeting, cost optimisation, smarter use of options, strategic operational hedging, capability in emerging market currencies, payments

innovation and integrated risk management, offer practical routes to higher investment efficiency and profitability.

The study responds to its objective by showing how advances in FX risk management can be translated into higher investment efficiency and profitability. Its principal contribution is an integrated conceptual model and operational framework that link exposure analytics, financial and operational hedging, centralised treasury, governance and technology to the protection of investment capacity, together with four testable propositions.

4.2. Limitations

This study has several limitations. First, as an integrative review it synthesises existing evidence rather than producing new empirical tests, and the propositions derived from the conceptual model remain to be validated. Second, the review is bounded by sources published in or before 2024, so developments after that date are outside its scope. Third, a substantial part of the applied literature consists of conceptual frameworks and reviews rather than large-sample empirical studies, which limits the strength of causal inference. Fourth, although sources from both developed and emerging markets were included, evidence remains concentrated in a limited number of jurisdictions, and findings may not generalise to every institutional setting. Finally, thematic coding involves researcher judgement, and alternative classifications of the literature are possible.

4.3. Future Research

Future research could usefully pursue several directions. First, studies that directly measure the effect of hedging on the gap between planned and realised investment would test the core mechanism more precisely than valuation studies. Second, the impact of machine learning forecasting and automated treasury platforms on hedge performance and costs deserves systematic evaluation. Third, more evidence is needed from emerging market MNEs, where financing constraints are tighter and currency shocks larger, and where the marginal benefit of effective FX management may therefore be greatest. Fourth, researchers could examine how geopolitical fragmentation and supply chain reconfiguration are changing the balance between operational and financial hedging. Finally, the accounting reforms of the past decade offer a natural setting to study whether reducing accounting frictions changes real hedging behaviour and outcomes.

In addition, the four propositions in Section 3.5 offer a structured agenda. Panel studies combining hedging disclosures with capital expenditure plans could test Propositions 1 and 2. Case studies and surveys of treasury centres could examine Proposition 3, while cross-country comparisons of firms facing different degrees of financial constraint and currency volatility could test Proposition 4.

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How to Cite This Article

Kpobie C, Odufuye O, Azubuike C, Nwozaku E. Advances in foreign exchange risk management and emerging opportunities for enhancing investment efficiency and profitability in multinational enterprises. Int J Foreign Trade Int Bus Upgrad. 2024;5(1):45-64. doi:10.54660/.IJFTIBU.2024.5.1.45-64.

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