

## Currency Exchange Rate Determinants: A Case Of MENA And India

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### Abstract

*This study focuses on the determinants of Currency Exchange Rates (CERs) of the Middle East North Africa countries, and India. For the benefit of governments, companies, and investors operating throughout the MENA (Middle East and North Africa) region and India, the research can offer insightful information on the variables affecting currency exchange rates in these regions. The study employs two methods: first, it looks at what past studies have found in their research to understand the determinants of CERs. Secondly, it models the identified factors with the help of experts' opinions using Interpretative Structural Modeling (ISM) approach. The motivation for this research arises from the ever-evolving global financial landscape, accentuated by the MENA region and India's rapid economic growth and shifting political landscapes. The findings unravel a complex web of interdependencies among the identified factors, presenting actionable insights for stakeholders like central bank intervention, financial stability, and poverty and inequality. This research contributes to both academic understanding and practitioner decision-making by discussing the practical ramifications of its insights for policymakers, investors, and business operators. It lists the future research avenues and underscores areas necessitating further exploration and refinement within this critical financial domain.*

**Keywords:** Exchange Rate; Currency; MENA; Exchange Rate Management System; Interpretative Structural Modeling (ISM)

### 1 Introduction

Currency exchange rates are a critical determinant of international economic relations, impacting trade, investment, and financial stability. The intricate interplay of factors that shape these rates has captured the attention of economists, policymakers, businesses, and investors for decades. India and the MENA area are examples of vibrant economic environments with strong linkages to the remainder of the globe, particularly the United States, in terms of trade and investment. As a result, understanding the variables affecting CERs in this part of the world is crucial for firms involved in international commerce as well as for politicians developing economic strategies. Against the backdrop of a dynamic global economic landscape, the focus of this research is to explore and model the key drivers of Currency Exchange Rates (CER) between the Middle East and North Africa (MENA) region and India concerning the United States Dollar (USD). Over the past few decades, the world has witnessed dramatic shifts in global financial markets. Currency exchange rates have been particularly dynamic, often responding to a complex interplay of domestic and international factors. In the MENA region and India, these trends have been

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accentuated by rapid economic growth, political changes, and evolving global trade dynamics (Baffour et al., 2019). Understanding the underlying forces driving CER movements in this context is imperative for several reasons.

Firstly, the MENA region and India represent a dynamic economic landscape with significant trade and investment ties to the rest of the world, especially the United States (Marinakis et al., 2020). Currency exchange rates are central to these economic interactions. As such, comprehending the factors influencing CER in this region is of paramount importance for businesses engaged in international trade and for policymakers shaping economic strategies. Secondly, the research is motivated by the observed volatility and uncertainty in global financial markets (Feng et al., 2021). Currency exchange rate fluctuations can have profound implications for businesses' profitability, the stability of financial systems, and the overall health of national economies. A deeper understanding of the drivers of these fluctuations can provide insights into how to manage and mitigate risks associated with CER movements (Chen et al., 2020). However, it might be difficult to comprehend the underlying factors that are influencing CER trends in India and the MENA area. In response to a complex interaction of internal and international causes, currency exchange rate movements are frequently unpredictable and unclear. The MENA region's and India's fast economic expansion, political shifts, and changing dynamics of international commerce have all reinforced these tendencies.

The implications of this research are multifaceted. By unveiling the intricate web of relationships among factors influencing CER, policymakers can use this knowledge to formulate more effective economic policies, particularly those related to interest rates, inflation, political stability, and trade. Businesses and investors can make more informed decisions by considering the factors that drive CER movements in their strategic planning. Understanding the dynamics of CER can help nations and businesses build resilience against external economic shocks and crises (Hoffman et al., 2021). This study seeks to address the following research questions to achieve the above objectives.

- What are the key factors influencing Currency Exchange Rates (CERs) in the MENA region and India?
- What are the dynamics in modeling CERs in the MENA region and India?
- What are the potential avenues for further research and practical applications of this model in real-world economic scenarios?

In order to address these inquiries comprehensively, this research employs a two-fold approach. Firstly, it conducts a rigorous structured literature review to identify the pivotal determinants influencing Currency Exchange Rates (CERs). Subsequently, the study utilizes the Interpretative Structural Modeling (ISM) technique to construct a conceptual model, integrating expert insights and opinions. The rest of this study is organized as follows. Section 2 encompasses a comprehensive review of the pertinent literature, delineating key clusters and variables for examination. Section 3 outlines the research methodology, elaborating on the structured literature review process and the application of ISM in modeling CER determinants. Section 4 presents the research's empirical results and critical findings, elucidating the interconnections among the identified factors. Section 5 offers a conclusive summary of the study's findings and proposes a roadmap for future research endeavors. It also outlines the study's limitations, providing valuable insights for potential enhancements in subsequent research efforts.

## **2 Review of Literature**

### **2.1 Studies related to “Currency Exchange Rate Determinants”**

The study utilizes a structured review process for analyzing past literature on the CER modeling. For countries in a deficit balance, substantial foreign reserves are necessary to maintain equilibrium, while surplus balance nations require unreciprocated capital export, making foreign reserves a crucial determinant of exchange rates. Despite extensive

attention from economists, empirical success in explaining exchange rate determinants has been elusive (Mungule, 2020). Key factors affecting exchange rates include productivity shifts, purchasing power parity, market characteristics, interest rates, and expectations. However, one burning question remains: Is the exchange rate predictable? The consensus suggests that no model consistently outperforms the random walk model in forecasting exchange rates. Al-Gasaymeh, et. al., (2019) investigated the use of the Co-integration approach to apply the principles of purchasing power parity to the intriguing examples of India and Pakistan. The results of both countries' co-integrations show that exchange rates and price fluctuations move more closely together, validating the PPP theorem.

Macroeconomic indicators are essential in the switch from "non-renewable energy (NRE)" to "renewable energy (RE)". The link between the real effective exchange rate (RE) and the foreign exchange rate of the developing economies (Brazil, China, Indonesia, India, Mexico, Russia, and Turkey, or the E7 countries) is attempted to be examined (Deka, et. al., 2023). Foreign reserves decrease to finance trade deficits, maintaining equilibrium in the foreign currency market. The monetary approach introduces dynamics to exchange rate determination, revealing volatility under floating exchange rates, especially with increased capital mobility (Jablai and Sehnai, 2019). Flexible exchange rates, coupled with capital mobility, amplify exchange rate volatility. International money demand explains exchange rate movements concerning relative prices in different countries, driven by relative money demand and supply.

Heydari and Jariani (2020) examined the effective causes of capital flight from Middle Eastern and North African nations. The MENA nations are now dealing with a capital outflow crisis while having high rates of joblessness, budget shortfalls, a low income per person, foreign loans, and significant inequality. To find a solution to this issue, it is important to understand the elements that influence it. Salim & Shi (2019) analyzed the exchange rate determinants for the Indonesian rupiah, discovering a high correlation between exchange rates and macroeconomic variables. They utilized Autoregressive Distribution Lag models, linear and non-linear, to estimate exchange rate volatility.

The non-linear ARDL model's application reveals that the return index, interest rate, as well as exchange rate are all cointegrated. This indicates that the stock markets in the MENA region are significantly influenced by these macroeconomic issues (Moussa and Delhoumi, 2021). Kilicarlsan (2018) examined exchange rate volatility determinants for Turkey's real effective exchange rate, discovering that volatility decreased due to factors like trade balance and government expenditures but increased due to capital movements and production. Bouraoui & Phisuthiwatcharavong (2015) investigated the Thai baht's exchange rate determinants, finding that terms of trade and foreign reserves significantly influenced nominal exchange rates. This study further utilized a co-occurrence of keywords analysis to visualize patterns in research papers through keywords mentioned by authors in the research manuscripts (Donthu et al., 2021). Al-Shakrchy, et. al., (2023) predicted Coronavirus-related changes in interest rates, inflation, and foreign direct investment in MENA nations. The results showed that "inflation", "real interest rate", and "COVID-19" all had a negative effect on "FDI" in MENA nations, whereas "exchange rate" and "GDP per capita" both had a favorable effect.

## 2.2 Study Variables

Currency exchange rates between countries are influenced by a variety of factors, and their interactions can be complex. Some of the key determinants that impact currency exchange rates include:

- **Interest Rates:** Central banks' decisions on interest rates have a significant influence on exchange rates. Higher interest rates in a country tend to attract foreign investors seeking higher returns, which increases demand for the country's currency and, in turn, strengthens its value (Patel et al., 2014; Pandey et al., 2020).
- **Economic Growth Rate:** A country's economic health and performance play a vital role in determining its currency's strength (Guzman et al., 2018). Strong economic

growth, low unemployment, and stable inflation tend to boost a currency's value, while economic uncertainty can lead to a weakening currency.

- **Inflation Rates:** Countries with lower inflation rates generally experience an appreciation of their currency because their purchasing power increases compared to countries with higher inflation rates. A higher inflation rate can erode the value of a currency over time.
- **Trade Balance:** The balance of trade between countries, i.e., the difference between exports and imports, can impact exchange rates. A country with a trade surplus (exports exceeding imports) will likely experience an increase in demand for its currency, driving its value up. Conversely, a trade deficit (imports exceeding exports) may lead to a depreciation of the currency (Deka et al., 2022).
- **Political Stability and Economic Policies:** Countries with stable political environments and sound economic policies tend to attract more foreign investment, leading to increased demand for their currency (Blomberg et al., 2005).
- **Market Sentiment:** Currency markets can be influenced by speculative trading and investor sentiment. Positive perceptions about a country's economic outlook may lead to increased demand for its currency, even if the economic fundamentals do not fully support it (Kala et al., 2018).
- **Capital Flows:** The flow of capital into and out of a country can impact exchange rates. Foreign direct investment, portfolio investment, and other capital flows influence currency demand (Jena and Sethi, 2020).
- **ForEx Reserves:** The economies having higher foreign exchange reserves tend to have lower currency exchange volatility in comparison to economies with lower foreign exchange reserves (Kapoor and Sachan, 2015; Mishra, 2018).

The same order of the variables is further utilized in coding these variables for ISM-MICMAC analysis.

### 3 Research Methodology

In line with the objectives of this research aimed at modeling currency exchange rates, a comprehensive research methodology is proposed, comprising two primary stages: Factor Identification and Factor Modelling. Here, we outline the stages for the current research:

#### 3.1 Factor Identification

The Factor Identification phase is critical for identifying and selecting the factors influencing currency exchange rates. In this phase, the Delphi method, a well-established technique for gathering expert opinions, will be employed to identify and refine the factors affecting exchange rates. The Delphi method offers a structured approach for assessing complex issues and aligning expert perspectives (Han et al., 2019).

##### 3.1.1 The Delphi Method

The Delphi method, initially developed in the 1950s, will be used to gather and consolidate expert opinions regarding exchange rate determinants (Okoli and Pawlowski, 2004). The Delphi process involves the following steps:

- Step 1: Factor Selection:** A preliminary list of factors will be generated based on existing literature, encompassing various potential determinants of exchange rates.
- Step 2: Remove Duplicates:** The preliminary list will be meticulously reviewed, and duplicate factors will be eliminated.
- Step 3: Selection of Experts:** An expert panel will be assembled, consisting of professionals with extensive experience in areas relevant to exchange rate modeling. This panel will include academics specializing in economics and

finance, industry experts, and consultants who have practical knowledge of exchange rate dynamics.

**Step 4: Iteration of Pre-Prepared List** The expert panel will be provided with the preliminary list of factors and asked to modify and amend it based on their expertise. This process may involve multiple iterations until a consensus is reached.

**Step 5: Finalization of Factors** Based on the responses and iterations from the expert panel, a finalized list of factors will be prepared for use in the subsequent phases of the research.

From the comprehensive literature review, 17 potential exchange rate determinants will be identified. The Delphi method will be employed to refine and finalize this list, resulting in a selection of 8 factors for further study.

### 3.2 Factor Modelling

The Factor Modelling phase is designed to organize the identified exchange rate determinants into a structured model that captures their interrelationships and relative importance. This phase will leverage the Interpretive Structural Modeling (ISM) approach, a widely recognized technique for structural analysis and decision-making (Han et al., 2019).

#### 3.2.1 Interpretive Structural Modeling (ISM)

ISM, developed in 1974 by J. Warfield, is a powerful approach for analyzing the structural relationships between criteria and developing multilevel models (Gorane and Kant, 2015). The following steps outline the application of ISM to our research:

**Step 1: Identification of Criteria** A list of criteria, representing the exchange rate determinants, will be identified and listed for modeling.

**Step 2: Finding Contextual Relationship**, The contextual relationships between the criteria will be established through pairwise comparisons using qualitative ratings (V, A, X, O) to indicate the influence of one criterion on another.

**Step 3: Develop Initial Reachability Matrix** An initial reachability matrix will be generated from the contextual relationships, converting qualitative ratings to binary values (0 and 1) based on predefined rules.

**Step 4: Convert Initial Reachability Matrix to Final Reachability Matrix** The initial reachability matrix will be converted into a final reachability matrix using transitivity rules, which will reveal the driving and dependence powers of each determinant.

**Step 5: Finding Hierarchical Level of Criterion**, The hierarchical levels of exchange rate determinants will be determined through iterative processes based on reachability and antecedent sets. Variables at the top level will have a greater degree of independence.

**Step 6: Developing ISM Model**, A structural model (diagraph) illustrating the relationships between the determinants will be constructed based on their hierarchical levels. The diagraph will be converted into a clear ISM model by removing transitive relationships.

**Step 7: Currency Exchange Rate (CER) Determinants MICMAC Analysis** To classify the determinants, MICMAC (Matrice d'Impacts Croisés Multiplication Appliquée à un Classement) analysis will be employed. This analysis categorizes determinants into four clusters: autonomous, dependent, linkage, and driving based on their driving and dependence powers.

### 3.3 Fuzzy Cross-Impact Matrix Multiplication Applied to Classification (F-MICMAC)

Building upon the ISM analysis, the F-MICMAC approach will be applied to determine the degree and quality of relationships between the exchange rate determinants, addressing the limitations of binary relationships (Singh et al., 2019; Ahmad et al. 2021).

**Step 1: Developing Binary Direct Reachability Matrix (BDRM)** The BDRM will be created from the final reachability matrix by removing transitive relationships and setting diagonal elements to 0.

**Step 2: Developing Fuzzy Direct Reachability Matrix (FDRM)** The F-MICMAC analysis will rate the quality of relationships on a linguistic scale and then convert them into quantitative terms. This will result in a fuzzy direct reachability matrix (FDRM) that accounts for the quality of relationships.

**Step 3: Classification of Categories** Based on the FDRM analysis, the exchange rate determinants will be classified into four categories: autonomous, dependent, linkage, and driving. This classification will provide insights into the influence and susceptibility of each determinant.

Leveraging this research methodology, adapted from established frameworks and techniques, this study attempts to model the complex relationships between these determinants, ultimately contributing to a deeper understanding of exchange rate dynamics.

#### 4 Results and Findings

Previous studies, as outlined in the literature review, have utilized similar methodologies to analyze complex systems and relationships, including factors influencing exchange rates. These studies have successfully applied the Delphi method for factor identification and ISM for structural analysis (Han et al., 2019; Malviya and Kant, 2017; Singh et al., 2019). Moreover, the application of F-MICMAC analysis, as used in our methodology, has addressed the limitations of binary relationships and offered a more nuanced understanding of interdependencies (Mishra et al., 2017). The stepwise results are shown in below figures:

	Currency Exchange Rate	Interest Rates	Inflation	Economic Growth Rate	Trade Balances	Political Stability	Market Sentiment	Capital Flows (FDI/FII)	Forex Reserves
Currency Exchange Rate		A	A	A	A	A	A	A	A
Interest Rates			V	O	O	O	V	V	V
Inflation				V	O	V	V	V	V
Economic Growth Rate					X	O	V	X	O
Trade Balances						O	O	A	V
Political Stability							V	V	O
Market Sentiment								O	O

Capital Flows (FDI/FII)									V
ForEx Reserves									
V → row variable influences corresponding column variable.									
A → row variable is influenced by corresponding column variable.									
X → row and corresponding column variable influence each other									
O → row and corresponding column variable have no relationship.									

**Figure 1: VAXO Matrix for ISM**

Figure 2 represents the VAXO Matrix for ISM in which the result shows the relationship between all variables. The relationship between variables is shown on the basis of VAXO matrix in which V represents that column variable is influenced by row variable, A represents that column variable influences row variable, X represents that both row and column variable influence each other and O represents that both row and column variable do not have any relationship.

**Table 2: Structural Self-Interaction Matrix (SSIM)**

Variables	1	2	3	4	5	6	7	8	9
Currency Exchange Rate		A	A	A	A	A	A	A	A
Interest Rates			V	O	O	O	V	V	V
Inflation				V	O	V	V	V	V
Economic Growth Rate					X	O	V	X	O
Trade Balances						O	O	A	V
Political Stability							V	V	O
Market Sentiment								O	O
Capital Flows (FDI/FII)									V
ForEx Reserves									

The Structural Self-Interaction Matrix (SSIM) table 2 illustrates the relationships between different variables, where "A" means a variable influence itself, "V" signifies that one variable affects another, "X" indicates that two variables mutually affect each other, and "O" suggests no direct relationship between the variables. Table 2 shows how each economic and financial variable influences or interacts with the others. For example, Currency Exchange Rate is affected by many factors, while Interest Rates have an impact on themselves and a few others. Economic Growth Rate and Trade Balances have a mutual relationship, and Political Stability is influenced by Trade Balances and Market Sentiment.

**Table 3: Reachability Matrix (RM)**

Variables	1	2	3	4	5	6	7	8	9	Driving Power
Currency Exchange Rate	1	0	0	0	0	0	0	0	0	1
Interest Rates	1	1	1	0	0	0	1	1	1	6
Inflation	1	0	1	1	0	1	1	1	1	7

Economic Growth Rate	1	0	0	1	1	0	1	1	0	5
Trade Balances	1	0	0	1	1	0	0	0	1	4
Political Stability	1	0	0	0	0	1	1	1	0	4
Market Sentiment	1	0	0	0	0	0	1	0	0	2
Capital Flows (FDI/FII)	1	0	0	1	1	0	0	1	1	5
ForEx Reserves	1	0	0	0	0	0	0	0	1	2
Dependence power	9	1	2	4	3	2	5	5	5	

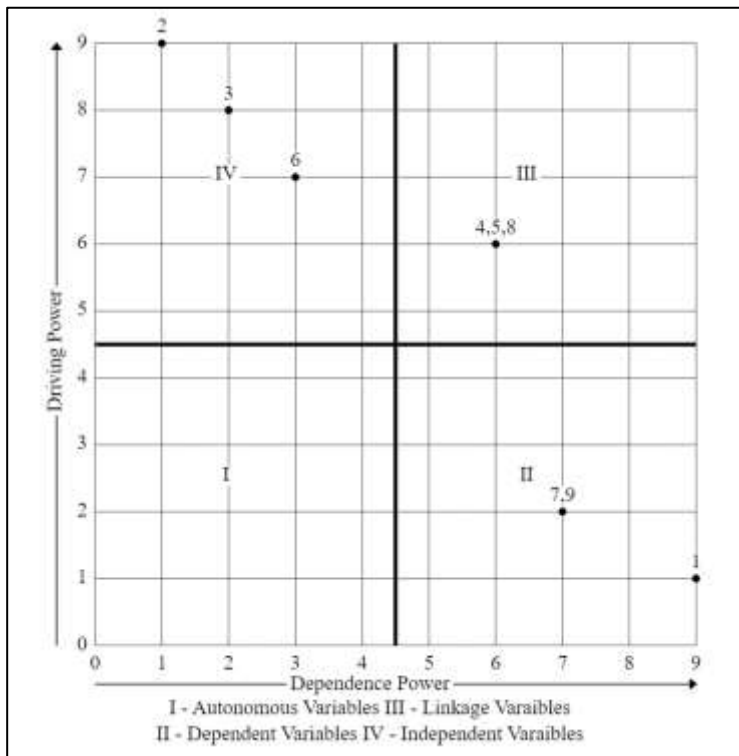
The Reachability Matrix (RM) table 3 depicts the relationships between variables. Rows represent variables, and columns show their influence on other variables (1 signifies a strong influence, 0 means no influence). The "Driving Power" column reveals how many variables influence each variable. For instance, Interest Rates are influenced by most variables, while Market Sentiment is influenced by only two. Currency Exchange Rate and ForEx Reserves don't influence any other variables, and Dependence Power has the highest driving power, indicating its susceptibility to external influences within the system.

**Table 4: Final Reachability Matrix (FRM)**

Variables	1	2	3	4	5	6	7	8	9	Driving Power
Currency Exchange Rate	1	0	0	0	0	0	0	0	0	1
Interest Rates	1	1	1	1*	1*	1*	1	1	1	9
Inflation	1	0	1	1	1*	1	1	1	1	8
Economic Growth Rate	1	0	0	1	1	0	1	1	1*	6
Trade Balances	1	0	0	1	1	0	1*	1*	1	6
Political Stability	1	0	0	1*	1*	1	1	1	1*	7
Market Sentiment	1	0	0	0	0	0	1	0	0	2
Capital Flows (FDI/FII)	1	0	0	1	1	0	1*	1	1	5
ForEx Reserves	1	0	0	0	0	0	0	0	1	2
Dependence power	9	1	2	6	6	3	7	6	7	

The Final Reachability Matrix (FRM) table 4 illustrates the relationships between variables, with 1 indicating influence and 0 indicating no influence. The "Driving Power" column reveals how many variables influence each variable. For instance, "Interest Rates" are influenced by most variables, while "Economic Growth Rate" and "Trade Balances" mutually affect each other. "Political Stability" is highly influenced and has significant driving power, while "Market Sentiment" is influenced by fewer variables and has lower driving power. Variables like "Currency Exchange Rate" and "ForEx Reserves" don't influence others. "Dependence Power" quantifies the total influences on each variable, with Interest Rates, Inflation, and Political Stability being highly susceptible to external factors.





**Figure 3: MICMAC Plotting**

MICMAC (Matrice impacts Croisés Multiplication Applique à un Classement) analysis, conducted to investigate the determinants of currency exchange rates in the context of MENA and India, unveiled a comprehensive understanding of the intertwined relationships among the selected factors. The study identified "Driving" factors, such as Interest Rates, Inflation, Economic Growth Rate, and Trade Balances, as being instrumental in influencing currency exchange rates.

Labeling the First Quarter The least amount of influence is exerted by elements that are either completely autonomous or that have a low driving power and minimal reliance. Nothing of significance exists here. Both the driving and dependent powers are modest in them. Classified as dependent factors in the second quarter, the 7, 9, and 1 variable in this area have more to do with dependency than driving. They are not very significant. In the third Quarter called balancing variables, 4, 5, and 8 factors belong to this zone. The elements whose dependency and driving force both are equally powerful come under this group. Key to the management's improvement might be the weak reliance and increased driving capability components present in the fourth quarter, sometimes known as the left quarter. In this case, the range of 2, 3, and 6 elements fits inside this plot.

**Table 5: Level Partitioning (LP)**

Elements (MI)	Reachability set R(Mi)	Antecedent Set A(Ni)	Intersection set R(Mi)∩A(Ni)	Level
1	1,	1,2,3,4,5,6,7,8,9	1,	1
2	2,	2,	2,	6
3	3,	2,3,	3,	5
4	4,5,8,	2,3,4,5,6,8,	4,5,8,	3
5	4,5,8,	2,3,4,5,6,8,	4,5,8,	3
6	6,	2,3,6,	6,	4
7	7,	2,3,4,5,6,7,8,	7,	2
8	4,5,8	2,3,4,5,6,8,	4,5,8	3

9	9,	2,3,4,5,6,8,9,	9,	2
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The given table is a Reachability Matrix (RM) table that illustrates the relationships between different elements (Mi), their reachability set (R(Mi)), antecedent set (A(Ni)), intersection set (R(Mi)∩A(Ni)), and level. The reachability set for each element includes the element itself and others it can reach, while the antecedent set comprises the element itself and those that can reach it. The intersection set represents common elements in both sets. The level column assigns a hierarchical level to each element. By analyzing the table, one can discern the impact and connectivity of elements, facilitating a deeper understanding of a system's dynamics and influencing factors.

**Table 6: Conical Matrix (CM)**

Variables	1	7	9	4	5	8	6	3	2	Driving Power	Level
1	1	0	0	0	0	0	0	0	0	1	1
7	1	1	0	0	0	0	0	0	0	2	2
9	1	0	1	0	0	0	0	0	0	2	2
4	1	1	1*	1	1	1	0	0	0	6	3
5	1	1*	1	1	1	1*	0	0	0	6	3
8	1	1*	1	1	1	1	0	0	0	6	3
6	1	1	1*	1*	1*	1	1	0	0	7	4
3	1	1	1	1	1*	1	1	1	0	8	5
2	1	1	1	1*	1*	1	1*	1	1	9	6
Dependence power	9	7	7	6	6	6	3	2	1		
Level	1	2	2	3	3	3	4	5	6		

The Conical Matrix (CM) table is a tool used in Interpretive Structural Modeling (ISM) to identify the relationships between variables or elements in a system. The table shows the degree to which each variable or element is influenced by other variables or elements in the system. The CM table shows the reachability set, antecedent set, intersection set, driving power, and level for each element. The driving power column shows how many variables influence each variable, while the level column represents the level of each element in the hierarchy of the system. The final result of the table shows that element 2 has the highest dependence power, while element 1 has the lowest dependence power. The level column shows that elements 5, 4, and 8 are at the same level, while element 2 is at the highest level.

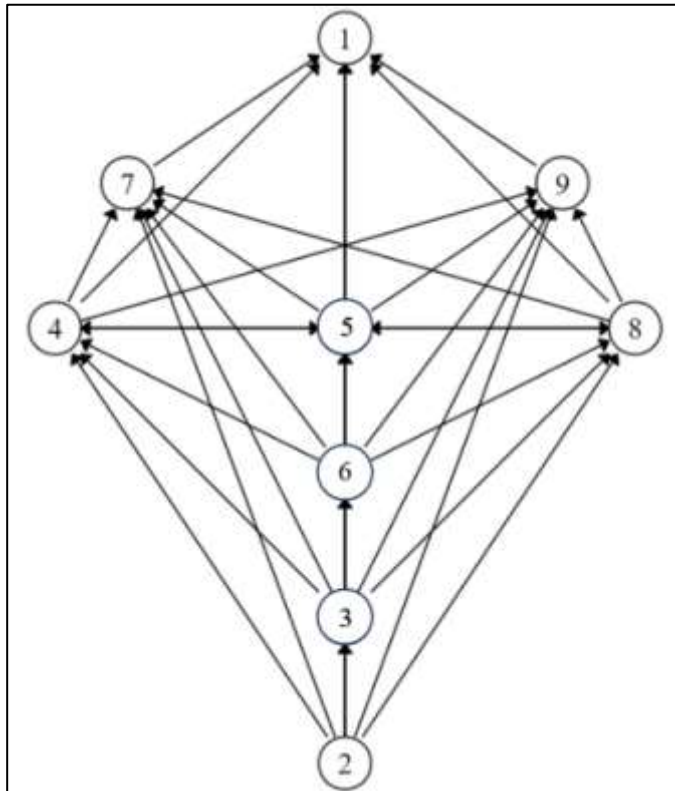


Figure 4: Digraph Model

Table 7: Reduced Conical Matrix

Variables	1	7	9	4	5	8	6	3	2	Driving Power	Level
Currency Exchange Rate	1	0	0	0	0	0	0	0	0	1	1
Interest Rates	1	1	0	0	0	0	0	0	0	2	2
Inflation	1	0	1	0	0	0	0	0	0	2	2
Economic Growth Rate	0	1	1*	1	1	1	0	0	0	6	3
Trade Balances	0	1*	1	1	1	1*	0	0	0	6	3
Political Stability	0	1*	1	1	1	1	0	0	0	6	3
Market Sentiment	0	0	0	1*	1*	1	1	0	0	7	4
Capital Flows (FDI/FII)	0	0	0	0	0	0	1	1	0	8	5
ForEx Reserves	0	0	0	0	0	0	0	1	0	9	6
Dependence power	9	7	7	6	6	6	3	2	1		
Level	1	2	2	3	3	3	4	5	6		

The reduced Conical Matrix table simplifies how various factors are related within a system. In this table, each row and column represents a different factor, and the "1" values indicate that one factor has a direct influence on another. The "Driving Power" column shows how many factors each factor directly affects, and the "Level" column assigns a level based on the degree of influence or dependence. For example, "Currency Exchange Rate" has a level of 1, indicating it's a primary factor, and it influences "Interest Rates," which in turn affects other factors, giving it a level of 2. The final result of this table is a structured

view of the relationships among these factors, helping us understand their interconnectedness and which factors have the most influence in the system based on their levels.

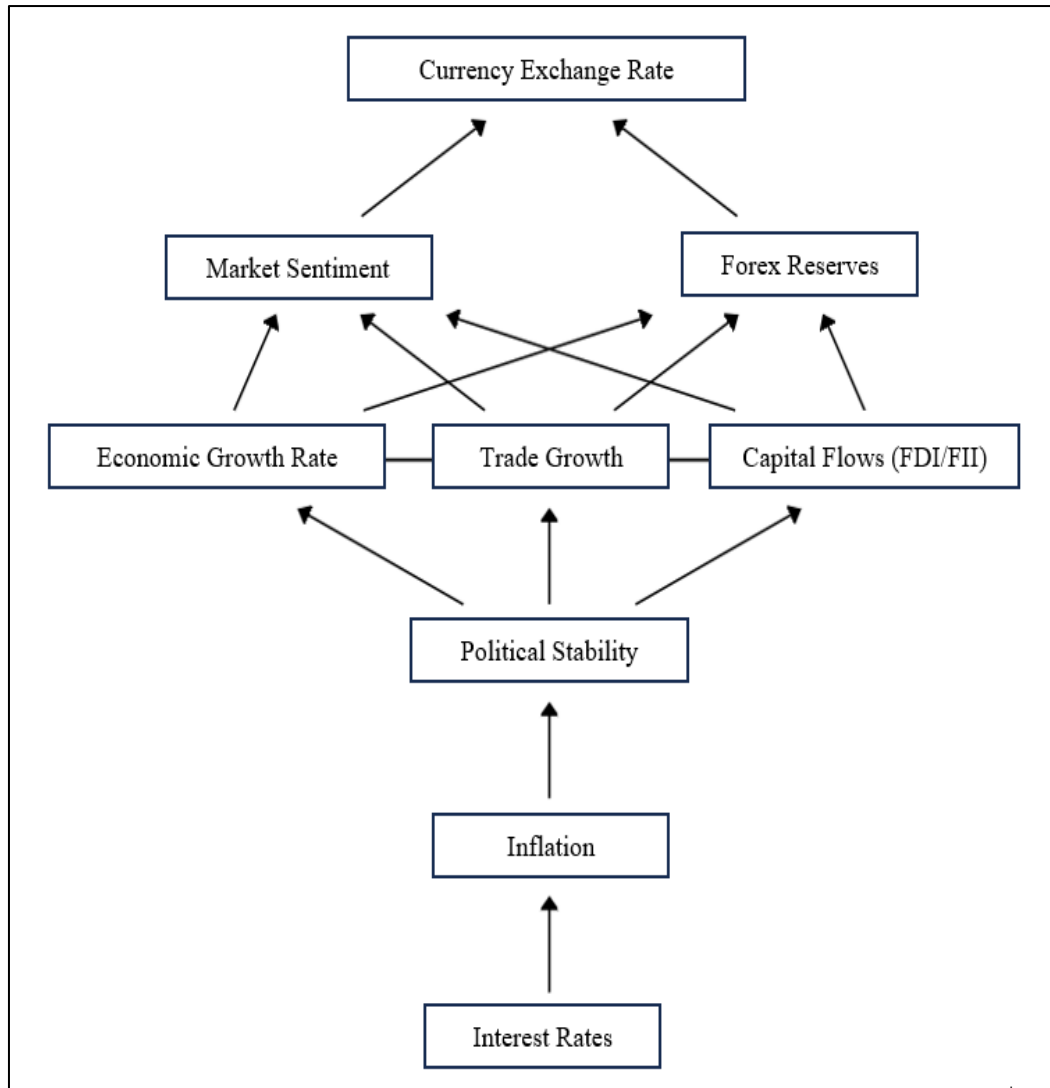


Figure 1 Final Model

The findings from the ISM-MICMAC analysis are multifold. Interest rates emerge as a foundational factor in the model, exerting a significant impact on the dynamics of CER. Higher interest rates are associated with increased inflation. Inflation rates are identified as an intermediate factor, influenced by interest rates and in turn influencing political stability. Political stability is recognized as a crucial factor that influences not only economic growth rates but also trade balances and capital flows. Economic growth rates, trade balances, and capital flows are closely interlinked, with each affecting the others. Economic growth rates positively impacts market sentiment and forex reserves. Market sentiment and forex reserves, while influenced by economic factors, also play a crucial role in determining CER. Positive market sentiment and higher forex reserves contribute to a stronger currency exchange rate. CER, as the dependent variable, is influenced by a complex interplay of factors within the model. It is both directly and indirectly affected by interest rates, inflation, political stability, economic growth, trade balances, capital flows, market sentiment, and forex reserves.

**5 Discussion**

The data supplied in the tables and figures provide a thorough knowledge of the complex linkages and dynamics at play in the framework of the factors that determine the relative values of MENA and Indian currencies. The correlations between the variables may be seen in Figure 2's VAXO Matrix, which lays the groundwork for further examinations. The particular links between economic and financial factors are explored further in Table 2's "Structural Self-Interaction Matrix (SSIM)" and Table 3's Reachability Matrix (RM), both of which illuminate how individual variables impact or interact with one another. The addition of Driving Power as well as Dependence Power measures increases the precision of the research by highlighting which variables are most vulnerable to outside effects. However, in contrast to the current study, Pathak and Singh (2019) reviewed past articles and brainstorming sessions of academicians and industrialists on the relative database and identified 12 variables. Hence, in current study, only 9 variables were identified for the analysis.

Strategic insight into the driving and reliant capabilities of factors is provided by the MICMAC analysis, which classifies them as autonomous, dependent, balanced, as well as left-quarter factors. Using this fine-grained classification, important management factors and stakeholders may be zeroed in on with more precision. Table 6's Reachability Matrix (RM) deepens this investigation by illuminating the "antecedent sets, intersection sets, and hierarchical levels of each element", all of which contribute to a more complete picture of the system's interdependence. On the contrary, Ahmad, M. (2019) identified many variables for conducting analysis and didn't use experts opinions as compared to this study.

Tables such as "the Conical Matrix (CM) and the Reduced Conical Matrix (RCM)" dive into the structural connections between variables, revealing the influence and dependency of each component. The driving power along with level measurements shed light on the hierarchy of components by highlighting which aspects are most influential and hold key places in the system. The results of the ISM-MICMAC research shed light on interest rates as a key component, revealing the complex web of interconnections that underpin the dynamics of currency exchange rates. In sum, this comprehensive research from several angles gives a solid basis for making sense of the myriad of factors that affect the value of currencies traded between the Middle East and North Africa (MENA) and India.

When compared to previous research, "Currency Exchange Rate Determinants: A Case of MENA and India" stands out due to its use of the MICMAC methodology and Delphi Method to determine the most important factors influencing exchange rates in the MENA area and India. In "Emerging market exchange rates during quantitative tapering: The effect of US and domestic news" study, the analysis was done using secondary data but in "Currency Exchange Rate Determinants: A Case of MENA and India" study, the analysis was done using Delphi Method and ISM-MICMAC (U. Tamgac, 2021). The Delphi Method was used to gather opinions from experts to make the study more comparable. To assist in prioritizing measures to promote exchange rate stability, policymakers should use the MICMAC analysis, which is a strong tool for finding the most significant components in a complex system. The importance of the study's focus on the prerequisites for these countries to properly manage their economies as well as currencies in enhancing their worldwide image cannot be overstated (Bernoth and Herwartz, 2021).

## **6 Conclusion**

In summary, this research study has conducted a thorough examination of the factors influencing Currency Exchange Rates (CERs) in the Middle East North Africa (MENA) area and India. This study has utilized a systematic literature review and employed Interpretative Structural Modelling (ISM) and Fuzzy Cross-Impact Matrix Multiplication Applied to Classification (F-MICMAC) to reveal an intricate network of interrelationships among crucial components that impact CERs. The results emphasize the significant influence of many factors such as interest rates, inflation, political stability, economic development, trade balances, capital flows, market sentiment, and foreign reserves on the

dynamics of the CER. The aforementioned insights possess noteworthy consequences for policymakers, enterprises, and investors operating within the MENA region and India. These implications empower them to make well-informed decisions and effectively mitigate risks connected with fluctuations in currency exchange rates.

Given the ongoing evolution of the global financial landscape, it is imperative for future research endeavors to prioritize certain key areas. These areas include dynamic modelling, the ramifications of digital currencies, the influence of geopolitical issues, behavioral factors, economic integration, machine learning, big data, sustainable finance, and the policy implications stemming from these phenomena. Through the examination and exploration of these specific domains, scholars have the potential to enhance their comprehension of the dynamics of CER (Cross-Exchange Rate) and furnish decision-makers with invaluable resources in the face of a progressively interconnected and intricate global economy.

## **7 Implications**

The study "Currency Exchange Rate Determinants: A Case of MENA and India" sheds light on the complex variables that affect currency exchange rates in both the MENA and India. This research is helpful for policymakers, financial analysts, and investors because it examines the factors that influence currency exchange rates. By looking at these areas, the developers get a more nuanced understanding of the many factors that go into determining the value of a currency due to the wide range of economic and geopolitical systems they contain. This study's conclusions can be used as a basis for additional academic investigation into the world economy, as well as to guide strategic decisions by enterprises involved in international commerce. Given the importance of exchange rates in determining business dealings, this study aids in elucidating the factors that influence currency fluctuations. This, in turn, may lead to better international financial decisions.

## **8 Future Research Directions**

Based on a structured literature search and findings of this study, following areas are recommended for researchers in this domain:

Currency exchange rates exhibit a high degree of dynamism and are susceptible to fast fluctuations in reaction to a multitude of causes. Future research should potentially prioritize the development of dynamic models capable of capturing short-term changes in order to enhance the precision of short-term projections for certified emission reductions. This may entail the utilization of several methodologies such as time-series analysis, machine learning, or agent-based modeling techniques (Qi et al., 2020). The emergence of digital currencies, including cryptocurrencies and central bank digital currencies (CBDCs), has the capacity to significantly impact conventional currency exchange markets. Exploring the potential effects of digital currencies on carbon emission reductions and international trade is a promising direction for future scholarly inquiry.

Geopolitical factors encompass a range of events and tensions that can exert a notable influence on the dynamics of carbon emission reductions (Patil et al., 2022). Further investigation is warranted to explore the intricate relationship between geopolitical variables, namely trade disputes, sanctions, and foreign conflicts, and their impact on exchange rates within the Middle East and North Africa (MENA) region as well as India. Behavioral factors, such as investor emotion and behavior, are of significant importance in currency markets. Subsequent investigations may delve into behavioral determinants, encompassing herding behavior, risk aversion, and sentiment analysis, in order to gain a more comprehensive comprehension of their impact on CERs.

The MENA region has had endeavors aimed at achieving economic unification, exemplified by the establishment of the Gulf Cooperation Council (GCC). This study aims to examine the impact of regional economic integration measures on the patterns of cross-border economic relationships and trade among member nations. The utilization of big data

analytics and machine learning algorithms has promised for improving the precision of CER forecasting models in future study (Patil et al., 2022). This potential stems from the increasing accessibility of extensive datasets and the continuous advancements in machine learning techniques. The growing significance of sustainability and environmental considerations in the international financial markets has prompted a need to investigate the influence of ESG (Environmental, Social, Governance) aspects on CERs (Corporate Environmental Responsibility) and investment choices (Mattke et al., 2021; Khandelwal et al., 2023). Consequently, exploring this domain could be a pertinent subject for academic inquiry.

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