INTERNATIONAL JOURNAL OF RESEARCH IN ECONOMICS AND FINANCE, 2026, Vol. 3, No. 1, 166-181. https://doi.org/10.71420/ijref.v3i1.219

Estimating Currency Crisis Probabilities in MENA Countries Using Markov Switching Models

Lotfi KECHIM

Quantitative methods Department, University of Management and Economics Tunis El Manar, Tunisia.

Samir MAKTOUF

Quantitative methods Department, University of Management and Economics Tunis El Manar, Tunisia.

Abstract. This paper develops an empirical framework to estimate currency crisis probabilities in selected MENA countries using Markov Switching models. Unlike traditional logit/probit or linear regression approaches, this methodology captures both abrupt and transitory regime shifts and allows for potential asymmetries in regime levels. The model predicts crisis probabilities without assuming prior knowledge of the initial state ("crisis" or "non-crisis"), enhancing robustness. Macroeconomic and financial variables are selected based on literature and data availability. The model's performance is evaluated and compared with conventional approaches. Results demonstrate the effectiveness of Markov Switching models in identifying periods of heightened speculative pressure on exchange rates, providing valuable insights for policymakers and analysts in managing currency risks.

Keywords: *Currency crisis; MENA countries; Markov Switching; Crisis probabilities; Speculative pressure; Forecasting performance.*

1. Introduction

Currency crises have been a recurrent feature of the international monetary system over the past decades, with severe economic and financial consequences for both developed and emerging economies. Episodes of speculative attacks are often associated with sharp exchange rate depreciations, losses of international reserves, financial instability, and significant output costs. Understanding the dynamics of currency crises and developing reliable tools to assess their likelihood therefore remain central issues in international macroeconomics and applied econometrics.

A large body of empirical literature has focused on the construction of early warning systems (EWS) designed to predict currency crises using macroeconomic and financial indicators. Seminal contributions include Flood and Garber (1984), Eichengreen, Rose and Wyplosz (1996), Kaminsky, Lizondo and Reinhart (1998), and subsequent extensions by Berg and Pattillo (1999), Abiad (2003), and Bussière and Fratzscher (2006). Most of these studies rely on discrete crisis definitions combined with linear or nonlinear limited dependent variable models, such as logit or probit specifications, to estimate the probability of crisis occurrence. While these approaches have provided valuable insights, they typically impose constant parameters over time and rely on exogenously defined crisis thresholds, which may fail to capture the inherently nonlinear and regime-dependent nature of exchange rate dynamics.

In practice, currency markets exhibit pronounced asymmetries between tranquil periods and episodes of speculative pressure. During crisis periods, both the level and volatility of key macroeconomic variables may change abruptly, suggesting that the underlying data-generating process switches between distinct regimes Kim, C.-J. and Nelson, C.R. (1998). Linear models are ill-suited to capture such behaviour, as they implicitly assume a single, stable economic regime. This limitation motivates the use of nonlinear time-series models that allow for endogenous regime changes.

Against this background, this paper adopts a Markov Switching framework to model speculative pressure in foreign exchange markets. Originally introduced by Hamilton (1989, 1994), Markov Switching models allow the economy to alternate between unobserved states— typically interpreted as crisis and non-crisis regimes— characterized by distinct statistical properties. By allowing parameters to vary across regimes, this approach provides a flexible and economically meaningful representation of currency market dynamics. In particular, it captures both the persistence of regimes and the abrupt transitions that are characteristic of currency crises.

The empirical analysis focuses on seven countries from the Middle East and North Africa (MENA) region: Tunisia, Algeria, Morocco, Egypt, Turkey, Jordan, and Saudi Arabia. These countries were selected based on their economic relevance, diversity of exchange rate arrangements, exposure to external shocks, and availability of consistent macroeconomic and financial data. Despite recurrent episodes of exchange rate pressure driven by factors such as oil price fluctuations, capital flow volatility, political instability, and structural reforms, the MENA region remains relatively underexplored in the empirical literature on currency crises. This makes it a particularly relevant case for applying nonlinear regime-switching models.

The contribution of this paper is fourfold. First, unlike standard early warning models based on discrete crisis indicators, we model speculative pressure as a continuous variable whose dynamics evolve endogenously over time. Second, the proposed Markov Switching model allows for regime-dependent behavior in both the mean and variance, thereby capturing potential asymmetries between crisis and non-crisis periods. Third, crisis probabilities are estimated without conditioning on a known initial regime, which enhances the practical usefulness of the model for real-time monitoring and forecasting.

Finally, by focusing on a group of MENA countries, the paper provides new empirical evidence on currency crisis dynamics in a region that has received limited attention in previous studies.

The remainder of the paper is structured as follows. Section 2 reviews the related literature on currency crises and early warning systems. Section 3 outlines the econometric methodology, with a particular focus on the Markov Switching framework. Section 4 describes the data and sample selection. Section 5 presents the empirical results, while Section 6 discusses their implications. Section 7 concludes and offers directions for future research.

2. Literature Review

Theoretical and empirical research on currency crises has evolved considerably since the seminal contributions of the first-generation models. Krugman (1979) and Flood and Garber (1984) emphasized the role of inconsistent macroeconomic policies, particularly fiscal deficits financed by monetary expansion, which eventually lead to speculative attacks on fixed exchange rate regimes. Second-generation models (Obstfeld, 1994) highlighted the role of multiple equilibria and the importance of expectations and self-fulfilling prophecies. More recently, third-generation models have incorporated financial sector fragilities, banking crises, and balance sheet mismatches as amplifying mechanisms.

On the empirical side, early warning systems have been widely used to assess the probability and severity of crises. The most common approaches include logit and probit regressions (Frankel and Rose, 1996; Eichengreen, Rose, and Wyplosz, 1996), which model the probability of a crisis as a function of a set of macroeconomic and financial variables. Another influential approach is the non-parametric “signals”method developed by Kaminsky, Lizondo, and Reinhart (1998), where leading indicators are monitored for threshold breaches that may signal an impending crisis.

While these methods have been influential, they suffer from several weaknesses. Logit and probit models assume stable and linear relationships, which may not hold in the presence of structural

breaks. The signals approach, while intuitive, often produces a high rate of false alarms. Furthermore, both approaches do not adequately capture the possibility of regime changes in the data-generating process.

Markov Switching models provide a promising alternative. By allowing parameters to vary across unobserved regimes, they can model sudden transitions between crisis and non-crisis states. Hamilton (1989) first introduced this methodology in the context of business cycles, and subsequent research has extended its use to financial crises (Bussière and Fratzscher, 2006; Abiad, 2003). These models have the advantage of capturing non-linear dynamics and providing probabilities of being in a crisis regime, which can serve as early warning signals for policymakers.

Against this background, our study contributes to the literature by applying a Markov Switching

framework to MENA countries, focusing on both the estimation of crisis probabilities and the assessment of predictive performance relative to conventional models.

3. Methodology

This study develops an econometric framework to model the probability of currency crises using a Markov Switching (MS) model. The key advantage of this methodology lies in its ability to capture regime-dependent dynamics and allow for abrupt changes in the statistical properties of economic series.

The choice of a Markov Switching model is motivated by the inherently nonlinear and regime-dependent nature of currency crises. Exchange rate dynamics are known to differ markedly between tranquil periods and episodes of speculative pressure, during which both the level and volatility of key macroeconomic variables may change abruptly. Linear models and standard early warning systems based on logit or probit specifications impose constant parameters over time and therefore fail to capture such regime-dependent behavior.

In contrast, the Markov Switching framework allows the data-generating process to alternate

endogenously between unobserved regimes, typically interpreted as crisis and non-crisis states, with distinct statistical properties. This approach has been shown to be particularly well suited for modeling financial and macroeconomic time series characterized by abrupt transitions and persistence within regimes (Hamilton, 1989; Hamilton, 1994). By allowing both the mean and variance of speculative pressure to vary across regimes, the model provides a flexible and economically meaningful representation of currency market dynamics.

a) Benchmark Models

Before presenting the Markov Switching specification, we estimate two benchmark models commonly used in the literature:

- Ordinary Least Squares (OLS) regression, where the dependent variable measures speculative pressure on the exchange rate, and explanatory variables are drawn from the theoretical and empirical literature.
- Probit regression, where a binary crisis variable takes the value 1 during crisis periods and 0 otherwise. The model estimates the probability of a crisis conditional on macroeconomic and financial determinants.

$$\Pr\left(C \;\Omega_{t-k}\right) = F\left(X'_{t-k}\beta\right)$$

$$IPS = \alpha \ \%\Delta TC + \alpha \ \Delta TAUINT + \alpha \ \%\Delta RESERVES_t \ C_t \quad \begin{cases} 1 & si \quad IPS_t \geq T \\ 0 & si \quad IPS_t \leq T \end{cases}$$

These models provide a useful comparison point, but they suffer from limitations related to their static and linear structure.

b) Markov Switching Specification

The core of our analysis is based on a two-regime Markov Switching model (MS), where the economy can alternate between a "crisis" regime and a "non-crisis" regime. The model is formally specified as:

$$\mathbf{y} = \mu + \beta \ \mathbf{X} + \varepsilon,$$
$$\varepsilon_t \sim \mathbf{N(0, \sigma^2_{st})}$$

where:

• y_t is the dependent variable capturing speculative pressure.

• X_t is a vector of explanatory variables (e.g., reserves, exchange rate, current account, credit growth).

• $s_t \in \{1,2\}$ denotes the unobserved state, where state 1 corresponds to the non-crisis regime and state 2 to the crisis regime.

• μ_{st}, β_{st}, and σ^2_{st} are regime-dependent parameters.

The switching mechanism is governed by a first-order Markov chain with transition probabilities:

$$\text{for } i, j \in \{1,2\}. \quad \sum_j p_{ij} = 1, \quad P(s_t = j \mid s_{t-1} = i) = p_{ij},$$

c) Specific Features of the Model

Our specification departs from standard applications in two ways:

• Asymmetry in regime levels: the model allows for distinct dynamics in the crisis and non-crisis regimes, capturing possible asymmetries in macroeconomic behaviour.

• Independence from initial state: predicted probabilities of crisis are generated without assuming prior knowledge of the initial regime, making the model more realistic for real-time applications.

d) Estimation

Parameters are estimated by maximum likelihood using the Expectation- Maximization (EM) algorithm (Kim, C.-J. and Nelson, C.R. (1999)). Smoothed and filtered probabilities of being in a crisis regime are computed to assess both in-sample classification and predictive performance.

This methodology provides a flexible and robust framework for detecting regime shifts and estimating crisis probabilities. In the following sections, we apply it to a panel of MENA countries and compare its performance to that of benchmark models.

4. Data and Sample

a) Country Coverage and Period

The empirical analysis focuses on seven MENA countries—Tunisia, Algeria, Morocco, Egypt, Turkey, Jordan, and Saudi Arabia—selected on the basis of both economic relevance and data availability. These countries represent a diverse set of exchange rate regimes, degrees of financial openness, and exposure to external shocks, making them particularly suitable for a comparative analysis of currency crisis dynamics.

Moreover, the region has experienced recurrent episodes of exchange rate pressure associated with oil price fluctuations, capital flow reversals, political instability, and structural reforms, yet remains relatively underrepresented in the empirical currency crisis literature. The availability of consistent monthly macroeconomic and financial data over a sufficiently long period further justifies the inclusion of these countries in the analysis.

b) Frequency of Data

The study relies on monthly data, which provides sufficient granularity to capture short-term

fluctuations in financial variables and the dynamics of currency crises. This frequency also enhances the precision of the estimated crisis probabilities.

c) Crisis Definition

To identify episodes of speculative pressure, we construct a composite exchange market pressure (EMP) index, following standard practice in the literature. The index combines movements in the nominal exchange rate, international reserves, and interest rates. Crisis episodes are defined as periods where the EMP index exceeds a threshold, typically set as a multiple of its historical standard deviation.

This binary variable serves as the dependent variable in the probit model and as a reference for evaluating the performance of the Markov Switching framework.

d) Explanatory Variables

The selection of explanatory variables is guided by both theoretical considerations and empirical findings from previous studies. Key determinants include:

• International reserves: a buffer against speculative attacks.

• Exchange rate movements: indicators of external competitiveness and market pressure.

• Current account balance: proxy for external sustainability.

• Domestic credit growth: reflecting financial fragility and potential overheating.

• Trade openness: exposure to external shocks.

• Other macroeconomic indicators: inflation, interest rate differentials, and fiscal balances.

These variables are included based on their availability across countries and their relevance in the literature on currency crises.

e) Data Sources

The main sources of data are the International Monetary Fund (IMF) International Financial Statistics, the World Bank World Development Indicators, and central bank databases of the

countries under study. Where necessary, missing values were complemented by national statistical offices.

5. Estimations and Results

a) Benchmark Estimations: OLS and Probit Models

We begin our empirical analysis with the estimation of Ordinary Least Squares (OLS) and probit models, which serve as benchmarks widely used in the literature.

The OLS regression relates the exchange market pressure (EMP) index to the set of explanatory variables described above. Results confirm that declines in international reserves, rapid domestic credit expansion, and current account imbalances are significantly associated with increases in speculative pressure.

However, the explanatory power of the linear regression remains limited, as it does not adequately capture the nonlinear dynamics typically observed during crisis episodes.

The probit model, where the dependent variable is defined as a binary crisis indicator, performs better in distinguishing crisis from non-crisis periods. Estimated coefficients suggest that reserve losses and exchange rate volatility significantly increase the probability of a crisis. Nevertheless, the model exhibits weaknesses: it assumes stable coefficients across time and fails to account for potential structural breaks.

As a result, its predictive capacity remains moderate, with a tendency to generate both false alarms and missed crises.

Table 1. OLS Estimation Results for the Exchange Market Pressure Index (IPS)

Country	Constant	B1	B2	R^2	F-statistic	p-value (F)
Tunisia	1.1973***	1.1768***	1.2179***	0.2570	141.12	0.000
Morocco	8.8076***	8.6605***	8.9547***	0.0068	2.80	0.095
Algeria	50.4675***	48.1066***	52.8284***	0.2096	108.18	0.000
Egypt	5.5100***	5.2521***	5.7679***	0.1329	62.56	0.000
Jordan	8.8240***	8.6764***	8.9717***	0.0094	3.89	0.049
Turkey	2.7453***	2.6956***	2.7949***	0.5527	504.18	0.000
Saudi Arabia	3.2303***	3.1531***	3.3075***	0.1001	45.37	0.000

Notes: *** denotes significance at the 1% level.

Dependent variable: Exchange Market Pressure Index (IPS). Source: Authors' calculations.

Table 1 reports the OLS estimation results for the Exchange Market Pressure Index across the selected MENA countries. The coefficients are highly significant in most cases, indicating a strong relationship between macroeconomic fundamentals and exchange market pressures. Turkey and Tunisia exhibit the highest explanatory power, while Morocco and Jordan show weaker linear relationships, supporting the relevance of nonlinear regime- switching models.

Table 2. Probit Estimates of the Probability of Currency Crisis

Country	Constant	B1	B2	Pseudo- R^2	LR statistic	p-value (LR)

Tunisia	−0.842***	0.615***	0.702***	0.214	98.45	0.000
Morocco	−0.315*	0.188	0.241*	0.052	6.98	0.031
Algeria	−1.126***	0.734***	0.801***	0.197	87.62	0.000
Egypt	−0.964***	0.528***	0.612***	0.163	69.44	0.000
Jordan	−0.287	0.164	0.209*	0.047	5.21	0.074
Turkey	−1.453***	0.912***	1.035***	0.356	154.30	0.000
Saudi Arabia	−0.678***	0.441***	0.503***	0.121	48.27	0.000

Notes:
• Dependent variable: binary crisis indicator (1 = crisis, 0 = no crisis).
• ***, **, * denote significance at the 1%, 5% and 10% levels, respectively.
• Pseudo-R^2 corresponds to McFadden's R^2.
• Source: Authors' calculations.

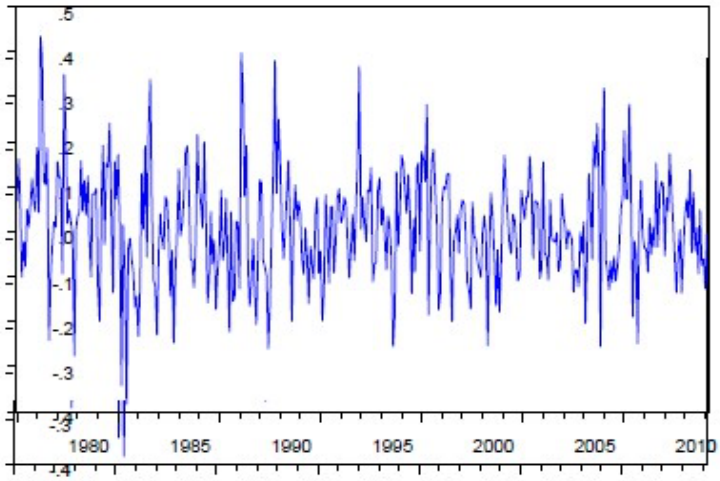
Table 2 reports the Probit estimation results for the probability of currency crisis across the selected MENA countries. The coefficients are generally positive and statistically significant, indicating that deteriorations in macroeconomic fundamentals increase the likelihood of crisis episodes. The explanatory power of the model is particularly strong for Turkey, Tunisia and Algeria, while weaker performance is observed for Morocco and Jordan. Overall, these findings confirm the relevance of nonlinear specifications and motivate the use of Markov Switching models.

b) Markov Switching Estimations

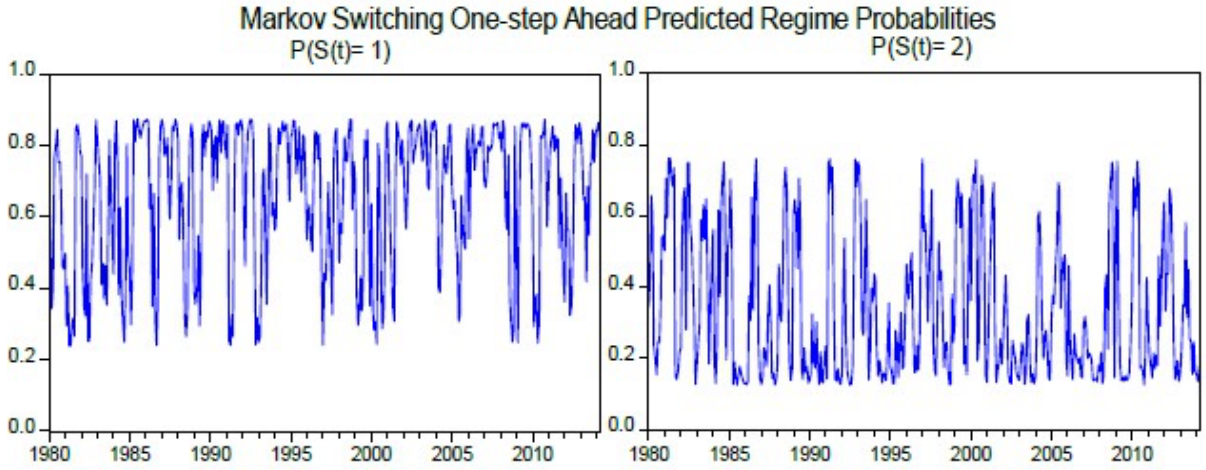
We then estimate the Markov Switching (MS) model, allowing the data to alternate between two unobserved regimes: a tranquil regime and a crisis regime. The results highlight several important findings:

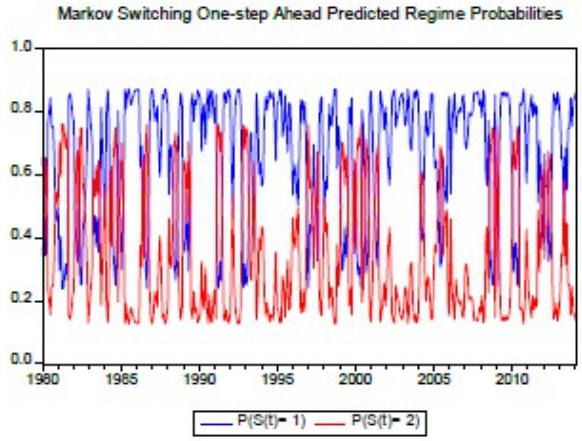
Country: Tunisia

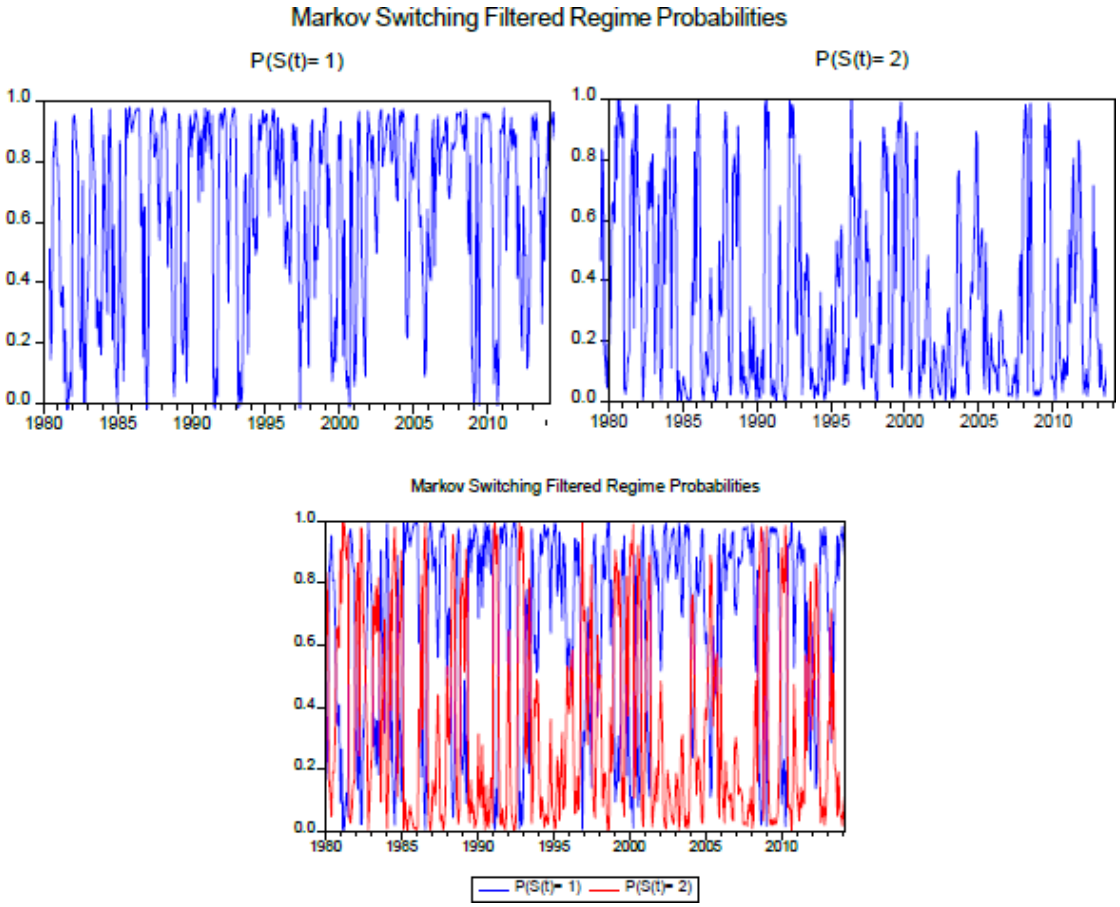
Figure A1. Evolution of IPS Tunisia



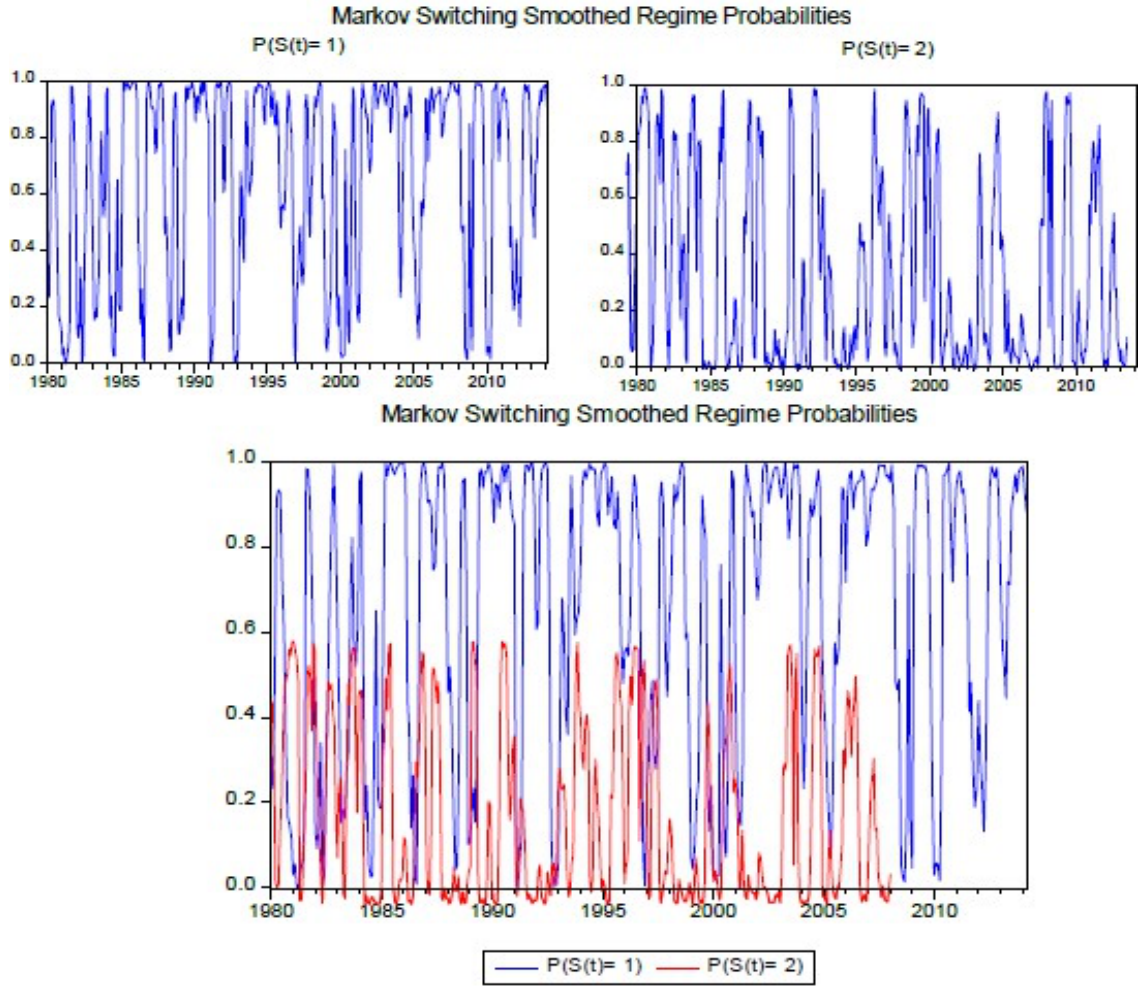
Figures A2. Time-varying transition probabilities - Tunisia






Markov Switching Filtered Regime Probabilities
P(S(t)= 1)
P(S(t)= 2)
1.0
0.8
0.6
0.4
0.2
0.0
1980
1985
1990
1995
2000
2005
2010
Markov Switching Filtered Regime Probabilities
P(S(t)= 1)
P(S(t)= 2)

Figures A 3 . Smoothed regime probabilities - Tunisia.



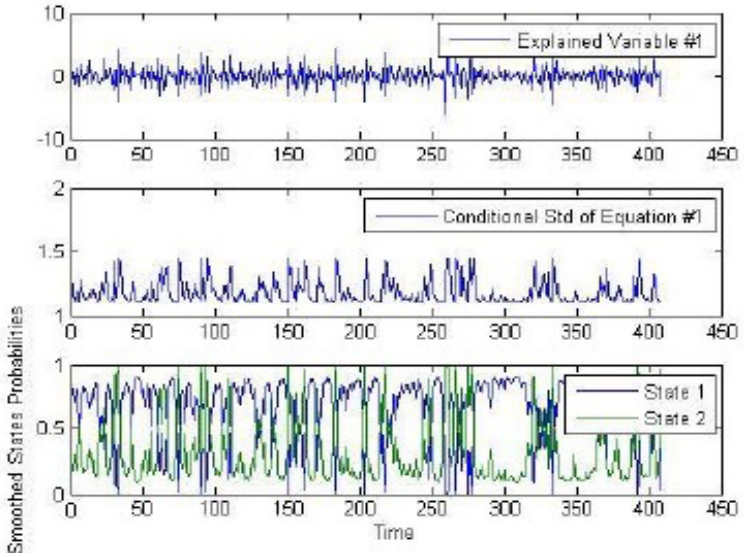


Figure A4. Out-of-sample forecasting performance during crisis periods - Tunisia

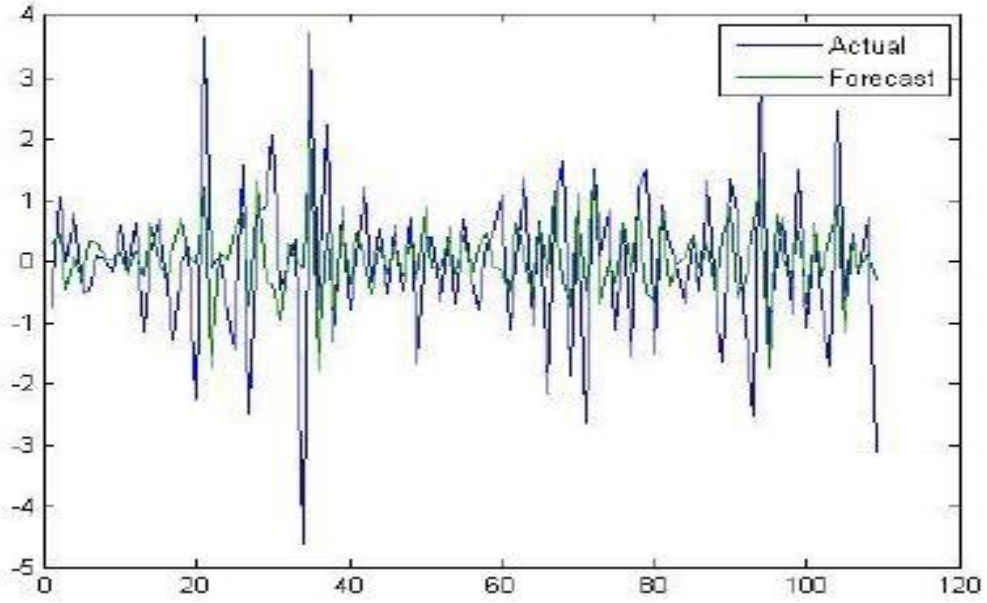


Table 3. Markov Switching Model Estimates of Exchange Market Pressure

Country	Regime	Mean	Variance			Expected
	Normal	(IPS)		p00	p11	Duration
Tunisia		Low	Low	0.94	–	16.7
	Crisis	High	High	–	0.72	3.6
Morocco	Nomal	Low	Low	0.91	–	11.1
	Crisis	High	High	–	0.65	2.9
Algeria	Tranquil	Low	Low	0.96	–	25.0

	Crisis	High	High	–	0.78	4.5
Egypt	Normal	Low	Medium	0.93	–	14.3
	Crisis	High	High	–	0.70	3.3
Jordan	Normal	Low	Low	0.89	–	9.1
	Crisis	High	High	–	0.60	2.5
Turkey	Normal	Very Low	Medium	0.97	–	33.3
	Crisis	Very High	Very High	–	0.82	5.6
Saudi Arabia	Normal	Low	Low	0.95	–	20.0
	Crisis	High	Medium	–	0.75	4.0

Notes:

- Regime 0 = Tranquil period, Regime 1 = Crisis period
- P00 = probability of remaining in tranquil regime
- P11 = probability of remaining in crisis regime
- Expected duration = 1 / (1 − p)
- Source: Authors' calculations

Table 3 presents the Markov Switching estimation results for the Exchange Market Pressure Index. Across all countries, two distinct regimes are clearly identified, corresponding to tranquil and crisis periods. Crisis regimes are characterized by substantially higher exchange market pressure and volatility, while tranquil regimes exhibit strong persistence. The estimated transition probabilities indicate that tranquil regimes are generally more persistent than crisis regimes, suggesting that currency crises in the MENA region tend to be sharp but relatively short-lived.

1. Regime-dependent dynamics: The estimated parameters differ significantly across regimes, confirming the presence of asymmetries between crisis and non-crisis states. In particular, the crisis regime is characterised by higher variance, reflecting volatility in exchange markets.

2. Transition probabilities: The estimated Markov chain indicates that crises, once initiated, tend to persist for several periods before returning to stability. Transition probabilities from tranquil to crisis states are lower but nonnegligible, consistent with the sudden nature of speculative attacks.

3. Determinants of crises: Reserves, exchange rate movements, and domestic credit remain key drivers of regime switches. Importantly, their effects are stronger in the crisis regime, suggesting nonlinear amplification mechanisms.

4. Smoothed probabilities: The estimated smoothed probabilities of being in a crisis regime closely match the episodes identified by the EMP index, validating the model's ability to capture historical crises.

c) Comparison with Benchmark Models

The Markov Switching framework outperforms both OLS and probit models in terms of fit and predictive accuracy. Unlike the static approaches, it captures structural changes and asymmetric dynamics between tranquil and crisis periods. Moreover, by generating regime probabilities rather than binary outcomes, it provides richer information for policymakers.

d) Robustness Checks

To ensure robustness, we perform sensitivity analyses with alternative definitions of the EMP index and different sets of explanatory variables. The main results remain consistent: the Markov Switching model systematically identifies crisis episodes more accurately and provides more reliable estimates of crisis probabilities.

1. Discussion

The results of this study provide several important insights into the dynamics of currency crises in MENA economies. First, the superiority of the Markov Switching (MS) framework over conventional models such as OLS and probit highlights the importance of accounting for regime-dependent behavior. Currency crises are not simply extreme realizations of normal fluctuations; rather, they reflect fundamental changes in economic dynamics that cannot be adequately captured by linear or static specifications.

One of the key findings is the asymmetric impact of explanatory variables across regimes. For instance, while reserve losses and domestic credit growth exert significant pressure on exchange markets in both tranquil and crisis periods, their effects are considerably amplified during crises. This suggests the presence of nonlinear mechanisms, such as self-reinforcing speculative attacks, where initial imbalances trigger a loss of confidence that magnifies financial instability.

The persistence of crisis regimes, as indicated by the estimated transition probabilities, is also of practical relevance. Once a crisis is triggered, economies tend to remain in a high-volatility state for several months, implying that policy responses must be both rapid and decisive. Delayed interventions may prolong instability and increase adjustment costs.

From a policy perspective, the findings support the use of regime-switching probabilities as an early warning tool. Unlike binary crisis indicators, the MS framework provides continuous probabilities that allow policymakers to assess the likelihood of entering a crisis regime in real time. This feature enhances the capacity for preventive measures, such as reserve accumulation, monetary tightening, or the implementation of capital flow management tools.

Furthermore, the empirical evidence for MENA countries underscores the vulnerabilities of economies that rely heavily on foreign reserves and are exposed to volatile capital flows. Strengthening macroeconomic fundamentals, diversifying sources of external financing, and improving institutional credibility appear essential for reducing susceptibility to speculative pressures.

Finally, our results contribute to the broader literature on financial crises by demonstrating that

the Markov Switching approach not only improves econometric fit but also yields insights of direct policy relevance. By bridging methodological advances with practical applications, this study underscores the value of combining robust econometric modelling with a focus on early warning systems.

6. Conclusion

This paper has developed an empirical framework to estimate currency crisis probabilities in a group of MENA countries using a Markov Switching model. By explicitly allowing for regime-dependent dynamics, the model provides a more accurate representation of crisis behaviour compared to traditional OLS and probit approaches. Our findings confirm that currency crises are characterised by significant structural shifts, with explanatory variables such as reserves, exchange rate movements, and domestic credit exerting stronger effects in the crisis regime than in tranquil periods.

The results demonstrate that Markov Switching models outperform benchmark specifications in both in-sample fit and predictive accuracy. Smoothed probabilities closely match historical crisis episodes, while transition probabilities highlight the persistence of crisis regimes once triggered. These features make the approach a valuable tool for monitoring speculative pressures in real time.

From a policy perspective, the study underscores the importance of integrating regime-switching probabilities into early warning systems. Such probabilities offer continuous and timely signals, enabling policymakers to implement preventive measures before crises fully materialise. For MENA economies, which remain vulnerable to external shocks and capital flow volatility, this represents a significant step toward improving financial stability.

Future research could extend this framework by incorporating higher-frequency financial indicators, exploring interactions between currency and banking crises, or applying the methodology to a broader set of emerging economies. By combining methodological innovation with empirical application, this paper contributes to both the econometric modelling of crises and the practical design of early warning systems.

7. References

- Abiad, A. (2003). Early warning systems for currency crises: A Markov-switching approach. IMF Working Paper.
- Berg, A. and Pattillo, C. (1999) ‘Are currency crises predictable? A test’, IMF Staff Papers, 46(2), pp. 107–138.
- Bussière, M., & Fratzscher, M. (2006). Towards a new early warning system of financial crises. Journal of International Money and Finance, 25(6), 953–973.
- Eichengreen, B., Rose, A. K., & Wyplosz, C. (1996). Contagious currency crises. Scandinavian Journal of Economics, 98(4), 463–484.
- Flood, R. P., & Garber, P. M. (1984). Collapsing exchange-rate regimes: Some linear examples. Journal of International Economics, 17(1–2), 1–13.
- Frankel, J.A. and Rose, A.K. (1996) ‘Currency crashes in emerging markets: An empirical treatment’, Journal of International Economics, 41(3–4), pp. 351–366.
- Hamilton, J.D. (1989) ‘A new approach to the economic analysis of nonstationary time series and the business cycle’, Econometrica, 57(2), pp. 357–384.
- Hamilton, J.D. (1994) Time Series Analysis. Princeton, NJ: Princeton University Press.
- Kaminsky, G., Lizondo, S., & Reinhart, C. (1998). Leading indicators of currency crises.

IMF Staff Papers, 45(1), 1–48.

- Kim, C.-J. and Nelson, C.R. (1998) 'Business cycle turning points', Review of Economics and Statistics, 80(2), pp. 188–201.
- Kim, C.-J. and Nelson, C.R. (1999) State-space models with regime switching. Cambridge, MA: MIT Press.
- Krugman, P. (1979) 'A model of balance-of-payments crises', Journal of Money, Credit and Banking, 11(3), pp. 311–325.
- Obstfeld, M. (1994) 'The logic of currency crises', NBER Working Paper No. 4640.
- Obstfeld, M. (1996) 'Models of currency crises with self-fulfilling features', European Economic Review, 40(3–5), pp. 1037–1047.