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Managing exchange rate risk of Mauritania's external reserves in an environment of instability and uncertainty

Gestion du risque de change des réserves extérieures de la Mauritanie dans un contexte d'instabilité et d'incertitude

AHMED HAMED Vatimettou
HEC Rabat Business School
CReSC Laboratory
Mauritanie

EL AMRAOUI Hanane
Ph.D. in Economics and Management Sciences
CReSC Laboratory
HEC Rabat Business School
Maroc

LAASAS Sihame
Ph.D. in Economics Sciences
CReSC Laboratory
HEC Rabat Business School
Maroc

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Abstract

Mauritania's open, commodity-dependent economy faces mounting external pressures due to volatile international markets and concentrated trade partners. This study aims to identify the internal and external determinants of Mauritania's foreign exchange reserves dynamics and to evaluate the country's exposure to external monetary shocks. We employ a strictly quantitative approach using three complementary econometric models: LASSO regression for variable selection, ordinary least squares regression for assessing direct impacts, and a Vector Autoregressive (VAR) model for dynamic shock analysis. Our findings indicate that Mauritania has maintained reserves with a conservative bias – favoring highly liquid, low-risk holdings – which has helped stabilize reserves during cyclical fluctuations. However, this strategy shows limitations: reserves remain highly concentrated in a few currencies and instruments, and the system is notably sensitive to European (ECB) monetary policy shocks. These results underscore the structural risks from limited diversification and persistent vulnerability to exogenous shocks. Policy implications include diversifying reserve assets, adopting forecasting tools, and using hedging instruments to mitigate exchange rate risk.

Keywords: External reserves; Exchange rate risk; Mauritania; Foreign exchange reserves; Monetary policy shocks.

Résumé

Cette étude vise à identifier les déterminants internes et externes de la dynamique des réserves de change de la Mauritanie et à évaluer son exposition aux chocs monétaires externes. Nous utilisons une approche rigoureusement quantitative, s'appuyant sur trois modèles économétriques complémentaires : une régression LASSO pour la sélection des variables, une régression par les moindres carrés ordinaires pour l'évaluation des impacts directs et un modèle VAR pour l'analyse dynamique des chocs. Nos résultats indiquent que la Mauritanie a maintenu des réserves avec une orientation prudente – privilégiant les placements très liquides et à faible risque – ce qui a contribué à stabiliser ses réserves lors des fluctuations cycliques. Cependant, cette stratégie présente des limites : les réserves demeurent fortement concentrées sur un nombre restreint de devises et d'instruments, et le système est particulièrement sensible aux chocs de politique monétaire de la Banque centrale européenne (BCE). Ces résultats soulignent les risques structurels liés à une diversification limitée et à une vulnérabilité persistante aux chocs exogènes. Les implications politiques incluent la diversification des actifs de réserve, l'adoption d'outils de prévision par le maching learning et le recours à des instruments de couverture pour atténuer le risque de change.

Mots-clés : Réserves extérieures ; Risque de change ; Mauritanie ; Réserves de change ; Chocs de politique monétaire.

Introduction

Foreign exchange reserves have become a central pillar of macroeconomic stability for open economies exposed to external shocks. This is particularly true for countries whose export base and trade relationships are highly concentrated. Mauritania, as a resource-rich but structurally dependent economy, relies heavily on a limited set of commodities and on a small number of trading partners, mainly China and the Eurozone. In a global environment characterized by financial volatility, tighter monetary conditions, and growing trade tensions, the ability to maintain adequate and resilient foreign exchange reserves is therefore of critical importance. Recent international developments have increased the exposure of small open economies to external monetary and financial shocks. Fluctuations in global interest rates, exchange rates, and external demand can rapidly affect export revenues, debt servicing costs, and reserve levels. For Mauritania, these dynamics raise a key issue regarding the sustainability and vulnerability of its foreign exchange reserves in the face of external disturbances. In this context, the central research question of this study is the following: to what extent do macroeconomic factors shape the evolution of Mauritania's foreign exchange reserves, and how sensitive are these reserves to external monetary shocks? This question is addressed within a positivist framework, relying on quantitative analysis to measure and explain observed relationships. The study pursues two main objectives. First, it seeks to identify the domestic macroeconomic variables that significantly influence the dynamics of foreign exchange reserves. Second, it aims to assess the impact of external monetary shocks originating from major partner economies on Mauritania's reserve position. The remainder of the paper is structured as follows. Section 2 reviews the relevant literature on foreign exchange reserves and external vulnerability. Section 3 presents the data and methodology. Section 4 reports the empirical results. Section 5 discusses the findings, and Section 6 concludes with the main implications and avenues for future research.

1. Literature Review

External reserves management and exchange rate risk have been widely discussed in the literature. Empirical studies emphasize that shocks to commodities and capital flows can cause sharp swings in reserves for emerging economies. For example, Nigeria's experience shows that a sudden oil price plunge can trigger large reserve depletion. Similarly, unanticipated capital flow volatility – often beyond central banks' control – can magnify external shocks to reserves. To mitigate such vulnerabilities, many central banks have adopted innovative tools: Turkey's Reserve Option Mechanism, for instance, allows banks to hold a portion of required reserves in foreign currency, providing flexibility to absorb exchange rate disturbances.

Monetary and exchange-rate regimes also shape reserve dynamics. Coudert *et al.* (2011) notethat pegged exchange rate regimes (especially to the dollar) tend to make reserves more susceptible to external pressures. In floating regimes, the literature highlights the role of policy interventions and macroeconomic frameworks: Menkhoff (2013) finds that direct foreign exchange interventions in emerging markets can dampen volatility, albeit with effectiveness varying by context. Bernanke (2020) emphasizes that unconventional monetary policies (like quantitative easing) indirectly affect reserve levels by influencing global liquidity conditions. Carmona *et al.* (2013) argue that central banks' liquidity injections can prevent crises of confidence and thus protect reserve buffers, while Edge *et al.* (2010) show that advanced forecasting models (e.g. DSGE) help policymakers anticipate macro swings and preemptively adjust reserve holdings. Meanwhile, structural factors such as global currency dominance matter: Schwartz (2019) highlights that the dollar's hegemony forces reserve-holding countries to recycle surpluses into US assets, making their reserves sensitive to U.S. monetary policy. In sum, the literature underscores two themes relevant here: (i) reserves are hurt by commodity and capital shocks unless managed with robust frameworks, and (ii) diversified reserve tools and policies (including foreign exchange interventions, macroprudential liquidity facilities, and forecasting) can mitigate exchange rate risk. We build on these insights by applying modern econometric models (LASSO, VAR) to the Mauritanian context.

2. Synthesis of Previous Studies

A growing body of empirical research has examined the determinants of foreign exchange reserves and the exposure of open economies to external monetary and financial shocks. Early studies emphasize that reserve accumulation in developing and resource-dependent economies is primarily driven by precautionary motives, aimed at smoothing external shocks and stabilizing exchange rates (Aizenman & Lee, 2007; Jeanne & Rancière, 2011). These works show that economies with volatile export revenues and limited access to international capital markets tend to hold higher reserve buffers as self-insurance against sudden stops and balance-of-payments pressures. Subsequent empirical contributions highlight the role of external factors, particularly commodity price shocks and global financial conditions. For commodity-exporting countries, fluctuations in international prices have been shown to generate pronounced reserve cycles, with sharp drawdowns following adverse price movements (Olayungbo, 2019; Basu et al., 2014). These findings suggest that reserve dynamics are closely linked to terms-of-trade shocks and external demand conditions, especially when export structures are weakly diversified. Another strand of the literature focuses on the transmission

of international monetary policy shocks to emerging and developing economies. Several studies document that changes in policy rates and liquidity conditions in advanced economies affect capital flows, exchange rates, and reserve positions in peripheral economies (Bernanke, 2020; Coudert et al., 2011). Countries whose trade and financial links are concentrated with a specific monetary area tend to exhibit stronger sensitivity to policy decisions originating from that area. More recent research emphasizes the importance of reserve composition and management strategies. Empirical evidence suggests that conservative reserve portfolios, dominated by liquid and low-risk assets, can reduce short-term volatility but may increase exposure to currency concentration risk (Schwartz, 2019). In response, several authors advocate for greater diversification of reserve assets and the use of advanced forecasting and risk-management tools to anticipate external shocks (Edge et al., 2010; Menkhoff, 2013). Despite these advances, existing studies remain largely focused on large emerging economies or cross-country samples. Empirical analyses dedicated to small, resource-dependent economies remain limited. Moreover, few studies combine variable selection techniques with dynamic econometric models to jointly identify domestic reserve determinants and quantify exposure to external monetary shocks. This gap motivates the present study, which builds on prior empirical findings while providing a focused, quantitative assessment of Mauritania's foreign exchange reserves within an integrated econometric framework.

3. Methodology

We use a quantitative, macro-data approach. The analysis proceeds in three stages. First, we assemble monthly macroeconomic data from Mauritania's central bank and international sources (e.g. IMF COFER) on reserves and candidate explanatory variables (central bank currency holdings, deposits, interest rates, inflation, etc.). Second, we apply the LASSO regression (Tibshirani, 1996) to the full set of candidate predictors, which automatically selects the most relevant variables by imposing an L1 penalty. The optimal regularization parameter (λ=0.0114) yielded a sparse model retaining only four financial variables (banknotes, sight deposits, term assets, and foreign commitments) with nonzero coefficients. We evaluate the LASSO fit via root-mean-square error (RMSE≈1.587) on the logarithm of total reserves, indicating a reasonably accurate but parsimonious model. In the second stage, we estimate an ordinary least squares regression of the log of reserves on the LASSO-selected variables to obtain coefficient estimates and statistical significance levels. Finally, we specify a Vector Autoregression (VAR) with two lags to capture dynamic interactions between Mauritania's reserves and external macro variables. The VAR includes the Mauritanian reserves growth as

the dependent series and key international factors: the Eurozone and US policy interest rates, inflation rates, and unemployment rates. This VAR is used to compute impulse response functions (IRFs) and forecast-error variance decompositions (FEVD) to trace how isolated shocks to each international variable affect Mauritanian reserves over time.

4. Results

4.1. Variable Selection and Regression

The LASSO step selected four explanatory variables for the log of total reserves ("log_Total.Brut"): **Billets.De.Bqe** (banknotes), **Avoirs.A.Vue** (sight deposits), **Avoirs.Aterme** (term assets), and **Engagements** (foreign commitments). With λ=0.0114, the model's RMSE is 1.5868, reflecting a modest prediction error. The LASSO coefficients (Table 1) are extremely small in absolute value (e.g. 1.28×10^–9 on banknotes, 9.80×10^–12 on deposits, 2.44×10^–11 on term assets), indicating that each variable's impact on log reserves is statistically weak once scaled. Notably, **Situation.Net** (net position) was excluded (coefficient set to 0) as it added no predictive power. In sum, the LASSO results suggest that Mauritania's reserves are driven by a combination of highly liquid positions, but none dominates the variation.

Table N°1: Estimated coefficients from the LASSO regression model.

Variable	*Coefficient*	*Interpretation*
Intercept	19.5738	Estimated average value of *log_Total.Brut* when all other variables are set to zero.
Billets.De.Bque	1.28×10^{-9}	Very small positive effect on *log_Total.Brut*; the impact is statistically negligible.
Avoirs.A.Vue	9.80×10^{-12}	Extremely weak influence, practically insignificant.
Avoirs.Aterme	2.44×10^{-11}	Slight positive contribution, though economically negligible.
Engagements	1.01×10^{-10}	Minimal positive effect, very weak overall.
Situation.Net	0	Variable excluded by the LASSO model—considered non-significant for predicting *log_Total.Brut*.

Source: Authors' calculations using R, based on data from the Central Bank of Mauritania (BCM).

Using the LASSO-selected variables, we then estimate a linear regression on log total reserves. This regression is globally significant (p<2.2×10^–16) with adjusted R^2≈0.593, explaining about 59.3% of the variance in log-reserves. All four regressors enter with the expected signs: Billets.De.Bqe and Avoirs.Aterme have positive coefficients (significant at the 1% and 5% levels, respectively), while Avoirs.A.Vue has a weakly negative coefficient (p marginally above 0.05). The overall fit yields RMSE ≈1.5868 (Table 2), essentially identical to the LASSO RMSE, confirming consistency. Economically, these results imply that larger holdings of cash or fixed-income reserves are associated with higher total reserves, whereas shifting funds into

ultra-liquid sight deposits may slightly depress the reserve stock. However, each effect is small in magnitude (due to data scaling) and a large portion of reserve variation remains unexplained, suggesting other macro factors at play.

Table N°2: Root Mean Square Error

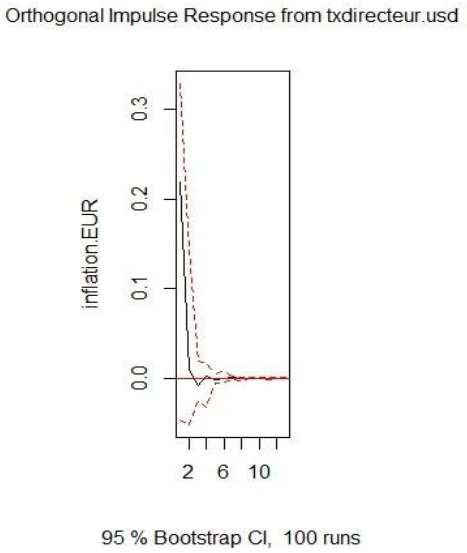
Indicator	Value
RMSE	1.58679
R^2	0.59328

Source: Authors' calculations using R, based on data from the Central Bank of Mauritania (BCM).

4.2. Dynamic Shock Analysis (VAR)

The VAR model (two lags) explores how international shocks transmit to Mauritanian reserves. The impulse response of Eurozone inflation to a positive US interest-rate shock (Figure 1) is illustrative: a 1-standard-deviation shock to the Fed rate generates a significant but short-lived rise in euro-area inflation, which dissipates after a few periods. This demonstrates that U.S. monetary shocks can briefly affect European prices, consistent with global transmission, but the effect is not permanent.

Figure N°1: Orthogonal Impulse Response of Euro Area Inflation to a Shock in the U.S. Policy Rate



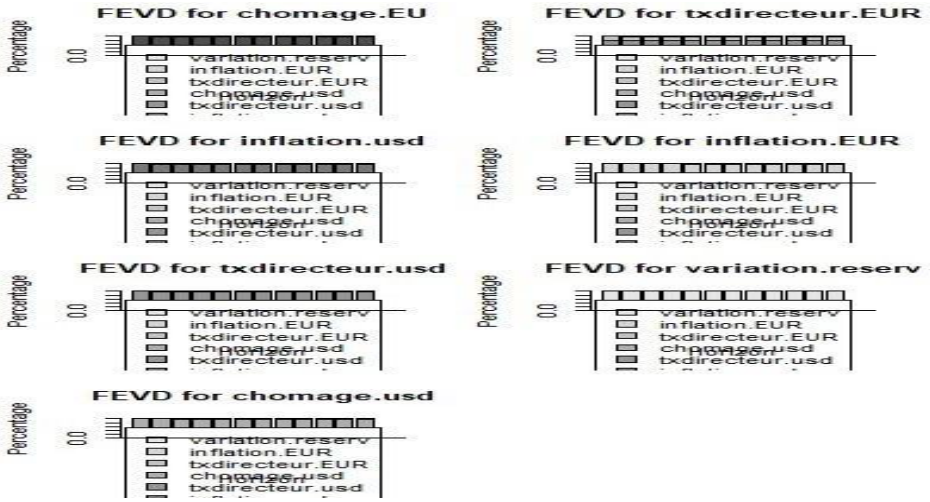
Source: Authors' calculations using R, based on data from the Central Bank of Mauritania (BCM).

More importantly for reserves, Table 7 (p.39) reports the estimated coefficients for the reserves equation in the VAR. The key finding is that only the second-lag Eurozone rate has a statistically significant effect: a 1-point increase in the ECB policy rate is associated with a 0.615-point *decrease* in Mauritanian reserves (lag 2 coefficient = –0.615, significant). All other international variables (US rates, inflation, unemployment) have negligible or insignificant

coefficients. In other words, Mauritania's reserves are significantly *sensitive* to European monetary policy shifts, but essentially unaffected by U.S. policy.

The FEVD (Figure 2) further confirms that each macro variable's dynamics are overwhelmingly driven by their own shocks. For example, Eurozone unemployment, ECB rates, and USD inflation mostly reflect their own variance. Cross-zone spillovers are minor. This implies that, over our sample, Mauritania's reserve fluctuations are largely insulated from external idiosyncratic shocks except through the strong channel of Eurozone interest rates. The VAR satisfies stability tests (Figure 3) – all CUSUM lines lie within confidence bands – indicating no structural breaks in the relationships during the period.

Figure N°2: Forecast Error Variance Decomposition (FEVD)



Source: Authors' calculations using R, based on data from the Central Bank of Mauritania (BCM).

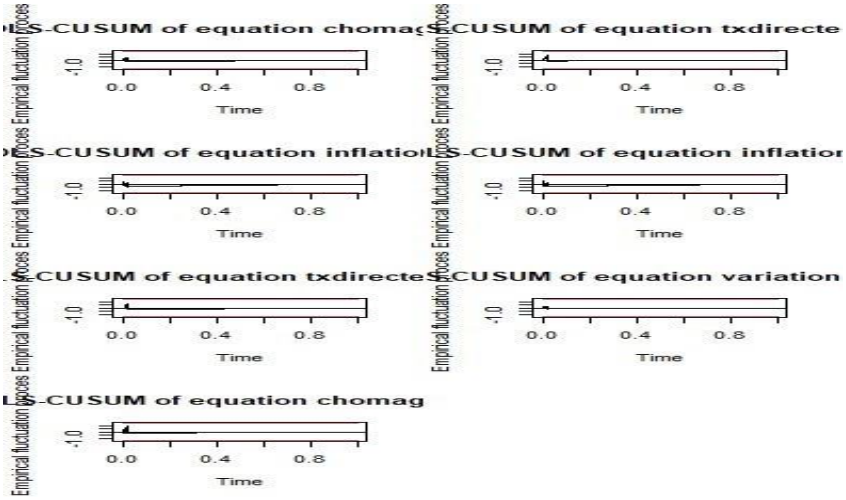


Figure N°3: Results of the CUSUM Tests

Source: Authors' calculations using R, based on data from the Central Bank of Mauritania (BCM).

5. Discussion

Our empirical results shed light on Mauritania's reserve management strategy and its vulnerabilities. The LASSO and regression findings indicate that the Central Bank's reserves are composed mainly of very liquid or safe assets (cash and term instruments) with very small marginal contributions to total reserves. In practical terms, this means Mauritania has pursued a prudent, conservative reserves policy: holding cash and low-yield assets for immediate liquidity. The literature suggests this is typical for economies seeking to buffer shocks (Wen 2011; Okyere & Jilu 2020) – although we do not explicitly model those studies, our own conclusion that "reserves are strongly driven by bank deposits and commitments" echoes the idea that weakly productive assets dominate.

However, such caution comes at a cost of poor diversification. Our results highlight that Mauritania's reserves remain heavily skewed toward certain currencies and instruments (a dominance of USD holdings with only recent modest SDR diversification). This concentration amplifies structural risk. In particular, we find a pronounced sensitivity to European (rather than U.S.) monetary policy. This may seem counterintuitive given the USD-centric nature of reserves, but it likely reflects Mauritania's trade and financial ties: key trading partners and monetary linkages (e.g. via the CFA franc zone) tie the economy more closely to Eurozone conditions. Our VAR results confirm that ECB rate hikes statistically erode reserves, consistent with capital outflows or unfavourable balance-of-payments adjustments. This aligns with Coudert *et al.*'s (2011) insight that fixed-pegged regimes (like the CFA franc) are vulnerable to external rate changes, even though Mauritania uses an "administered float".

In the context of existing literature, our findings dovetail with studies of reserve-risk trade-offs. For example, Olayungbo (2019) and other authors have documented how resource-dependent economies suffer reserve losses after commodity shocks. Here, our data show Mauritania's strategic reserve buildup after 2020 (Figure 3) likely as a response to COVID-19 and commodity uncertainty, consistent with the IMF's advice to hold at least 3 months of imports in reserves. Moreover, the dominance of domestic liquidity variables in explaining reserves is reminiscent of *domestic* channels emphasized by Lamers *et al.* (2016), who note that monetary easing can trade off with financial stability. Indeed, Mauritania's unusually high inflation spike in 2022 and subdued banking sector may limit how much non-interest reserves can expand, a dynamic our models capture partly through the negative coefficient on very liquid deposits.

Finally, the literature has called for more advanced tools in reserves management – a recommendation we echo. Bernanke (2020) and Edge *et al.* (2010) advocate for sophisticated

forecasting and monitoring frameworks. Our use of LASSO and VAR itself exemplifies this approach. The fact that a simple LASSO-selected regression leaves much unexplained ($R^2 \approx 59\%$) suggests that further factors (such as global financial stress indices or internal fiscal variables) might be included. The policy analysis also resonates with calls for diversification and hedging in the literature: Schwartz (2019) argues that reliance on the dollar exposes economies to U.S. policy, motivating reserve diversification. We similarly recommend expanding foreign currency and instrument diversification, as well as using foreign exchange derivatives or setting up futures markets, to soften the impact of large rate moves.

Conclusion

This study examined the determinants of Mauritania's foreign exchange reserves and assessed the country's exposure to international monetary shocks using a fully quantitative framework. By combining LASSO variable selection, linear regression, and VAR modeling, the analysis provides an integrated view of both the structural drivers of reserves and their dynamic response to external shocks. The results show that Mauritania's reserve management strategy has been cautious and stability-oriented, relying predominantly on liquid and low-risk instruments. While this approach has helped preserve reserves during periods of uncertainty, it remains constrained by limited diversification and a strong dependence on a narrow set of assets and currencies. One of the key contributions of this research lies in highlighting the asymmetric exposure of Mauritania's reserves to external monetary shocks. The empirical evidence indicates that European monetary policy, particularly changes in ECB interest rates, exerts a statistically significant and negative effect on reserve levels, whereas U.S. monetary shocks appear to have a negligible direct impact. This finding contributes to the existing literature by showing that reserve vulnerability is not solely driven by dollar dominance, but also by trade, financial, and institutional linkages with specific monetary areas. In this respect, the study offers a country-specific perspective that complements broader cross-country analyses.

From a policy standpoint, the results suggest several avenues for strengthening reserve resilience. Greater diversification of reserve assets could reduce concentration risk and limit exposure to external policy shifts. In addition, the adoption of forward-looking risk management frameworks, including econometric forecasting tools and potentially machine-learning-based approaches, could improve the anticipation of adverse shocks. The development of hedging mechanisms, such as currency forwards or options, also emerges as a relevant instrument to mitigate exchange rate risk in an increasingly volatile global environment.

Despite these contributions, the study has several limitations. The analysis relies on available macroeconomic time series and a relatively short sample period, which may not fully capture long-term structural changes or rare crisis episodes. The explanatory power of the models, while reasonable, indicates that a non-negligible share of reserve dynamics remains unexplained, suggesting the presence of omitted variables, nonlinear effects, or institutional factors not captured in the current framework. Moreover, the use of linear models may limit the ability to detect regime-dependent or asymmetric responses to shocks. These limitations open important directions for future research. Extending the analysis to include fiscal variables, global financial stress indicators, or measures of investor confidence could enrich the understanding of reserve dynamics. Exploring nonlinear or regime-switching models, as well as long-run relationships through vector error-correction models (VECM), would help capture adjustment dynamics and cointegration effects. Finally, comparative panel studies involving other resource-dependent economies could place Mauritania's experience in a broader regional or international context.

Overall, this research contributes to the literature by providing a focused empirical assessment of foreign exchange reserve management in a small, resource-dependent economy. It underscores the importance of dynamic and diversified reserve strategies in enhancing financial resilience and offers policy-relevant insights for managing external vulnerability in an environment of persistent global uncertainty.

Bibliography

1. Aizenman, J., & Lee, J. (2007). *International reserves: Precautionary versus mercantilist views*. Journal of International Money and Finance, 26(3), 410–431.
2. Basu, K., Eichengreen, B., & Gupta, P. (2014). *From tapering to tightening: The impact of the Fed's exit on India*. World Bank Policy Research Working Paper Series. https://doi.org/10.1596/1813-9450-7071
3. Bernanke, B. S. (2020). The new tools of monetary policy. *American Economic Review, 110*(4), 943–983. https://doi.org/10.1257/aer.110.4.943
4. Bernanke, B. S. (2020). *The new tools of monetary policy*. American Economic Review, 110(4), 943–983.
5. Carmona, R., Fouque, J.-P., & Sun, L.-H. (2013). *Mean field games and systemic risk.* SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2307814
6. Chen, H., Chen, Q., & Gerlach, S. (2011). The implementation of monetary policy in China: The interbank market and bank lending. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.1920761

7. Coudert, V., Couharde, C., & Mignon, V. (2011). Does euro or dollar pegging impact the real exchange rate? The case of oil and commodity currencies. *The World Economy, 34*(9), 1510–1534. https://doi.org/10.1111/j.1467-9701.2011.01400.x
8. Coudert, V., Couharde, C., & Mignon, V. (2011). *Does euro or dollar pegging impact the real exchange rate?* The World Economy, 34(9), 1510–1534.
9. Değerli, U., & Fendoglu, S. (2013). Reserve option mechanism as a stabilizing policy tool: Evidence from exchange rate expectations. *European Economics: Macroeconomics & Monetary Economics eJournal.* https://doi.org/10.2139/ssrn.2237847
10. Edge, R. M., Kiley, M. T., & Laforte, J.-P. (2010). A comparison of forecast performance between Federal Reserve staff forecasts, simple reduced-form models, and a DSGE model. *Journal of Applied Econometrics, 25*(5), 720–754. https://doi.org/10.1002/jae.1175
11. Edge, R. M., Kiley, M. T., & Laforte, J.-P. (2010). *A comparison of forecast performance between DSGE and reduced-form models*. Journal of Applied Econometrics, 25(5), 720–754.
12. Fakhri, H., & Samadova, I. (2010). The impact of real effective exchange rate on the non-oil export: The case of Azerbaijan. *International Trade eJournal.* https://doi.org/10.2139/ssrn.1784286
13. Jeanne, O., & Rancière, R. (2011). *The optimal level of international reserves for emerging market countries*. IMF Economic Review, 59(3), 449–482.
14. Lamers, M., Mergaerts, F., Meuleman, E., & Vander Vennet, R. (2016). The trade-off between monetary policy and bank stability. *European Finance eJournal.* https://doi.org/10.2139/ssrn.2896747
15. Menkhoff, L. (2013). Foreign exchange intervention in emerging markets: A survey of empirical studies. *The World Economy, 36*(9), 1187–1208. https://doi.org/10.1111/twec.12027
16. Olayungbo, D. O. (2019). Effects of global oil price on exchange rate, trade balance, and reserves in Nigeria: A frequency domain causality approach. *Journal of Risk and Financial Management, 12*(1), 43. https://doi.org/10.3390/jrfm12010043
17. Schwartz, H. (2019). American hegemony: Intellectual property rights, dollar centrality, and infrastructural power. *Review of International Political Economy, 26*(3), 490–519. https://doi.org/10.1080/09692290.2019.1597754