



Panel Data Analysis in Identifying and Mapping Caused Factors of Financial Crises and Monetary Instability in Developing Countries

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Abstract

This study aims to reveal the extent of macroeconomic instability, which has the characteristics of a financial crisis and inflation. To test the hypothesis, researchers use fixed effects and random effects estimators to assess the presence of individual and temporal effects. Macroeconomic fundamentals, especially the risk of devaluation and a drop in economic activity can be seen as early warning signs of banks becoming less solvent. They also play a big role in explaining how deposits changed during the crisis. Our findings highlight the unique features of the convertible monetary regime, reinforcing the belief that debtors will enjoy permanent protection against devaluation risks. This perception encourages the dollarization of bank portfolios, thereby increasing the financial system's solvency risks. There is also evidence that the regulatory framework in this area is weak when it comes to the financial system's exposure to devaluation risks and public debt risks. This is especially true when it comes to an institutional framework that makes it hard for government funding to be changed into other currencies. We find that inflation is a very persistent process during periods of high inflation. However, with the decline in inflation after the implementation of the convertibility regime, its persistence reduced significantly. The results show that non-rational persistence is currently not very high, suggesting that the costs of designing the economy should not be either. We find that univariate models tend to perform better over very short horizons. The results suggest that there may be advantages to using a combination of different models, provided they are informative about the relationship between inflation and its short- and long-run determinants.

Keywords: Macroeconomic, Fundamental, Financial, Inflation.

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1. Introduction

These diverse perspectives on financial crises offer valuable insights into their occurrence and strategies for mitigating their impacts. Misperceptions about the liquidity of other agents trigger banking crises, a self-fulfilling prophecy that ultimately leads to banks losing their liquidity balance and customer funds fleeing. This shows how important trust and perception are in financial markets [1]. On the other hand, other views describe financial crises as a form of market discipline where depositors act as risk assessors for financial institutions. This approach emphasizes the importance of markets in regulating financial behavior and reinforcing the health of the financial system by reducing excessive risk. The latter approach views financial crises as a response to underlying macroeconomic conditions. It highlights the importance of macroeconomic factors in shaping economic and financial behavior, emphasizing the importance of appropriate macroeconomic policies to prevent crises. These three views demonstrate the complexity of financial crises, which often involve a combination of psychological, market, and macroeconomic factors. Understanding these different perspectives can help in developing more effective strategies to prevent and overcome future financial crises [2].

The developed model highlights how bank runs can be a natural response to the increase in aggregate risk that occurs when the value of a company's assets declines, such as in situations of overall decline in economic activity. In this context, depositors perceive a bank run as a market mechanism that mitigates risk by withdrawing their funds from banks deemed risky. This adds a new dimension by demonstrating a positive correlation between bank runs triggered by self-fulfilling prophecies and poor fundamentals [2]. This highlights how market perceptions and expectations of a bank's fundamental condition can influence overall market behavior. Bad expectations can trigger a bank run in multiple equilibria, where there are multiple possible equilibrium points, thereby influencing the behavior of economic actors. These two models provide a deeper understanding of the dynamics behind bank runs and financial crises in general. They demonstrate that external

factors like macroeconomic conditions and market perceptions, in addition to internal bank factors, also cause bank runs. We hope that this understanding will lead to the development of more effective strategies for managing financial crisis risk and preventing bank runs in the future [3].

Crisis episodes in emerging market economies are often a combination of monetary and banking crises, which have an adverse impact on economic growth. The general characteristics of these crises actually have similarities with previous crises [2]. They note that market-oriented economic reforms, trade and financial liberalization, and deregulation and privatization of public enterprises have been the hallmarks of most of these crises. They also underscore that inadequate banking regulation and supervision, leading to financial fragility, constitutes a significant weakness in nearly all crisis experiences [3]. This analysis highlights the importance of effective regulation and supervision in reducing the risk of financial crises. Although market-oriented economic reforms can provide long-term benefits, it is important to pay attention to the need to maintain the stability of their financial systems through appropriate regulation and strict supervision. Thus, we can hope to prevent or minimize such crisis events in the future [4]. Investigating the determinants of financial crises can provide valuable insights for designing and improving policies and regulations to reduce the likelihood of future crises. In the specific context of the banking crisis, this represents a unique opportunity to test some of the hypotheses proposed in the literature about the causes of the event. Although it has undergone structural market reforms and financial liberalization, similar to other countries experiencing a crisis, it exhibits unique characteristics. Its banking system does not appear to be particularly vulnerable to financial crises, mainly due to the massive financial reforms implemented. These reforms have raised standards of financial regulation and supervision to standards [5]. This analysis of the banking crisis can provide a deeper understanding of how appropriate financial reforms can reduce vulnerability to crises. By studying the factors that help protect banking systems from financial crises, other countries can learn valuable lessons in designing more effective policies and regulations to reduce the risk of future crises [6].

Empirical evidence from curve estimates suggests a rather weak relationship between the output gap and the inflation rate during periods of low inactivity. This suggests that other factors, besides production levels, may have a greater influence on the inflation rate in this context. Analysis of inflation dynamics using the VAR model also shows that in recent years, inflation dynamics appear to be more exogenous to variables such as money, interest rates, and output [5]. This shows that these factors have a greater influence on inflation than in years when inflation was high. Thus, inflation in context is more difficult to predict using multivariate models because exogenous factors have a significant role in determining the level of inflation. These findings provide important insights into the factors that influence inflation and highlight the complexity of predicting inflation dynamics in a complex economic context [6]. We can better design monetary and fiscal policies to manage inflation and strengthen overall economic stability with a better understanding of these factors. The long-run determinants of inflation have been the focus of extensive research in monetary theory. Everyone agrees that the long-run high correlation between monetary growth and inflation rates is not unique, but rather dependent on the current monetary regime [7]. However, recent empirical evidence suggests that the long-run relationship between monetary growth and inflation is not unique and that the relationship weakens as the inflation rate decreases. In short, although the determinants of inflation are not unique, high long-term monetary growth tends to be associated with high levels of inflation [8]. There are two main reasons for high monetary growth first, monetary financing to overcome economic scale imbalances and second, ongoing efforts to exploit the trade-off between unemployment and inflation using expansionary monetary policy. Thus, a better understanding of these factors can help in designing more effective monetary policies to manage inflation in the long run [9].

The phenomenon of inflation persistence, which refers to the speed at which the inflation rate approaches its long-term value after a shock, has changed along with the decline in inflation [8]. The study of inflation persistence has become an important topic in recent years in industrialized countries, although the evidence regarding developing countries is still limited. Inflation persistence has great relevance in modeling and implementing monetary policy because the ability of a central bank to maintain inflation stability around its long-term value is highly dependent on the level of nominal rigidity in the economy [10]. Recent evidence suggests that when the long-run value of inflation is not constant, the degree of inflation persistence will tend to decrease. In addition, there are indications that inflation persistence tends to be higher during periods of high inflation. These findings highlight the importance of understanding inflation persistence in the context of developing countries, as this can influence the effectiveness of monetary policy. By understanding the factors that influence the persistence of inflation, central banks can design more effective policies to maintain price stability and reduce unwanted economic fluctuations.

2. Research Methods

In this research, to evaluate the three hypotheses proposed regarding the causes of the banking crisis, researchers built a model of changes in deposits for each bank. Two main factors explain this model a set of macroeconomic fundamentals and a set of microeconomic fundamentals for individual banks. Due to the dynamic nature of the

model, the researchers used the data panel method, which is an appropriate technique for dealing with the autoregressive nature of the data, to estimate the model of bank deposits during the crisis. To test the hypothesis, researchers use fixed effects as well as random effects estimators to assess the presence of individual and temporal effects. First, they evaluated overidentification restrictions with the test. This test's results confirm the correct specification of the model's instruments. Second, the researchers also evaluated the presence of second-order autocorrelation in the first difference residuals, which is important for the consistency. The results show that all models pass both tests. Overall, the empirical evidence supports the hypothesis that worsening macroeconomic fundamentals, rather than excessive risk-taking by financial institutions or sunspot phenomena, triggered banking crises. Changes in the estimation technique in this study strengthen these results.

3. Results and Discussion

The empirical results of this study strongly support the second hypothesis, which states that fundamental macroeconomic factors, especially the risk of devaluation and decline in economic activity, play a major role in explaining savings dynamics during the crisis. The risk of devaluation and a decline in economic activity can be considered early indicators of deteriorating banking solvency, influencing depositors' decisions to withdraw their deposits from banks. Additionally, each bank's exposure to public debt also proves important in explaining deposit dynamics during the crisis. This shows that the government's financial condition also plays a role in influencing public confidence in the stability of the banking system. However, the microeconomic foundations of banking do not make a significant contribution to explaining the dynamics of savings during the crisis. This shows that factors related to bank performance and internal management do not have a major impact in the context of this crisis. Finally, there is evidence that savings dynamics during the crisis became systemic as the crisis progressed. Although there was heterogeneity among banks initially, this is no longer significant as macroeconomic fundamentals worsen. This shows that in crisis conditions, systemic factors become more dominant in influencing people's savings behavior.

The study's results suggest that the unique features of the convertible monetary regime, which give the impression that debtors will always be safe from devaluation risks, are what cause bank portfolios to become more dollarized. This causes a high increase in solvency risk in the financial system. This risk is only felt when the economy's macroeconomic fundamentals show real signs of decline. Empirical evidence also shows that a weak regulatory framework is associated with the financial system's exposure to devaluation risk and public debt risk. In particular, an institutional framework that severely limits the convertibility of government funding is also a factor that contributes to high solvency risks in the financial system. This highlights the importance of adequate regulatory and institutional frameworks for managing solvency risks in the financial system. In this context, increased awareness of devaluation and public debt risks, as well as increased convertibility of government funding, can help reduce high solvency risks in the financial system.

Policy recommendations from these findings emphasize the importance of developing financial instruments in local currencies to deepen the banking system. This aims to reduce dependence on foreign currency and reduce the risk of devaluation. In addition, regulations need to be established to control devaluation risks in the financial system, with a focus on the internalization of risks in foreign currency deposits by depositors. Limiting bank loans in foreign currency and ensuring that debtors receive income in that currency are also important to maintain solvency. Finally, controlling exposure to sovereign debt risk in a bank's active portfolio is also necessary to minimize risks from exchange rate fluctuations and changes in macroeconomic conditions. Implementation of these recommendations is expected to reduce high solvency risks in the financial system and strengthen overall stability.

The experience of recent crises in emerging markets highlights the importance of financial liberalization policies balanced with effective regulation. Developing countries often rely on foreign capital flows due to a lack of sufficient national savings to support economic growth. However, this dependence places their banking systems at certain risks that developed countries do not experience. Therefore, it is important for developing countries to have appropriate regulatory standards for their banking systems. These regulations should be designed to control relevant risks and protect the stability of the financial system. Flexibility is also important in these regulations, given the differences in economic and financial conditions between developed and developing countries. Good regulatory policies can help reduce the risk of excessive credit expansion and maintain the stability of developing countries' financial systems. Thus, effective regulation must be an integral part of sustainable economic development strategies for these countries.

Recent empirical evidence shows that resilience, which is usually considered an intrinsic characteristic of a nation, is not always consistent and can change depending on the monetary regime prevailing in the economy. These studies also highlight the importance of considering the long-term experience of stalled inflation when measuring inflation persistence. Additionally, this research shows that with the reduction in the incidence of hunger as a common phenomenon in the economy, the nation's dynamics also appear to have changed. The decline in non-actionary persistence of inflation, a phenomenon unaffected by government or monetary authority

actions, is evident. This indicates that external factors, such as the monetary regime and changes in food policy, can influence the nation's dynamics in terms of the persistence of inflation and hunger. Therefore, it is important for policymakers to pay attention to these changes in designing economic and social policies that are more effective and responsive to the actual conditions faced by society. By better understanding the factors that influence the tenacity and persistence of inflation, policymakers can take more appropriate steps to address the economic and social problems faced by the nation.

In this case, there is a visible lag in long-term inflation values, which illustrates the complex dynamics of monetary policy. There was a lag in monetary policy action due to the strong influence of ongoing fiscal imbalances, which demonstrated high fiscal dominance and limited monetary policy capabilities. After experiencing an episode of hyperinflation at the end of the decade, it adopted a currency board regime that succeeded in stabilizing the inflation rate permanently at a lower level. This regime adopts a passive monetary policy, with external factors largely influencing lower inflation dynamics. However, the devaluation led to the abandonment of convertibility, paving the way for a more flexible exchange rate regime. Following the devaluation, inflation briefly accelerated before returning to lower levels, albeit still slightly higher than during the convertibility period. This shows that monetary and exchange rate policies have a significant impact on inflation dynamics. This experience highlights the importance of carefully considering various factors, including fiscal policy, exchange rate regimes, and external factors, in designing effective monetary policy to maintain price stability and sustainable economic growth.

In our analysis, we examine the dynamics of action and inaction during periods of inflation, especially their persistence. Through simulations, we conducted a study on the implications of modeling monetary policy, assuming that inaction is a highly persistent process. Using recursive methods and the structural change test developed by Bai and Perron, we identify breaks in the average inflation rate that coincide with changes in the monetary regime: the introduction of convertibility and its abandonment. We differentiate inflation variables based on discrete lags and calculate a measure of inflation persistence. We find that inflation is a very persistent process during periods of high inflation, almost like a random process. However, the persistence of inflation decreased drastically after the implementation of the convertibility regime. After the introduction of the managed inflation regime and the control of inflationary episodes caused by the devaluation, inflation once again showed more persistent behavior. These results reinforce the importance of considering structural breaks when modeling non-rational dynamics and when estimating their persistence. We also emphasize that in this case, persistence is not an intrinsic characteristic of inaction but rather depends on the prevailing monetary regime. Our results also show that the persistence of inflation is currently not very high, which suggests that the costs of designing the economy should not be high either.

In our research, we estimate various inflation models for forecasting purposes. We consider univariate models, causal models, and models based on alternative theories to develop a comprehensive forecasting framework. Univariate models are models that only use historical information from observed variables, in this case the inflation rate, to make estimates about the value of inflation in the future. Univariate models often use statistical approaches such as Autoregressive Integrated Moving Average or simple regression models to perform forecasting. Causal models, on the other hand, try to take into account external factors or other variables that may influence the inflation rate. This could include variables such as economic growth, unemployment rates, or commodity prices. Causal models use regression or other techniques to identify the relationship between these variables and inflation and then use this information to forecast future inflation levels. In addition, we also consider alternative theory-based models which may include models based on broader economic theory or assumptions about market behavior. Examples are models that take inspiration from economic theories such as the quantity theory of money or rational expectations theory. By combining these approaches, we hope to develop a more accurate and reliable inflation forecasting model that can assist decision-makers and policymakers in planning appropriate economic and monetary strategies.

In our research, we use factors as summary measures of the combined variability of a large number of economic series to develop forecasting models. We find that although univariate models generally perform best, as the forecast horizon broadens, multivariate models approach their performance. In particular, the monetary model does better than the univariate model for a year if its point estimates are different from the statistics used to test the model's ability to predict. However, when we calculated tests to evaluate the statistical significance of differences in the predictive capacity of the models using the univariate model benchmark, we found no statistically significant differences. Then, we combine the estimated models over a pool of estimates using the inverse of each model's as a weight. The results show that some combinations of forecasts outperform individual best forecasts for a one-year time horizon. Given that this time period is relevant for economic policy decision-making, the possibility of combining univariate and multivariate forecasting models is attractive because it allows us to answer specific policy questions related to economic conditions.

4. Conclusion

Macroeconomic fundamentals, especially the risk of devaluation and a drop in the level of economic activity, can be seen as early warning signs of banks becoming less solvent. They also play a big role in explaining how deposits changed during the crisis. Our findings highlight the unique features of the convertible monetary regime, reinforcing the belief that debtors will enjoy permanent protection against devaluation risks. This perception encourages the dollarization of bank portfolios, thereby presenting significant solvency risks to the financial system. Only when there are no clear signs of deterioration in macroeconomic fundamentals does this risk become apparent. There is also evidence that the regulatory framework in this area is weak when it comes to the financial system's exposure to devaluation risks and public debt risks. This is especially true when it comes to an institutional framework that makes it hard for government funding to be changed into other currencies. These findings show that, first, a key element that enables the deepening of the banking system is to develop attractive financial instruments in local currencies. Second, considering that the financial system has a risk of devaluation, regulations must control this risk. Because the Central Bank lacks the policy tools to act as the lender of last resort in this situation, a good regulatory design must enable depositors to internalize the risks inherent in foreign currency deposits. Limiting bank lending in foreign currency is crucial to ensure debtors in that currency receive income, thereby protecting their solvency from exchange rate fluctuations. Regulations must also control the exposure to sovereign debt risk in bank portfolios.

We find that inflation is a very persistent process during periods of high inflation. However, with the decline in inflation after the implementation of the convertibility regime, its persistence reduced significantly. After the introduction of the managed inflation regime and controlling the inflationary episodes caused by devaluation, we find that inflation once again shows more persistent behavior. These results reinforce the importance of evaluating the presence of structural breaks when modeling non-rational dynamics, especially in efforts to estimate their persistence. We also emphasize that in this case, persistence is not an intrinsic characteristic of inflation but rather depends on the monetary regime. The results show that non-rational persistence is currently not very high, suggesting that the costs of designing the economy should not be either. It depends on the length of time used for the forecast to see how well causal models, like the curve and monetary models, do compared to univariate models. In addition, we also test the forecasting capacity of models used as regressors to measure the joint variability of a large number of economic series, commonly referred to as factors. We find that univariate models tend to perform better over very short horizons.

However, as the horizon lengthens, causal models appear to provide more relevant information for forecasting. In particular, the monetary model performs better than the univariate model in forecasting one-year horizons, confirming the role of money as a long-term determinant of inflation. Finally, in this model, we use factors as regression variables to explain inflation behavior over a longer period of time. The analysis results reveal that these factors hold significant information, particularly in identifying economic cycles for multivariate forecasting. When we performed statistical tests to compare the predictive capacity of the best-performing models, we found no statistically significant differences between them. This shows that there is no strong empirical evidence to rule out either approach for forecasting purposes. On the contrary, the research results suggest that there may be advantages to using a combination of different models, provided that the models are informative about the relationship between inflation and its short- and long-term determinants.

References

- [1] Chauhan, C., Dhir, A., Akram, M. U. I., & Solo, J. (2021). Food Loss and Waste in Food Supply Chains: A Systematic Literature Review and Framework Development Approach. *Journal of Cleaner Production*, 1-14.
- [2] Blay, M. W., Musah, A., Ayariga, C., & Okyere, D. O. (2024). Determinants of Financial Literacy and its Effect on Stock Market Participation among University Students in Ghana. *International Journal of Economics and Financial Issues*, 14(2), 15–25. <https://doi.org/10.32479/ijefi.15613>
- [3] Shenjere, P., & Ferreira-Schenk, S. (2024). Analysing the Life Satisfaction of Risk-averse and Risk-loving Investors in South Africa. *International Journal of Economics and Financial Issues*, 14(2), 89–96. <https://doi.org/10.32479/ijefi.15440>
- [4] Limei, H., Tannady, H., & Nurprihatin, F. (2018). Meminimumkan Biaya Transportasi pada Capacitated Vehicle Routing Problem dengan Metode Heuristik. *SEMRESTEK 2018*, 605-613.
- [5] Pujawan, I. N., & Mahendrawati. (2017). *Supply Chain Management Edition 3*. Yogyakarta: ANDI.
- [6] Diane, L., & Brijlal, P. (2024). Forecasting Stock Market Realized Volatility using Random Forest and Artificial Neural Network in South Africa. *International Journal of Economics and Financial Issues*, 14(2), 5–14. <https://doi.org/10.32479/ijefi.15431>
- [7] Séraphin, P. Y., & Cyrille, K. K. (2024). Tourism, Financial Development and Sectoral Development in ECOWAS Countries: Empirical Evidence from the CS-ARDL Approach. *International Journal of Economics and Financial Issues*, 14(2), 54–64. <https://doi.org/10.32479/ijefi.15658>
- [8] Sharma, M. K., Bhagwat, R., & Sharan, G. (2005). Practice of Performance Measurement: Experience from Indian SMEs. *International Journal of Globalization and Small Business*, (2), 183-213.

- [9] Habanabakize, T., & Dickason-Koekemoer, Z. (2024). A Comparative Analysis between Intrinsic and Extrinsic Drivers of Inflation. *International Journal of Economics and Financial Issues*, 14(2), 36–44. <https://doi.org/10.32479/ijefi.15685>
- [10] Tannady, H. (2019). Process improvement to reduce waste in the biggest instant noodle manufacturing company in South East Asia. *Journal of applied engineering science*, 17(2).