

MASTER
APPLIED ECONOMETRICS AND FORECAST

MASTER'S FINAL WORK
DISSERTATION

THE EFFECTIVENESS OF MONETARY POLICY IN CONTROLLING
INFLATION IN ANGOLA: AN APPROACH USING LOCAL PROJECTIONS

Mateus José Manuel Maquiadi

DECEMBER - 2025

MASTER

APPLIED ECONOMETRICS AND FORECAST

MASTER'S FINAL WORK

DISSERTATION

THE EFFECTIVENESS OF MONETARY POLICY IN CONTROLLING
INFLATION IN ANGOLA: AN APPROACH USING LOCAL PROJECTIONS

Mateus José Manuel Maquiadi

SUPERVISION:
Prof. Paulo M. M. Rodrigues

DECEMBER – 2025

Abstract

This study examines the effectiveness of monetary policy in controlling inflation in Angola, an economy highly exposed to oil-price volatility and exchange-rate shocks. Using monthly data from 2012–2025 and the Local Projections method of Jordà (2005), the paper evaluates how key policy instruments influence inflation dynamics. Results show that neither the BNA policy rate nor the marginal lending Facility rate generates significant price adjustments, indicating weak interest-rate transmission. Changes in reserve requirements produce only temporary effects, while broad money (M2) growth has no measurable impact. By contrast, exchange-rate shocks generate immediate and persistent pass-through to prices. Overall, Angola's inflation is mainly driven by external and structural forces, underscoring the need for stronger monetary transmission mechanisms.

JEL: E31, E52, E58, O55

Keywords: Monetary Policy, Inflation, Angola, Local Projections

Resumo

This study examines the effectiveness of monetary policy in controlling inflation in Angola, an economy highly exposed to oil-price volatility and exchange-rate shocks. Using monthly data from 2012–2025 and the Local Projections method of Jordà (2005), the paper evaluates how key policy instruments influence inflation dynamics. Results show that neither the BNA policy rate nor the marginal lending Facility rate generates significant price adjustments, indicating weak interest-rate transmission. Changes in reserve requirements produce only temporary effects, while broad money (M2) growth has no measurable impact. By contrast, exchange-rate shocks generate immediate and persistent pass-through to prices. Overall, Angola's inflation is mainly driven by external and structural forces, underscoring the need for stronger monetary transmission mechanisms.

JEL: E31, E52, E58, O55

Keywords: Monetary Policy, Inflation, Angola, Local Projections

Acknowledgment

Agradeço a Deus, pela força, sabedoria e saúde que me concedeu durante todo o processo, sem a qual não seria possível terminar o mestrado.

Gostaria de expressar a minha profunda gratidão ao meu supervisor, Professor Paulo M.M Rodrigues, pelo apoio incansável e pelas orientações valiosas. Sua experiência foi crucial para o desenvolvimento dessa pesquisa.

Agradeço imenso ao Banco Fomento Angola, pelo suporte financeiro que foi essencial para realizar desse mestrado. Aqui, quero destacar o apoio do José Cerdeira, do Márcio Silva e da Dra. Francisca Ferrão, que não somente apoiaram a ideia como também permitiram que tivesse financiamento.

Não poderia deixar de agradecer à minha querida esposa, Bruna Maquiadi, que tem sido uma fonte constante de amor, paciência e compressão. Sua força ao cuidar de nossas filhas enquanto eu me dedicava ao trabalho foi incrível.

Agradeço também ao meu amigo Péricles, que esteve ao meu lado, acompanhando e apoiado o desenvolvimento deste trabalho, oferecendo conselhos e incentivo sempre que precisei. A sua disponibilidade para ouvir-me foram essências para o desenvolvimento dessa pesquisa.

Por fim, quero expressar minha sincera gratidão aos meus colegas do Gabinete de Estudos Económicos do BFA. Ana Cambango e Eukéria Ferreira, muito obrigado pelo suporte imenso que me deram e que foi essencial para que eu pudesse gerir trabalho e estar activo nessa formação intensa por esse longo período.

A todos vocês, meu mais sincero agradecimento.

Contents

1	Introduction	2
2	Literature Review	4
3	Countries' economic overview	7
4	Data and Methodology	8
4.1	Stationarity test and data preparations	8
4.2	Model specification	10
5	Empirical results and discussions	12
5.1	Robustness checks	14
5.2	Discussion of results	15
6	Conclusion	16
7	Appendix	18

Glossary

By order of appearance:

BNA: Central Bank of Angola

MLF: Marginal Lending Facility (MLF)

O/N: Luibor Overnight

LPs: Local Projections:

VAR: Vector Autoregressive

IRFs: Impulse Response Function

VECM: Vector Error Correction Model

ECB – European Central Bank

ITR: Inflation Target Regime (ITR)

GDP: Gross Domestic Product

DGP: Data-Generating Process

CPI: Consumer Price Index (CPI)

MRR: Mandatory Reserve Ratio

INE: National Institute of Statistics

ADF: Augmented Dickey-Fuller

YoY: Year on Year

OMO: Open Market Operations

OLS: Ordinary Least Squares

SE: Standard Errors

1 Introduction

Monetary policy plays a central role in macroeconomic stabilization, influencing variables such as inflation, exchange rates, and economic growth. However, its effects are not immediate; they are subject to time lags, which can vary significantly depending on economic conditions, the instruments used, and institutional frameworks. These lags are particularly critical in emerging economies such as Angola, where external shocks (including oil price volatility), alongside internal vulnerabilities and import dependence, add layers of complexity to the effective conduct of economic policy. In this context, the Central Bank of Angola (BNA) faces distinct challenges in implementing monetary policy due to its high exposure to exchange rate fluctuations, the economy's reliance on the oil sector, persistent inflationary pressures, and weak institutional settings. Moreover, the structure of the financial system and the shallow depth of domestic markets constrain the effective transmission of monetary policy.

The effectiveness of monetary policy depends on its ability to achieve intended economic objectives within a reasonable time frame. In Angola, the conduct of monetary policy is highly dependent on fiscal policy, such that the amount of money in circulation can be stimulated to grow in order to finance the general state budget. BNA has provided substantial financing to the Ministry of Finance and, as a result, the broad money aggregate (M2) has persistently outpaced inflation. The strong interconnection between monetary and fiscal authorities often generates monetary shocks (such as abrupt changes in interest rates or sudden expansions and contractions of the monetary base), which are considered detrimental to market functioning and, in particular, to inflation control.

In August 2024, the President of the Republic met with Chief Executive Officers of major commercial banks to discuss the elevated interbank interest rates used as benchmarks for credit to the economy¹. The following day, BNA intervened in the market by injecting approximately 179 billion kwanzas (local currency) through its marginal lending facility operations at a rate of 20.7%, resulting in a 127-basis point reduction in the Luibor Overnight rate (the key interest rate in the interbank money market²). This is merely one example of the recurrent shocks that characterize the conduct of monetary policy in Angola.

In June 2023, the Angolan government began phasing out fuel subsidies. The government's economic team announced an increase of approximately 87.5% in the price of gasoline³. One month earlier, in May, the exchange rate depreciated by about 35% after several months of stability⁴. The combined effect of these shocks was expected to lead to a significant rise in inflation. BNA convened its Monetary Policy Committee meetings in July and September, opting not to adjust its monetary policy instruments, arguing that the effects of these endogenous shocks on inflation would be temporary and likely

¹<https://expansao.co.ao/empresas/detalhe/presidente-chama-bancos-de-urgencia-para-definir-estrategias-para-combater-alta-de-juros-62483.html>

²<https://expansao.co.ao/empresas/detalhe/presidente-chama-bancos-de-urgencia-para-definir-estrategias-para-combater-alta-de-juros-62483.html>

³<https://governo.gov.ao/noticias/753/economia/fim-da-subvencao-aos-combustiveis/mais-investimentos-em-areas-prioritarias>

⁴<https://expansao.co.ao/economia/detalhe/kwanza-afunda-27-no-espaco-de-um-mes-60459.html>

to dissipate within three months⁵. Unfortunately, reality proved otherwise. In November (during its final meeting of the year), BNA reversed its stance, raising interest rates and introducing other monetary policy instruments to reduce excess liquidity⁶. In fact, year-on-year inflation, which began to accelerate in mid-2023, only began to decelerate approximately 12 months later, from August 2024 onward⁷. This episode sparked our interest in studying how inflation dynamically responds to monetary policy stimuli. We came to understand that grasping how monetary policy propagates over time is essential for designing more timely and effective interventions. Considering this context, this research seeks to investigate the extent to which monetary policy instruments have been effective in controlling inflation in Angola, thereby contributing to a deeper understanding of the country's monetary policy dynamics.

In Angola, the debate over the effectiveness of monetary policy in controlling inflation has generated extensive discussion among economists. Many argue that the instruments used by BNA face limitations in price stabilization, as inflation in the country is largely driven by structural factors, such as import dependence, exchange rate volatility, and constraints on domestic productive capacity. Nevertheless, monetary policy remains a key tool of macroeconomic management, underscoring the need to assess its actual impact on inflation. Accordingly, this research is guided by the following questions:

1. How do monetary shocks affect inflation over time?
2. Are monetary policy instruments effective in controlling inflation?
3. What are the transmission lags of monetary policy interventions on inflation in Angola?

By exploring these questions, this research aims to provide an empirical analysis of the effectiveness of Angola's monetary policy, contributing to the academic debate and offering relevant insights for the formulation of more effective economic policies.

This research is structured as follows: Chapter 2 presents the literature review, discussing key studies related to the effectiveness of monetary policy in controlling inflation, with a particular focus on the application of Local Projections (LPs); Chapter 3 provides an overview of the Angolan economy; Chapter 4 presents the data sources and data treatment, as well as the applied methodology; Chapter 5 presents the empirical results, discusses the findings of the econometric analysis and their interpretation, and explores the implications of the results for the Angolan economy, assessing the challenges and offering potential policy recommendations; Chapter 6 concludes the research by summarizing the key insights and contributions of the study and suggesting directions for future research.

⁵See minutes of the 124th Meeting of the Monetary Policy Committee at: <https://www.bna.ao/#/pt/publicacoes-e-media/comunicacao/comunicados/detalhe/671>; See minutes of the 125th Meeting of the Monetary Policy Committee at: <https://www.bna.ao/#/pt/publicacoes-e-media/comunicacao/comunicados/detalhe/706>; See press conference on: <https://www.youtube.com/watch?v=ritIML2ed2U>;

⁶See minutes of the 126th Meeting of the Monetary Policy Committee at: <https://www.bna.ao/#/pt/politica-monetaria/comite-politica-monetaria/calendario-comite-politica-monetaria>

⁷<https://expansao.co.ao/angola/detalhe/inflacao-homologa-diminui-pela-primeira-vez-nos-ultimos-16-meses-para-3053-62588.html>

2 Literature Review

According to @Jorda2005, LPs consist of a sequence of regressions that allow the direct estimation of impulse response functions at different horizons. In this approach, the dependent variable (projected for a specific horizon) is explained by the policy variable (or its instrument, when necessary), along with appropriate controls. These typically include lags of both the dependent and policy variables, as well as other exogenous or predetermined variables. Due to their flexibility and robustness against misspecification, LPs have become an increasingly popular methodological alternative to traditional models, particularly in the study of monetary policy.

Although over the past two decades LPs have become one of the most convenient methods for estimating the effects of policy shocks on macroeconomic variables, there remains a significant scarcity of applied studies focused on African countries, particularly Angola. Most existing research analyzing the effects of monetary policy on inflation across the African continent relies primarily on Vector Autoregressive (VAR) models as the main econometric approach. In the Angolan context, no studies have been identified that assess the effectiveness of monetary policy in controlling inflation using LPs, with the exception of @Fernandes2025, who examined the impacts of monetary policy shocks on variables such as GDP, inflation, dollarization, and credit to the private sector. The study found that contractionary shocks initially reduce GDP, followed by delayed positive effects; inflation displayed nonlinear responses; and the credit channel proved strong, underscoring the importance of financial development. Evidence of state-dependent effects was also identified, suggesting that the effectiveness of monetary policy varies according to structural and cyclical conditions. Thus, the study proposed herein assumes an innovative character and offers a relevant contribution to the literature (both for Angola and for other resource-dependent African countries), by applying LPs to examine the effectiveness of monetary policy in controlling inflation.

Given the small number of studies based on LPs across the African continent, we chose to include in the literature review works that employed VAR models and were conducted in countries with structural characteristics similar to those of Angola, such as Nigeria. This choice is justified for two main reasons. First, the similarity in the economic and institutional structures of the two countries allows us to assume that empirical findings from Nigeria may have external validity for the Angolan context. Second, although methodologically distinct, VAR and LPs can yield equivalent estimates of impulse response function (IRFs) under certain conditions. @Jorda2005 originally proposed LPs as an alternative to VARs, and @Plagborg2021 formally demonstrated that, at the population level, the impulse response functions obtained via LPs and VARs are identical, provided the models are correctly specified. While VARs are more efficient in small samples, LPs are more robust to specification errors. These researchers also argue that standard structural identification strategies used in VARs (e.g., short- and long-run restrictions and sign restrictions) can be equivalently applied within the LPs framework, further reinforcing the empirical relevance of this methodological equivalence.

In this context, two empirical studies on Nigeria stand out as particularly relevant for understanding the effects of monetary policy on inflation in economies structurally similar to Angola. The first is the study by @Yoriyo2025, whichd, which investigates the impact of monetary policy on inflation in Nigeria using a Bayesian VAR model with annual data

from 2007 to 2024. The model incorporates variables such as the inflation rate, interest rate, monetary base, real GDP, and nominal exchange rate, thereby allowing for the identification of monetary policy shocks and their dynamic effects. The results indicate that shocks to the monetary base exert statistically significant effects on inflation, while the impacts on GDP and the exchange rate are more modest. The variance decomposition shows that monetary policy accounts for a relevant (though not dominant) share of inflation dynamics. The authors conclude that monetary policy in Nigeria exhibits moderate effectiveness, with its performance being influenced by both structural and external

The second study is by @Razafimahefa2012, who examined the effectiveness of monetary policy in achieving price stability and fostering economic growth in Nigeria. Using a VAR model with quarterly data from 1981 to 2008, they analyzed key macroeconomic variables such as inflation, real GDP, exchange rate, money supply, and interest rate. The results show that monetary supply shocks have a positive impact on real GDP while reducing inflation with some lag. In contrast, interest rate shocks exhibit limited effects, suggesting low effectiveness of the interest rate channel. The study concludes that monetary policy effectiveness in Nigeria is partial constrained by factors like informality, exchange rate volatility, and shallow financial depth. The authors recommend strengthening central bank credibility and modernizing policy instruments as crucial steps toward improving monetary policy transmission. The findings in Nigeria suggest that monetary policy has moderate effectiveness in controlling inflation. It is expected that these results may not differ significantly from those observed in Angola.

Given the scarcity of applied studies employing LPs in Africa (particularly in Angola) it is valuable to consider broader international evidence to better understand the methodological nuances involved in the identification of monetary policy shocks and their transmission. Several recent studies have applied LPs in diverse contexts (e.g., the United States, the European Union, and Brazil), to examine how methodological choices (including the type of shock, data frequency, data transformation and identification strategy) can significantly influence empirical results. These contributions deepen our understanding of the limitations, advantages, and conditions under which monetary policy proves more or less effective.

@Brennan2024 investigated the impacts of US monetary policy, analyzing the influence of the choice of data and methods on the identification of monetary shocks and their transmission to the economy. Using high-frequency series of monetary shocks and applying LPs and VAR methodologies, the authors assessed whether the estimation of the effects of monetary policy varies according to the type of shock used. The results indicate that series of shocks based on short-term interest rates and different statistical methods generate relatively low correlations, especially in periods when the federal funds rate is close to its lower bound (Effective Lower Bound - ELB). The authors concluded that, while monetary shocks estimated from short-term assets can be predictable and subject to informational contamination, the inclusion of long-term data improves the robustness of the results. In addition, they demonstrated that LPs and VAR models present similar impulse responses, suggesting that the choice of a monetary shock has less impact on the estimates when dynamic approaches are used.

@Holban2024 analyzed the impacts of the ECB monetary policy on non-Exchange Rate Mechanism countries in the European Union using LPs. The study identified three types of monetary shocks: a pure monetary policy shock, a central bank information shock, and

a shock related to the ECB’s anti-fragmentation policy. The results showed that conventional monetary shocks had limited effects on the economies analyzed, while information and anti-fragmentation shocks had more pronounced impacts, especially on unemployment and industrial production. Furthermore, evidence of non-linearities in the effects of monetary policy was detected, suggesting that the economic response varies depending on the economic context and the magnitude of the shock.

@Flora2023 analyzed the conditions under which the Brazilian economy was under fiscal or monetary dominance between January 1999 and November 2022, the period marked by the Inflation Target Regime (ITR). Using the definition of fiscal dominance proposed by @Blanchard2004, the authors investigated whether monetary policy was effective in influencing the exchange rate, based on the estimation of IRFs through LPs. The results indicate that, in periods of high indebtedness, there was monetary dominance, which means that monetary policy was able to impact the exchange rate and inflation. However, when the net domestic debt was relatively low, fiscal dominance was observed, since the lack of response of the fiscal surplus to the increase in interest rates prevented monetary policy from influencing the exchange rate trajectory.

These international studies also highlight that the effectiveness of monetary policy depends not only on the prevailing macroeconomic regime but, more importantly, on how monetary shocks are defined and empirically identified. In this regard, the literature has increasingly emphasized the importance of using high-frequency data and robust identification strategies, such as instrumental variables and the distinction between anticipated and unanticipated shocks. This methodological concern is central to ensuring the causal validity of the estimates and contributes to more realistic and informative results regarding the conduct of monetary policy over time and across different economic contexts.

@Miranda2017 how different types of monetary policy shocks - anticipated and unanticipated - affect economic activity and prices in the United States. Using LPs with instrumental variable identification (IV-LP), they define shocks based on high-frequency surprises in Fed Funds Futures between 1990 and 2019. The study finds that unanticipated shocks generate conventional contractionary effects, whereas anticipated shocks may lead to procyclical responses. The results underscore the importance of correctly identifying monetary shocks to avoid biased interpretations regarding the effectiveness of monetary policy. The authors advocate for the use of high-frequency data and a clear distinction between types of shocks as sound empirical practices.

@Jorda2018 analyze the impacts of monetary policy through quasi-randomized experiments, based on the “trilemma” of international macroeconomics. They show that, in economies with fixed exchange rates and high capital mobility, domestic interest rates are strongly influenced by external factors, allowing the identification of exogenous monetary policy shocks. Using LPs with instrumental variables and an extensive set of historical data since 1870, the authors demonstrate that the effects of monetary policy vary according to the state of the economy. The results indicate that monetary shocks are more effective when the economy is above potential, but have a reduced impact in low inflation scenarios, especially when interest rates approach the lower bound. Furthermore, in periods of real estate credit expansion, monetary policy becomes a more powerful instrument to contain economic growth.

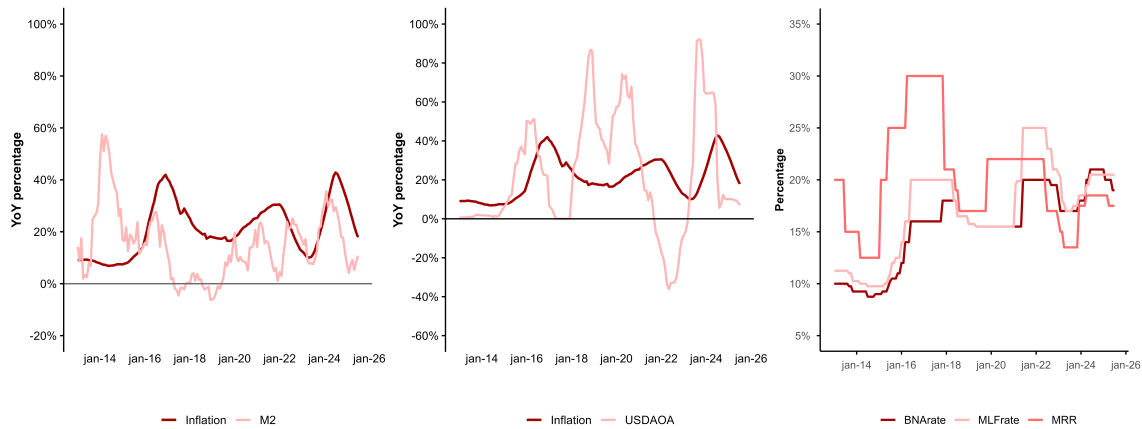
In summary, both international and African literature converge on the understanding that the effectiveness of monetary policy depends on multiple factors. While studies

in countries such as Nigeria and Brazil provide valuable insights into the transmission channels of monetary policy, an empirical gap remains in the Angolan context, particularly regarding the use of more recent and robust methodologies such as LPs. Thus, by applying LPs, this research assumes an innovative character and offers an original contribution to the literature on monetary policy in resource-dependent African economies.

3 Countries' economic overview

Inflation in Angola has been a persistent issue, with high consumer price variation, especially in recent years. Nowadays, inflation is perhaps one of the main economic challenges the country faces. Price variation is driven by several internal and external factors. Historically, inflation in Angola has been exacerbated by supply shocks, changes in international oil prices, and currency crises. The period of highest inflation in the last decade coincides with a significant depreciation of the local currency, as seen in Figure 1. The local currency has depreciated by an average of almost 29% per year since 2016, while inflation has remained at around 22% per year. Inflation has always reached high levels during currency shocks, and for this reason, there is consensus that the exchange rate is the biggest determinant of inflation, as the country is highly dependent on imports and, therefore, more vulnerable to external shocks.

Figure 1: Relationship between YoY inflation, USD/AOA and M2 variables over time



This inflationary reality places a significant responsibility on the Central Bank, whose main mission is to ensure price stability in accordance with Article 3 of Law No. 24/21⁸. According to the Monetary Policy Operational Framework⁹, to achieve these objectives, BNA uses a range of instruments, including interest rates, mandatory reserve ratios, and open market operations. Due to the continuous increase in prices in recent years, BNA has been raising interest rates and the reserve requirements, effectively adopting a restrictive monetary policy. However, when looking at M2, the perspective shifts somewhat. As shown in Figure 1, M2 grows faster than inflation for most of the time. In fact, M2

⁸<https://www.bna.ao/#/pt/legislacao-e-normas/legislacao-financeira/lei-banco-nacional-angola/detalhe/74>

⁹<https://www.bna.ao/#/pt/politica-monetaria/quadro-operacional-politica-monetaria/detalhe/57>

also grows at a faster pace than the real GDP growth rate, which, as @Friedman1956 suggested, “Inflation is always and everywhere a monetary phenomenon, in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output.”

Secondly, despite the Central Bank’s formal independence framework, practical constraints related to fiscal dominance and institutional coordination may limit its effective autonomy¹⁰. Consequently, the persistence of M2 growth amid inflationary pressures can be viewed as an outcome of these coordination dynamics. Thirdly, significant structural problems, such as low levels of financial inclusion¹¹ and high levels of economic informality, hinder credit expansion and, consequently, limit the transmission of monetary policy.

According to some flash notes from Banco Fomento de Angola, the main monetary policy instruments are open market operations. This is because, although BNA’s interest rate indicates the direction of monetary policy, it is generally not used in transactions, limiting its impact. For example, to influence credit to the economy, BNA needs to influence the interbank money market interest rates, which are used as benchmarks for various types of credit to the economy. Essentially, BNA relies on the reserve requirements and, above all, on open market operation and facilities (marginal lending facilities and deposit facilities). Thus, the transmission channels of monetary policy are constrained by the overall economic conditions, and structural issues play a significant role in facilitating the transmission of monetary policy.

4 Data and Methodology

This section outlines the methodological approach employed to assess the effectiveness of monetary policy in controlling inflation in Angola. The analysis is based on LPs, which provide a flexible framework for estimating IRFs without imposing restrictive assumptions on the underlying data-generating process. LPs are particularly suitable for contexts with relatively small sample sizes and potential non-linearity, which are features commonly observed in emerging economies such as Angola.

4.1 Stationarity test and data preparations

This analysis uses monthly macroeconomic data from Angola, covering the period from December 2011 to June 2025. This timeframe encompasses critical episodes in the Angolan economy, including severe external shocks, the transition to a floating exchange rate regime in 2019, and multiple cycles of monetary easing and tightening implemented by the BNA.

The selected variables include inflation, which was calculated as the logarithmic difference of the Consumer Price Index (CPI) for the province of Luanda, the reference interest rate

¹⁰<https://www.expansao.co.ao/angola/detalhe/parlamento-autoriza-violacao-a-lei-do-bna-e-mata-independencia-do-banco-central-63672.html>

¹¹<https://www.expansao.co.ao/gestao/detalhe/inclusao-financeira-a-urgencia-de-democratizar-o-acesso-ao-dinheiro-em-angola-65991.html>

(BNA rate), the marginal lending facility rate (MLF), the broad money (M2), USD/AOA¹² exchange rate, and the mandatory reserve ratio (MRR). The data were sourced from BNA and the National Institute of Statistics.

As part of the preliminary data analysis, non-stationarity tests were conducted to characterize the statistical properties of the time series. Specifically, the Augmented Dickey-Fuller (ADF) unit root test was applied to assess whether each series is stationary or exhibits a unit root. The results indicate that none of the variables are stationary in levels; however, all become stationary after first differencing, suggesting they are integrated of order one, $I(1)$. This pattern is common in macroeconomic time series, particularly in emerging economies exposed to external shocks and other sources of instability.

The results of the non-stationarity tests presented in Tables 1 and 2 of the Appendix were carried out not only as part of the preliminary statistical assessment of the variables' behavior but also with the purpose of evaluating the degree of temporal persistence of each series. This analysis is essential to define the most appropriate empirical specification and inferential methodology to be applied, thereby safeguarding the statistical validity of the estimates and subsequent inferences.

In the original framework of LPs, introduced by @Jorda2005, adopted a level specification for the variables. However, more recent studies, such as @Jorda2024, emphasize that although LPs can indeed be estimated in levels, this does not necessarily imply that it is the most appropriate approach. In turn, @Olea2021 demonstrate that LPs can be estimated robustly even in the presence of unit root, provided that a lag-augmented LPs is employed. Recent literature recognizes two common specification strategies:

- **Level specification:** directly regresses the future value of the dependent variable on its past values and the shock. While theoretically yielding the same impulse response as alternative specifications, it is prone to downward bias in small samples, particularly in the presence of strong persistence (@Jorda2024).
- **Long-difference specification:** uses the cumulative difference of the dependent variable over the projection horizon. This transformation, as argued by @Jorda2024, helps mitigate small-sample bias while maintaining theoretical equivalence with the level specification.

In the present study, the objective is to assess the impact of monetary policy on inflation, which is, by definition, a differenced measure of the price index. For this reason, we consider it more appropriate to estimate LPs using variable transformations that enhance the interpretability of the results:

- Inflation: used in logarithmic differences of the CPI, preserving interpretation in terms of percentage changes.
- BNA rate, MLF, and MRR: maintained in percentage terms, allowing shocks to be interpreted in percentage points or basis points.
- Broad money (M2): used in logarithmic differences, interpreted as the growth rate of the money supply.

¹²This symbol refers to the Kwanza, Angola's local currency.

- Exchange rate: used in logarithmic differences, enabling shocks to be interpreted in terms of currency depreciation.

The transformation of the variables adopted for the estimation of LPs therefore entails combining, within the same model, unit-root variables (Inflation, BNA Rate, MLF Rate, and MRR) with stationary variables, namely the logarithmic differences of M2 and the exchange rate (USDAOA). To mitigate potential inference issues arising from the simultaneous presence of I(1) and I(0) variables, this study follows the methodological proposal of @Olea2021, who recommend the use of lag-augmented local projections (LALP). This approach involves including an additional number of lags for the endogenous variables, beyond those suggested by the true autoregressive process, in order to strengthen the inference and ensure a robust inference even under non-stationarity conditions.

[1] This symbol refers to the Kwanza, Angola’s local currency.

4.2 Model specification

Based on the literature review and the dataset, we estimate the following equation to compute our LPs:

$$\pi_{t+h} = \alpha_h + \theta_h Shock_t + \gamma_h' X_t + \varepsilon_{t+h}, \quad h = 1, \dots, H$$

where π_t refers to inflation at time t ; θ_h estimated impulse response at horizon h (captures the effect of the shock h periods ahead); X_t represents the exogenous variables used as shocks affecting inflation. The interpretation of the shock depends on the transformation considered for each variable. For variables expressed in log-differences, a unit shock approximately corresponds to a one percent change in the original series. For variables expressed in levels, particularly the central bank interest rate and the reserve requirement ratio, a unit shock corresponds to a one percentage point change; γ_h is a vector of controls that includes lags of inflation and of other exogenous variables. In each regression, this vector contains all variables in lagged form, except the one that receives the contemporaneous shock; ε_{t+h} is the error term that aggregates idiosyncratic shocks not explained by the model.

Since shocks are defined as changes in the variables themselves, this does not imply that such an approach represents the optimal identification strategy. On the contrary, more robust methods exist in the literature to properly isolate exogenous shocks. In this study, the use of variable changes reflects a pragmatic choice driven by data availability, but these measures may still capture endogenous responses to underlying macroeconomic conditions.

More rigorous identification strategies include the use of residuals from Taylor-type reaction functions, which aim to remove the systematic component of policy responses, as well as the narrative approach and high-frequency identification methods based on financial market reactions around policy announcements. These approaches are generally regarded as the benchmark in the literature, as they provide a clearer separation between anticipated and unanticipated policy actions.

However, their application in the Angolan context is limited by significant data constraints. In particular, the absence of sufficiently long and detailed policy records, as well as the lack of high-frequency financial data, prevents the implementation of narrative or high-frequency identification strategies. Therefore, the approach adopted here represents a trade-off between methodological rigor and feasibility, and the results should be interpreted with these limitations in mind.

Model (1) is estimated by Ordinary Least Squares (OLS) for each forecast horizon h months. For each horizon, a separate equation was estimated, giving the model a non-recursive and highly flexible structure. Unlike a VAR model, which requires the simultaneous estimation of a system of equations with identical lags for all variables, the LP approach allows for directly estimating the effects of a specific shock on the variable of interest at each horizon. This methodological flexibility eliminates the need for strong structural restrictions and is better suited to capture changes in dynamic effects over time (Jorda2005)

To ensure inferential validity, given that the residuals may exhibit heteroskedasticity and serial correlation, the Newey-West correction was applied to the estimation of the standard errors (SE)¹³. Regarding interval inference, all LPs estimates were primarily constructed using uniform confidence bands (UCBs) rather than pointwise intervals. Following Olea2021, this approach ensures joint validity of inference across all horizons. As the authors emphasize, “such uniform validity is a much stronger result than pointwise validity for fixed n and h ” (p. 1796). For completeness and comparative purposes, pointwise confidence intervals were also computed and are presented in the Appendix, providing additional reference for the interpretation of the dynamic responses. The UCBs were obtained through a bootstrap procedure based on the max-t statistic, which provides robust and reliable simultaneous inference, particularly in small samples that encompass distortions.

Regarding the number of lags (p) used, the optimal lag length was selected based on the estimation of a traditional VAR model using the Akaike Information Criterion (AIC). In this case, the optimal lag order coincided with that suggested by the Bayesian Information Criterion (BIC), reinforcing the robustness of the selection. This methodological choice follows the recommendation of Jorda2024, who argue that since the LP equation for horizon $h = 1$ is equivalent to the corresponding equation in a VAR, it is natural to adopt conventional information criteria (such as AIC or BIC) from VAR estimation to determine the appropriate lag length. The number of lags was then kept constant across all subsequent horizons, in line with common practice in the literature. As emphasized by Jorda2024, LPs are generally more tolerant to lag-order misspecification than VAR models, as they estimate response coefficients directly rather than propagating estimation errors across horizons.

Olea2021 recommend selecting the lag length conservatively, that is, including more lags than strictly required. The authors emphasize that adding additional lags does not lead

¹³Montiel Olea and Plagborg-Møller (2021) demonstrate that using heteroskedasticity-robust (HC) standard errors within the LALP framework ensures correct asymptotic coverage even with highly persistent series, thereby avoiding the underestimation of uncertainty and making the use of the Newey–West correction theoretically unnecessary. However, as noted by Ke-Li Xu (2023), this robustness comes at the cost of efficiency, as HC errors produce wider and more conservative intervals. Conversely, the Newey–West correction can improve efficiency in small samples (yielding lower variance and smoother responses) but may underestimate uncertainty when persistence is strong, thus compromising inferential validity.

to meaningful efficiency losses, even when the true data-generating process involves fewer lags. On the contrary, this strategy helps eliminate residual autocorrelation in the horizon-specific regressions, thereby preserving the asymptotic properties of the OLS estimators and ensuring uniform inferential validity. In other words, within the LALP framework, it is generally preferable to over-specify rather than under-specify the number of lags, as the cost of including extra lags is minor, whereas the cost of omitting relevant ones can be substantial in terms of statistical reliability.

In this study, the optimal lag order identified by the VAR model was used only as an initial reference, serving as a benchmark for determining the degree of lag augmentation in the LALP framework. Accordingly, multiple specifications with different lag lengths were estimated to ensure that the results do not depend on a single parametric choice. This approach allowed for the presentation of more robust, consistent, and reliable results, ensuring that the conclusions do not hinge on a single specification or methodological choice, but instead reflect a comprehensive and coherent analysis of the effects of monetary policy on inflation in Angola.

5 Empirical results and discussions

The results obtained for the two benchmark interest rates (BNA rate and MLF rate) indicate a limited effectiveness of monetary policy in controlling inflation in Angola. Shocks to the BNA rate do not produce statistically significant effects on inflation at any horizon, while the MLF rate shows only a weak and short-lived contractionary impact, significant solely at the 15-month horizon. These findings suggest that, although both rates play a role in guiding monetary conditions, their transmission to prices remains very limited. This evidence is consistent with studies on emerging and commodity-dependent economies. @Ezeanyej2021 found that in Nigeria, monetary policy had no significant impact on inflation in either the short or long run, while @deus2018inflacao concluded that in Brazil, the effect of interest rates on prices is constrained by inertial factors and supply-side shocks. Therefore, the results for Angola confirm that in economies exposed to external shocks and structural rigidities, interest rate based monetary policy alone tends to be ineffective in controlling inflation, requiring coordination with fiscal policy and macroprudential instruments.

The results for the MRR shock reveal a delayed and temporary inflationary response, consistent across the different lag specifications. In all cases, inflation reacts positively and becomes statistically significant only between the 15th and 19th months, after which the effect dissipates. This pattern indicates that changes in MRR transmit to prices with a considerable lag, reflecting the slow adjustment of liquidity and credit conditions in the Angolan financial system. The absence of short-term significance further suggests that this instrument operates through indirect channels and is unlikely to influence inflation dynamics immediately, but rather over more extended horizons.

Such evidence aligns with prior research emphasizing that the transmission of reserve requirements to prices is typically slow and operates indirectly through the banking system. @Tovar2012 argue that the effectiveness of reserve requirements depends on the degree of financial development: in economies with shallow financial systems and limited interbank markets, the pass-through from liquidity tightening to aggregate demand

and prices tends to be slow and incomplete. In the Angolan case, this delayed response likely reflects structural characteristics of the financial system (including excess liquidity, high segmentation, and the prevalence of foreign-currency deposits) which weaken the immediate transmission of monetary policy via reserve requirement adjustments.

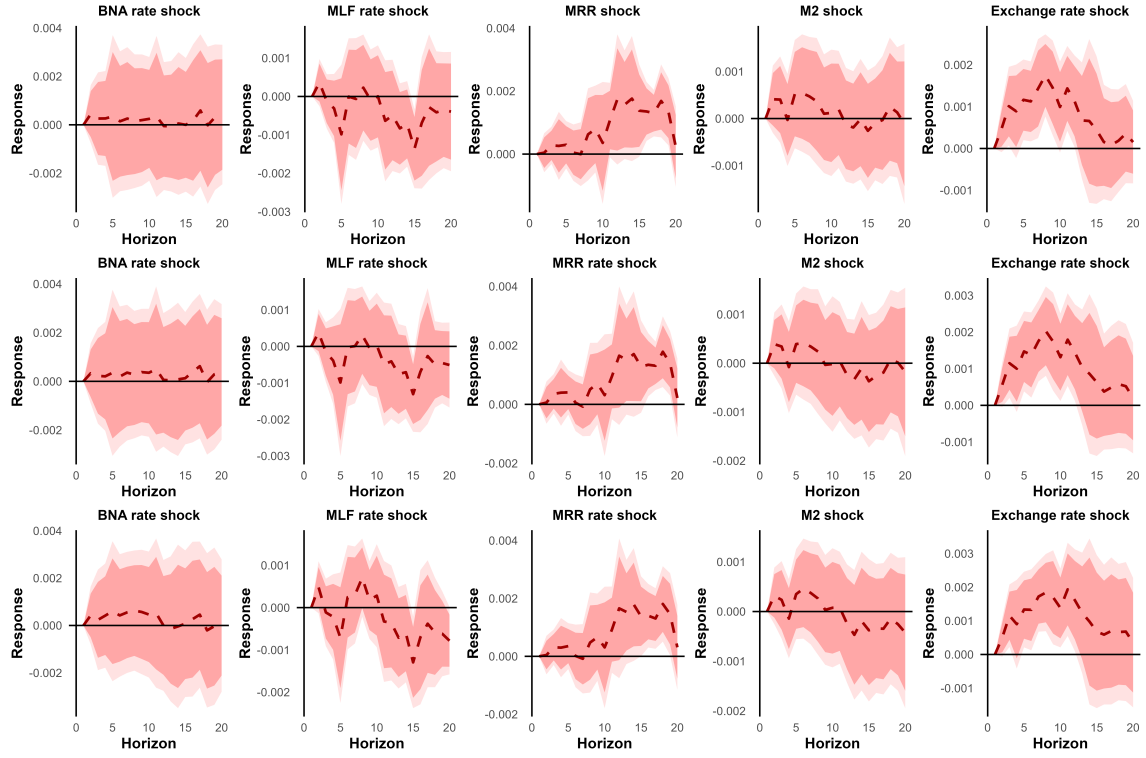
In the case of broad money (M2), the IRFs consistently indicate the absence of any statistically significant effect on inflation across all horizons and model specifications. This suggests that, within the Angolan context, monetary expansion does not automatically translate into inflationary pressures. Similar findings have been reported for other commodity-dependent and developing economies, where the link between money supply growth and inflation tends to be weak or unstable. @Amassoma2018b, analyzing Nigeria between 1970 and 2016, found that M2 had no statistically significant impact on inflation in either the short or long run. Similarly, @Dwyer1988 and @McCandless1995 show that while monetary expansion and inflation are positively correlated in the long run across countries, this relationship weakens substantially at high frequencies and in economies subject to structural rigidities, fiscal dominance, or supply-side shocks. In the case of Angola, these factors (together with a partial dollarization and weak monetary transmission) likely dampen the short-run effect of money supply on prices.

Estimated inflation responses to exchange rate shocks reveal a clear, robust, and consistent pass-through effect. A depreciation of the Kwanza leads to an immediate and statistically significant increase in inflation, with the impact intensifying between the 9th and 12th months and gradually dissipating thereafter. This pattern indicates a rapid but moderately persistent exchange rate pass-through, suggesting that exchange rate fluctuations are one of the main determinants of price dynamics in Angola, even though their inflationary effects tend to fade within approximately one year.

These results align closely with existing evidence for emerging and commodity-dependent economies, where exchange rate movements exert strong and direct effects on domestic prices (particularly through imported goods and energy costs).

@Choudhri2006 and @Razafimahefa2012 find that exchange rate pass-through tends to be both stronger and shorter-lived in economies with high inflation and unstable exchange rate regimes. Similarly, @Doojav2025 show that in highly dollarized, commodity-exporting countries such as Mongolia (and by extension, Angola) currency depreciations generate immediate and persistent inflationary pressures, underscoring the structural limitations of monetary policy in mitigating external shocks.

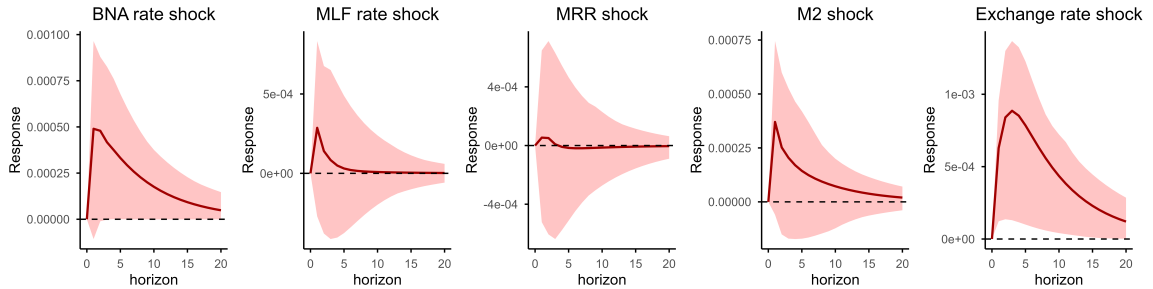
Figure 2: IRF of inflation to shocks estimated via LPs using UCB (lags 2, 3 and 4 respectively)



5.1 Robustness checks

The IRFs estimated using a VAR (1) with five variables, indicate that the BNA rate, MLF rate, MRR, and M2 do not exhibit statistically significant effects on inflation, confirming the limited capacity of monetary policy, via traditional instruments, to influence price dynamics. In contrast, for the exchange rate, the IRFs identify a positive and significant response of inflation following a currency shock, although, in this specific case, significance is limited to the first three months. These results therefore converge with the findings from LPs, which adds robustness to the analysis and supports the conclusion that, in Angola, exchange rate stability is the central condition for controlling inflation, unlike traditional monetary policy instruments, whose influence on prices appears limited.

Figure 3: IRF of inflation to shocks estimated via VAR(1) - Bootstrap confidence intervals



5.2 Discussion of results

The analysis of the IRFs suggests that monetary policy, represented by the BNA rate and MLF, currently exerts a limited influence on inflation. This result is consistent with the existing operational framework, in which the policy rate primarily serves as a tool for guiding expectations regarding the monetary policy stance. Thus, in Angola, the main transmission channel operates through open market operations based on repurchase agreements (repos). In the specific case of the MLF, the BNA uses it as an instrument to define the monetary policy corridor¹⁴, establishing the bounds within which interbank market rates tend to float. In practice, however, the use of these operations depends on liquidity conditions and prevailing operational needs, which may limit their frequency and predictability¹⁵. Consequently, commercial banks may adjust their liquidity positions cautiously, which reduces predictability in treasury management and restricts the transmission of monetary conditions to the real economy.

Changes in the MRR have a direct effect on banking liquidity, altering the volume of available free reserves. When the MRR is reduced, banks gain additional room to expand credit; however, this expansion does not always materialize, reflecting structural factors such as the high cost of credit risk and the attractiveness of government securities¹⁶. Thus, the net impact of the MRR on inflation tends to occur indirectly and with a lag, transmitted through the composition of banks' balance sheets, fiscal decisions, and subsequently aggregate demand.

@Friedman1956 stated that “inflation is everywhere and always a monetary phenomenon,” yet in economies such as Angola, highly dependent on natural resources and imports, this view requires adjustment. In the case of broad money, the estimates indicate no statistically significant impact on prices, reflecting the particular structure of the Angolan economy, characterized by high dollarization, a strong prevalence of administered and imported prices, and limited financial market depth.

Finally, the IRFs confirm that the exchange rate plays a central role in price formation in Angola. Theoretically, the exchange rate directly affects the cost of imported goods and, consequently, the dynamics of inflation. According to the database analyzed, over the past ten years the average inflation rate has been around 22%, showing consistent accelerations during episodes of exchange rate depreciation and declines during periods of currency appreciation. Given the strong dependence on oil exports, which account for about 90% of total exports¹⁷, exchange rate volatility tends to amplify inflation expectations, creating a cycle of more frequent and rapid price adjustments, which contributes to inflation persistence. This phenomenon was particularly evident between 2018 and 2020, during the transition to a new exchange rate regime¹⁸. Thus, the results indicate that, under current conditions, the exchange rate channel remains the main mechanism of

¹⁴<https://www.bna.ao/#/pt/politica-monetaria/quadro-operacional-politica-monetaria/detalhe/57>

¹⁵fn_06_inflation-and-mpc_2022.pdf

¹⁶<https://www.expansao.co.ao/empresas/detalhe/lucros-da-banca-comercial-crescem-8-para-3022-mil-milhoes-de-kwanzas-no-i-trimestre-65553.html>

¹⁷<https://www.reuters.com/world/africa/angola-says-it-is-leaving-pec-angop-news-agency-2023-12-21/>

¹⁸<https://documents1.worldbank.org/curated/en/099101123162536352/pdf/P17495914eda979f1a98614a9c186231ee3412a9b062.pdf>

monetary policy transmission in Angola, reflecting the high sensitivity of domestic prices to exchange rate fluctuations.

6 Conclusion

In this study, we investigate the effectiveness of monetary policy in controlling inflation in Angola, applying LPs (an approach still rarely used in the African empirical literature). The results show that, in the Angolan context, monetary policy exerts a limited impact on inflation, mainly due to structural constraints such as high exchange rate volatility and the country's strong dependence on imports. The estimates confirm that exchange rate shocks are the main determinant of inflation, producing immediate and slightly persistent effects on prices.

Although this conclusion is consistent with the widely held perception that the exchange rate plays a central role in price formation in Angola, this research offers a novel and methodologically rigorous contribution by quantifying this relationship empirically with robust statistical evidence, thereby raising the level of analytical precision and scientific credibility in the debate on monetary policy. The study thus provides solid empirical evidence to a discussion that, until recently, was largely dominated by descriptive analyses.

From a methodological perspective, this is one of the first systematic applications of LPs to the study of monetary policy in Angola and among the few conducted in commodity-dependent African economies. This contribution demonstrates the feasibility and relevance of the methodology for contexts characterized by data constraints and macroeconomic instability, opening the way for its application in other countries with similar structures.

In theoretical terms, the results reinforce the importance of understanding the monetary transmission mechanisms in economies with high levels of dollarization and shallow financial systems, providing an empirical foundation for future research on the interaction between monetary, fiscal, and exchange rate policies.

This research sheds new light on the debate surrounding the effectiveness of monetary policy in Angola and contributes to the advancement of the African literature on the topic by combining an innovative methodology with contextualized evidence. Future research could further explore demand and supply side exchange rate shocks, examine the relationship between credit and monetary policy, and assess the joint impact of fiscal and monetary policies on inflation. Such extensions would help build a more comprehensive understanding of transmission channels and macroeconomic dynamics in emerging economies like Angola.

Although this study represents an innovative application of the LPs methodology to the Angolan context, several methodological and empirical limitations must be acknowledged. First, the analysis relies on monthly time series with limited temporal coverage and strong persistence, which may reduce the precision of confidence intervals and increase sensitivity to alternative specifications. Second, the study focuses exclusively on aggregate variables and does not explicitly account for heterogeneous transmission channels (such as sectoral

credit, expectations, or fiscal behavior) that may condition the effectiveness of monetary policy.

Importantly, there are also limitations related to shock identification. In some cases, shocks are proxied using the variation of the variables themselves (e.g., exchange rate or oil prices), which may not fully isolate exogenous innovations and can therefore be subject to endogeneity concerns. More broadly, the identification strategy does not rely on external instruments or high-frequency surprises, implying that the estimated shocks may still embed endogenous responses to macroeconomic conditions. Given that Local Projections are inherently sensitive to the identification of shocks, these issues may affect the causal interpretation and magnitude of the estimated impulse responses.

Finally, the conclusions refer specifically to the period and context analyzed and may not generalize to future structural conditions of the Angolan economy, which is currently undergoing a process of significant structural reforms.

References

7 Appendix

Table 1: ADF test for series at the logarithmic level

Variable	Type	Lags	Test Statistic	Crit 1%	Crit 5%	Crit 10%	Decision
Inflation	Drift	1	-2.7228	-3.46	-2.88	-2.57	Fail to reject
BNArate	Drift	1	-1.0765	-3.46	-2.88	-2.57	Fail to reject
MLFrate	Drift	1	-1.1922	-3.46	-2.88	-2.57	Fail to reject
MRR	Drift	1	-1.7448	-3.46	-2.88	-2.57	Fail to reject
M2	Drift	1	-1.1356	-3.46	-2.88	-2.57	Fail to reject
USDAOA	Drift	1	-0.3476	-3.46	-2.88	-2.57	Fail to reject
Inflation	Trend	1	-2.7389	-3.99	-3.43	-3.13	Fail to reject
BNArate	Trend	1	-1.8896	-3.99	-3.43	-3.13	Fail to reject
MLFrate	Trend	1	-1.6135	-3.99	-3.43	-3.13	Fail to reject
MRR	Trend	1	1.7923	-3.99	-3.43	-3.13	Fail to reject
M2	Trend	1	-1.9126	-3.99	-3.43	-3.13	Fail to reject
USDAOA	Trend	1	-2.3098	-3.99	-3.43	-3.13	Fail to reject

Table 2: ADF test for log-difference series

Variable	Type	Lags	Test Statistic	Crit 1%	Crit 5%	Crit 10%	Decision
Inflation	Drift	1	-9.8637	-3.46	-2.88	-2.57	Reject
BNArate	Drift	1	-8.0825	-3.46	-2.88	-2.57	Reject
MLFrate	Drift	1	-7.7913	-3.46	-2.88	-2.57	Reject
MRR	Drift	1	-8.5354	-3.46	-2.88	-2.57	Reject
M2	Drift	1	-9.6668	-3.46	-2.88	-2.57	Reject
USDAOA	Drift	1	-7.1318	-3.46	-2.88	-2.57	Reject
Inflation	Trend	1	-9.8577	-3.99	-3.43	-3.13	Reject
BNArate	Trend	1	-8.0647	-3.99	-3.43	-3.13	Reject
MLFrate	Trend	1	-7.7680	-3.99	-3.43	-3.13	Reject
MRR	Trend	1	-8.5147	-3.99	-3.43	-3.13	Reject
M2	Trend	1	-9.1742	-3.99	-3.43	-3.13	Reject
USDAOA	Trend	1	-7.7720	-3.99	-3.43	-3.13	Reject

Figure 4: IRF inflation to shocks estimated via LPs with pointwise confidence band (lag 2, 3 and 4 respectively)

