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Inflation and Monetary Policy in a Low-Income and Fragile State: The Case of Guinea

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Sebastian Weber**

ABSTRACT: Inflation in low-income countries is often high and volatile, driven by external shocks. In addition, inflation in fragile states is affected by highly volatile domestic factors that complicate monetary policy's ability to deliver price stability. We estimate the drivers of inflation in Guinea since the early 2000s, a period in which the country suffered major shocks from pandemics, commodity price movements, and multiple military coups, and during which inflation averaged 12 percent. Results confirm that global commodity and transport prices account for a large share of the variation in inflation. The contribution of monetary policy shocks to inflation is moderate, reflecting its broadly neutral stance throughout most of the last two decades. However, monetary policy has occasionally made larger contributions to inflation, and recently helped contain price pressures from high commodity prices. The effectiveness of monetary policy reflects a strong relationship between monetary aggregates and the exchange rate.

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Contents

Glossary

AREAER	Annual Report on Exchange Arrangements and Exchange Restrictions
BCRG	Banque Centrale de la République de Guinée
BM	Base money
CPI	Consumer Price Index
FX	Foreign exchange
GDP	Gross Domestic Product
GNF	Guinean franc
INS	Institut National de la Statistique (Statistical Agency of Guinea)
LICs	Low-income countries
M2	Broad money
NCG	Net credit to the government
NEER	Nominal effective exchange rate
P@P	Domestic petrol price at the pump
SSA	Sub-Saharan Africa
VARX	Vector autoregression model with exogenous determinants

1. Introduction

Inflation in low-income countries (LICs) is often high and volatile, driven by external developments. In addition, inflation in fragile states is affected by domestic instability, weak fiscal positions, and a shallow financial system. These factors, together with often weak institutional frameworks (e.g., unclear nominal anchors or lack of central bank independence), imperfect competition in the banking sector and resistance to exchange rate flexibility hamper the traditional monetary transmission through interest rate, bank lending, asset price, and exchange rate channels (Mishra, Montiel, and Spilimbergo 2012). This makes it challenging for monetary policy to deliver price stability.

Guinea is a low-income and fragile state in Sub-Saharan Africa (SSA). The country is endowed with abundant mineral resources, holding more than a quarter of the world's reserves of bauxite, one of the largest untapped high-grade iron ore deposits, and significant gold reserves. Guinea maintained relative macroeconomic stability over the last decade despite a complex socio-economic environment. Following the Ebola health crisis and a commodity-price shock during 2014-15, Guinea endured recurrent social unrest, protests, and strikes. Socio-political tensions have persisted in recent years, leading to a military coup in September 2021. Notwithstanding, real GDP growth averaged 6 percent over 2012-21 supported by booming mining activities and substantial infrastructure investment.

Unlike most West African economies, Guinea has issued its own domestic currency since 1959, shortly after its independence. The Guinean franc is not currently pegged to a foreign currency and does not belong to a currency union.[1] This enables the Central Bank of Guinea (BCRG) to implement an autonomous monetary policy in pursuit of its price stability mandate, with a moderately flexible exchange rate. It uses a monetary policy framework that aims to deliver low and stable inflation using the growth rate of reserve money as the operational target.

This paper provides stylized facts about inflation and monetary policy in Guinea, focusing on the period since 2000. Inflation in Guinea over this period was amongst the highest and most persistent in SSA, and the contribution of food prices dominated overall CPI inflation. The central bank has generally not actively managed liquidity conditions during this period, and its extensive lending to the government has been highly correlated with the evolution of reserve money. We show that SSA economies operating similar regimes have had similar struggles to deliver price stability.

The paper then provides an empirical analysis of the determinants of inflation in Guinea to shed light on the effectiveness of the monetary policy framework in a low income and fragile state context.[2] Using a vector autoregressive model with exogenous variables (VARX), we analyze the impact of changes to monetary aggregates, exchange rates, domestic demand, and international prices on inflation. We impose sign restrictions to identify the main structural shocks driving inflation and provide estimates of their contribution to Guinea's observed inflation dynamics. We also provide a quantitative assessment of the pass-through of exchange rate movements to domestic prices using a local projections approach.

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[1] Between 1974 and 1985, the Guinean franc was replaced by the syli. In the past, the Guinean franc has at times been pegged to the CFA franc and the US dollar.

[2] Note that the IMF removed Guinea from its list of fragile or conflict-afflicted states on March 20, 2023.

We find that external factors—including petrol prices, exchange rate fluctuations, global shipping costs and commodity prices—play a substantial role in determining inflation dynamics in Guinea, which is aligned with previous studies of other LIC economies (Ha and others 2019; Durevall, Loening, and Birru 2013). We estimate that exchange rate pass-through in Guinea is relatively high by international standards. Pass-through to import prices is estimated to be complete over a one-year horizon and to increase further up to a two-year horizon. This suggests the presence of second-round effects on non-imported goods.

We also find evidence that monetary policy in Guinea is effective and has played an important role in buffering the impact of external shocks on domestic inflation. Evidence supporting the effectiveness of monetary policy in LICs is relatively scarce in the literature (Mishra and Montiel 2013), but the importance of the monetary regime in allowing the domestic economic to adjust in the face of external shocks has recently been confirmed in a sample of LICs by Carare and others (2022).[3] In Guinea, we find that the role of the exchange rate is central in monetary policy transmission. That is, monetary shocks have significant effects on inflation through their impact on the exchange rate. This mechanism is visible during episodes of high inflation, such as the monetary accommodation of large fiscal expansions in the mid-2000s, and before the military coup in 2008. It has also worked to contain inflation during 2021–22 following another military coup, when contractionary monetary policy helped offset international price pressures from global supply shocks related to the Covid-19 pandemic and the war in Ukraine.

Some studies that analyzed the drivers of inflation in individual SSA countries have come to similar conclusion. Using a single equation model, Diouf (2007) found that monetary and external factors matter for inflation in Mali, both in the short and long-term. Kinda (2013) combined a vector error correction model with a structural vector auto regression to analyze inflation dynamics in Chad. Both approaches point to supply-side shocks, public spending, and external factors as the main drivers of inflation. Blavy (2004) is one of the few studies that has investigated inflation in Guinea. He finds evidence of a strong long-run relationship between money supply growth and inflation during 1992-2003. Episodes of high money supply growth—associated with periods of civil unrest and domestic structural change—have a significant impact on headline inflation. Our results document a strong relationship between the exchange rate and monetary aggregates, underscoring its role in effective monetary transmission.

The remainder of this paper is structured as follows: Section II describes the evolution of inflation in Guinea, the monetary policy framework and the exchange rate regime in recent decades and provides comparisons to SSA peers. The empirical strategy for modeling inflation is motivated in Section III. Section IV presents the data, estimation methods and results. Section V concludes.

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[3] Two recent papers find evidence of monetary policy transmission in some contexts. Abuka and others (2019) study the case of Uganda using credit registry data and find that the credit channel underpins monetary policy effectiveness. Focusing on a sample of emerging markets and developing economies, Brandão-Marques and others (2021) find the interest rate channel to be effective when the exchange rate is allowed to adjust.

2. Inflation and monetary policy in Guinea: Stylized facts

A. Inflation developments

Inflation in Guinea is measured by the consumer price index (CPI) of the capital Conakry, compiled monthly by the National Institute of Statistics. The CPI basket includes 534 goods with weights derived from the 2002 household expenditure survey (Table 1).[4] Food products make up over one third of the CPI basket and fresh produce accounted for 20 percent of the basket, suggesting a potential role for international commodity prices and other exogenous factors such as weather conditions—temperature and rainfall—in driving headline inflation. The share of food in the CPI basket is below the median in Sub-Saharan Africa and is somewhat lower than the average across LICs (45 percent), but is above the average across emerging markets (30 percent) and advanced economies (15 percent) (Figure 1, Panel B).

Table 1. Composition of the CPI Basket

(Percent)

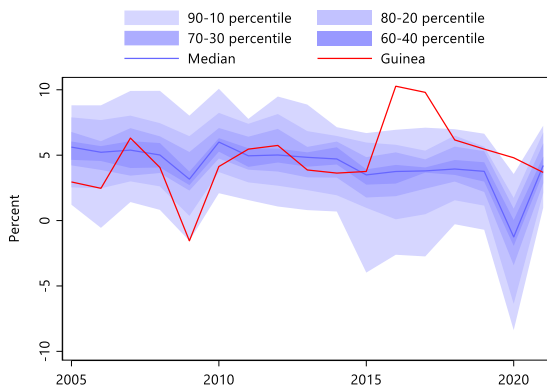| Major components	vintage	
	1987	2002
Food	**41.9**	**37.6**
Fresh produce		20.0
Non-Food	**58.0**	**62.4**
Clothing and footwear	7.0	7.3
Housing	22.5	19.2
Furnishing and equipment	15.1	8.3
Electricity and water	7.4	
Health		11.2
Transportation	12.0	11.2
Leisure and culture	7.2	3.6
Local products	**58.9**	**59.5**
Imported products	**41.2**	**40.6**

Source: National Institute of Statistics and Blavy (2004).

Inflation in Guinea has been volatile and among the highest in sub-Saharan Africa, averaging more than 12 percent in the last two decades (Figure 1, Panel C). A record level of inflation was reached in 2006 in a context of deteriorating economic conditions (IMF 2008). Economic growth then was subdued, and the relaxation of the fiscal stance was largely financed through monetary expansion by the central bank, with reserve money growth reaching 84 percent at end-2006. The most recent episode of high inflation occurred during the 2009–10 military regime, when fiscal control was abandoned, and a rapid expansion of the fiscal deficit was largely financed by the central bank and the accumulation of arrears (IMF 2011). Inflation increased steadily to 23 percent in August 2011.
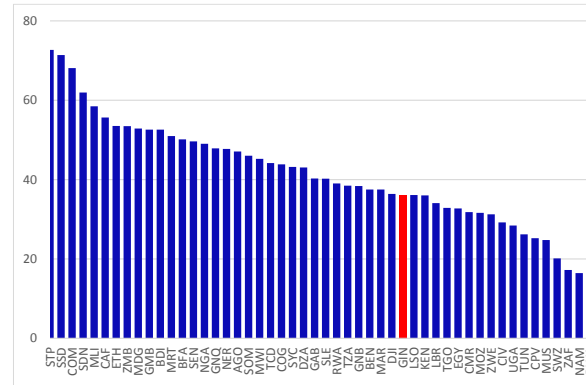
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[4] Since 2019, work has been underway to increase the coverage of the CPI to cities other than the capital and to include more items. The new index has been made available since August 2022 and thus does not allow for historic analysis. For the time it is available, the new index suggests a somewhat lower level of inflation than the previous index, which we rely upon in this paper.

Figure 1: Inflation Developments

A. Sub-Saharan Africa (SSA), Real GDP Growth

90-10 percentile 80-20 percentile
70-30 percentile 60-40 percentile
Median Guinea

B. Share of food in CPI basket

C. Sub-Saharan Africa (SSA), Inflation

90-10 percentile 80-20 percentile
70-30 percentile 60-40 percentile
Median Guinea
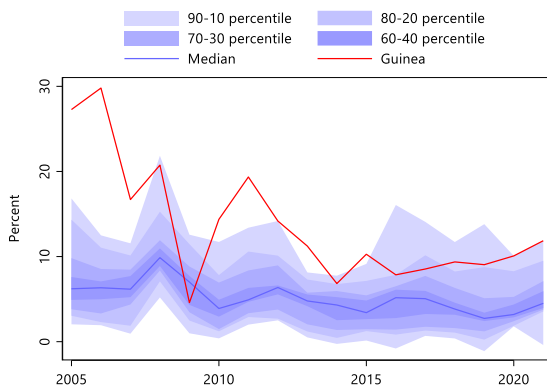
D. Average CPI inflation 2005-21
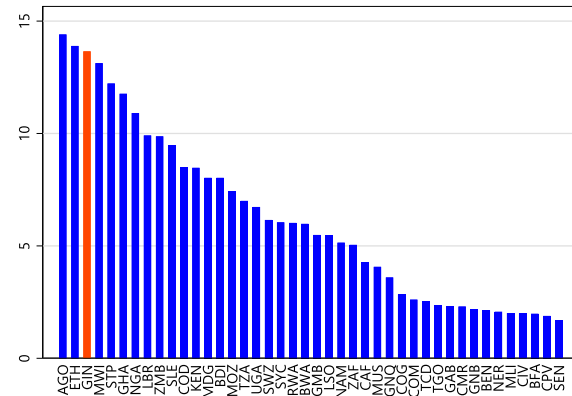
E. SSA: Estimated inflation persistence

CI
Persistence
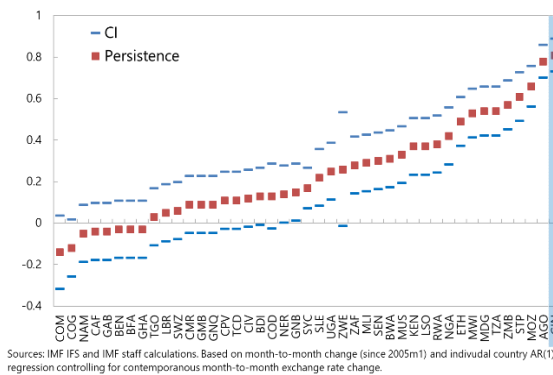
Sources: IMF IFS and IMF staff calculations. Based on month-to-month change (since 2005m1) and indivudal country AR(1) regression controlling for contemporanous month-to-month exchange rate change.

F. Inflation persistence over time

GIN SSA (simple average)
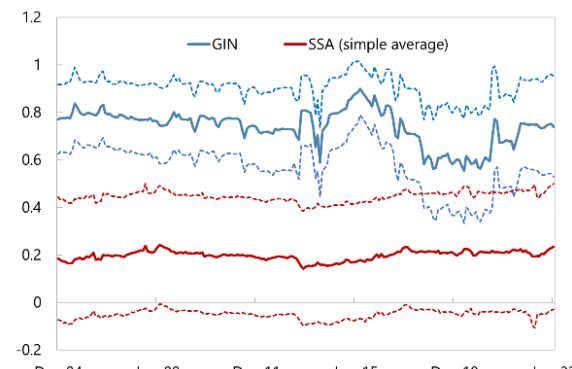
Sources: IMF IFS and IMF staff calculations. Based on 5 year rolling window, individual country regressions of month-to-month change in (log) CPI on its lag controlling for the contemporaneous month-to-month exchange rate change.

Sources: IMF Information Notice System and authors' calculations.
Note: Panel D excludes Zimbabwe, which has a value of about 35 percent.

Over the decade starting in 2012, inflation appears to display lower volatility despite the economy experiencing a series of large shocks. Following the country's first democratic elections in 2010, the new government embarked on reforms to consolidate macroeconomic stability through strengthened public finances and tighter monetary policy. Inflation declined steadily to reach a low of 7.3 percent at end-2015, despite the supply disruptions and fiscal response associated with the epidemic of Ebola virus disease that affected Guinea and neighboring countries starting in 2014. Since then, strong and sustained investments in the mining sector have supported strong growth, but increased Guinea's dependence on bauxite and gold, which together accounted for over 90 percent of exports of goods and services in 2020. The downside to this is an increasing vulnerability to global commodity price shocks. While inflation remained around 10 percent over the last decade, in the top decile of SSA, it was broadly kept under control. Rapid growth of food prices has driven an important share of overall inflation, despite food products representing about 38 percent of the CPI basket.[5]

Guinea's inflation is also highly persistent compared to SSA peers. We estimate a simple regression of month-to-month inflation on its lagged value and controlling for exchange rate variations, given by:

$$\Delta p_t = c + \rho \Delta p_{t-1} + \beta \Delta e_t + \varepsilon_t. \tag{1}$$

Equation 1 is estimated country-by-country for a sample of 48 SSA economies over the period 2005–21, and Figure 1 (Panel E) displays the estimated parameter $\hat{\rho}$ for each country. Guinea emerges as the country with the highest inflation persistence in the sample with an estimated AR(1) coefficient of $\hat{\rho} = 0.8$, implying that shocks to inflation dissipate very gradually (with a half-life of slightly above three months). We also investigate the stability of persistence over time by estimating equation (1) in rolling five-year windows for each country. For Guinea, the estimate for $\hat{\rho}$ is broadly stable and remains well above the average of 0.2 across SSA countries, which remained broadly unchanged over the same period (Figure 1, Panel F). Inflation persistence is found to be lowest in countries with fixed exchange rate regimes, and highest in countries with intermediate exchange rate regimes (see also Figure 4).

B. Monetary policy framework

The BCRG's primary mandate is to ensure price stability. It is also tasked with the secondary objective of "supporting the general economic policies of the Government with a view to ensuring sound and sustainable economic growth", without undermining price stability. In recent years, the BCRG has interpreted its price stability objective as maintaining the inflation rate below 10 percent.[6]

The monetary policy rate is used by the BCRG to signal its policy stance and is meant to anchor inflation expectations by serving as a basis for other interest rates. In practice, adjustments to the monetary policy rate are relatively infrequent, with the rate having been adjusted only five times in the past decade.[7] Following a

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[5] Domestic factors such as transportation costs and climatic conditions may exert large pressures on food prices and drive inflation in Guinea (Blavy 2004). The situation might have been exacerbated in recent decade by a Dutch disease effect arising from a booming mining sector and a rapid urbanization of the capital city (where price data is collected).

[6] Medium-term objectives are aligned with the West African Monetary Zone's convergence criteria. Over the longer term, the BCRG aims to bring inflation down to 5 percent.

[7] After remaining unchanged since 2016, the policy rate was reduced by 100 basis points in April 2020 as part of policy measures to support the economy throughout the Covid-19 pandemic.

Figure 2. Guinea: Recent monetary developments

A. **Interest rate developments**
(percent)

B. **Reserve money and net credit to government**
(year-over-year percent change)

Legend Panel A: Required reserve ratio, Policy rate, T-bill rate (average), Maximum lending rate (average), Term deposit rate

Legend Panel B: Reserve Money, Net credit to government (right scale)

Source: Authors' calculations based on data from BCRG.

series of reforms, the central bank's operational toolkit includes repos and sterilization bills, which are auctioned at variable rates guided by the monetary policy rate (Figure 2, Panel A).[8]

However, transmission of the BCRG's policy rate to market rates is weak, with liquidity conditions largely determined by autonomous factors such as Treasury financing needs and external financing disbursement. This partly reflects the shallowness of the market for government debt, with no secondary market, and the first longer-dated government bond issued only in early 2022. Crucially, the BCRG refrains from active liquidity management due partly to concerns about bearing the cost of monetary policy, such that changes to liquidity induced by autonomous factors are not regularly sterilized. The 2017 recapitalization of the BCRG was meant to strengthen the central bank's operational and financial autonomy. However, the US$300 million operation involved the issuance of non-marketable treasury securities, which cannot be used by the central bank to conduct open market operations. Further, the payment of interest on the recapitalization bonds has been made through the issuance of additional non-marketable instruments.

Over the last two decades, the BCRG has operated a base money targeting regime with a managed exchange rate. One salient feature of the regime is the prominent role of monetary financing of the fiscal deficit in determining monetary conditions. The central bank's lending to the government—including repeated use of short-term advances beyond the statutory limit defined in the BCRG law—accounted for about three quarters of base money growth over this period (Figure 2, Panel B).[9] Similar contributions can be found in other SSA countries, and particularly among fragile states with intermediate exchange rate regimes. In contrast, inflation targeting regimes tend to actively manage their monetary operations such that net credit to the government (NCG) does not determine base money growth. Under two successive IMF programs from 2012 to 2020,

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[8] In addition, a collateralized intraday refinancing facility is available.

[9] The limit on central bank advances is defined as 5 percent of average fiscal revenues over the past three years. In 2020, the outstanding stock of central bank advances surged to GNF 5,306 billion (3.6 percent of GDP) at end-August 2020, more than tripling the legal limit, before declining to GNF 3,180 billion by end-2020.
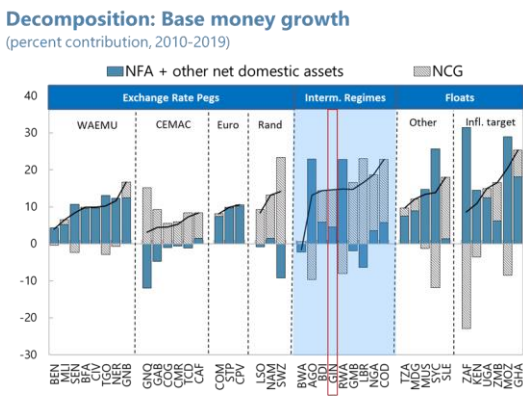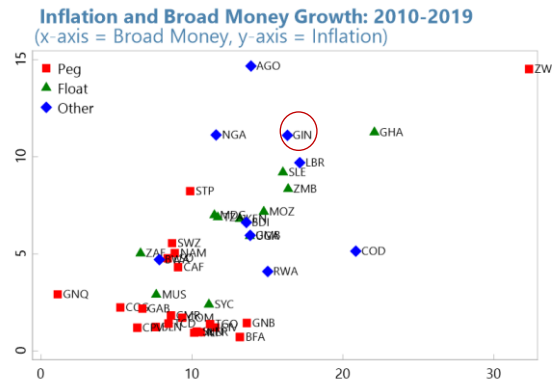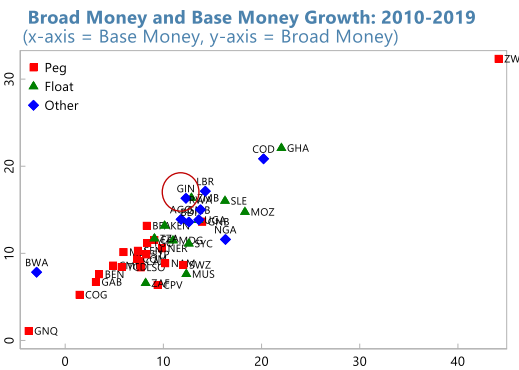
quantitative performance criteria for central bank net domestic assets and net foreign assets defined a path for base money growth that was designed to contain the extent of monetary financing consistent with the BCRG's inflation objective.

Historically, excessive monetary financing of fiscal deficits in Guinea has been associated with periods of nominal instability. Such effects from fiscal influences on inflation are more broadly found in developing countries that don't "tie their hands" by fixing the exchange rate (Loungani and Swagel 2001). Figure 3 provides related evidence for SSA economies. Higher base money growth is mostly observed in SSA countries with intermediate exchange rate regimes, translating into higher broad money growth, which tends to be correlated with higher inflation rates. The more recent evolution of monetary aggregates in Guinea reflects the relative stability of macroeconomic policies since 2012. Over this period, average broad money growth of 17 percent and base money growth of 13 percent have been relatively low compared to Guinea's previous record. However, they remain high compared to SSA peers, contributing to the relatively higher inflation in Guinea.

Domestic banks are subject to a reserve requirement that is unremunerated. While the requirement has been reduced from 22 percent in 2012 to 15 percent in 2022, it remains high by international standards (see Figure 2, Panel A). The reserve requirement is used as a tool to calibrate the transmission of monetary policy to credit conditions. A simple instrument to shore up excess liquidity and thereby reduce inflation, its high level (while being non-renumerated) also entails a significant cost for banks, which is passed to their customers in the form of a high spread between lending and deposit rates that oscillates between 15 and 20 percent. Partly because of the high intermediation cost, the credit market is shallow, with a ratio of private sector credit to GDP of below 10 percent. Over time, a lower reserve requirement would be more conducive to financial sector deepening and ultimately the transmission of monetary policy. Central bank funding of the government accounts for 40 percent of total credit to the economy and is one of the main sources of financing for the economy. In addition, commercial bank funding of the government accounts for more than 35 percent of banks total lending. Hence, overall credit to the economy is dominated by lending to the official sector, crowding out private sector borrowing and reducing the potential effectiveness of the credit channel of monetary policy. Dollarization is at about 30 percent but less pervasive than in some other economies with a history of macroeconomic volatility and high inflation.[10]

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[10] The dollarization rate measured by deposits in foreign currency as a share of total liquidity is estimated at 30 percent. This is broadly in line with the SSA average (see Mecagni and others 2015).

Figure 3: Money Aggregates, Frameworks, and Inflation

Broad Money and Base Money Growth: 2010-2019
(x-axis = Base Money, y-axis = Broad Money)

Inflation and Broad Money Growth: 2010-2019
(x-axis = Broad Money, y-axis = Inflation)

Decomposition: Base money growth
(percent contribution, 2010-2019)

Sources: IMF IFS and IMF staff calculations.

Outstanding Loans from Commercial Banks
(percent of GDP)

Central bank credit to the government
(Percent of total credit to the economy, 2019)

Decomposition: Total Credit to the Economy
(percent of total credit to economy 2019)

Sources: IMF IFS and IMF staff calculations.
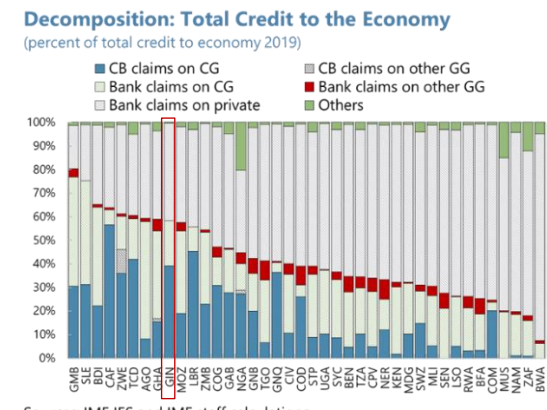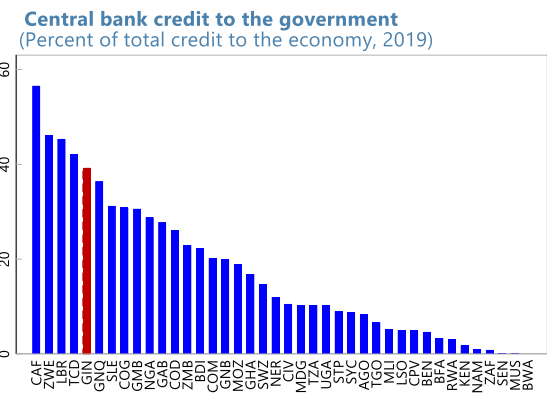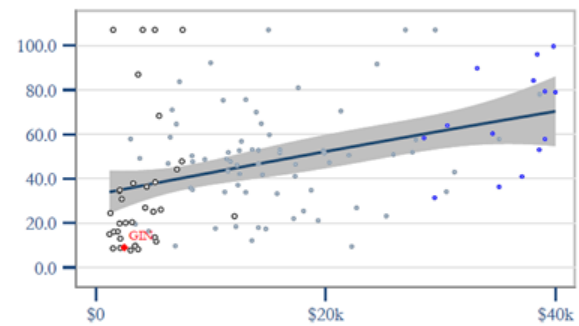
Sources: IMF International Financial Statistics and Financial Access Survey; World Bank World Development Indicators; and authors' calculations.
Notes: For the credit to GDP panel, the horizontal axis reports average GDP per capita over 2016-20 measured at PPP (constant 2017 international $). Low Income Countries=black circles; Emerging Market and Developing Economies=grey circles; Advanced Economies=blue circles.

C. Exchange rate policy

For most of the last two decades, Guinea combined a crawl-like arrangement subject to occasional large adjustments and a base money anchor. Recent evidence from SSA economies suggests that regimes other than floating and fixed exchange rate regimes, when paired with monetary base anchors, have struggled to deliver on price stability. Drawing on the IMF AREAER classification of de facto exchange rate regimes and IMF IFS price statistics, simple unconditional sample means suggest that those countries classified as pegs have the lowest inflation rates and inflation persistence in SSA (Figure 4). Intermediate regimes—including Guinea's—are associated with the highest average inflation, which is almost 10 percentage points higher than pegs and about 7 percentage points higher than floats. Inflation under these regimes is also more persistent compared to floats and pegs, while there are no statistically meaningful differences in terms of inflation volatility across regimes.

After managing the official exchange rate tightly around 9,000 GNF/USD from mid-2017, in October 2018 the BCRG moved to allow a gradual depreciation through a *de facto* crawl-like arrangement, with the exchange rate fluctuating within a narrow range with respect to a linear trend (Figure 5, Panel A). The central bank implements its foreign exchange policy by organizing auctions where it buys or sells foreign exchange from

Figure 4: Monetary policy regimes and inflation performance in SSA

Difference Across MP Regimes in SSA: Average Inflation
(Mean difference in monthly inflation to base case, 2014m1-2019m12)

Sources: IMF IFS and IMF staff calculations. Base case intermediate exchange rate regime and other monetary target anchor, respectivley. *MB anchor refers intermeidtae exchaneg rate regime with monetary anchor.

Average Inflation and Persistence, 2005m1-2021m12
(x-axis = Estimated persistence, y-axis = Average inflation)

y = 10.7x + 3.8
R² = 0.42

Sources: IMF IFS and IMF staff. Excludes outlier Zimbabwe.

Difference Across MP Regimes in SSA: Inflation Volatility
(Mean difference in inflation volatility to base case, 2014m1-2019m12)

Sources: IMF IFS and IMF staff calculations. Base case intermediate exchange rate regime and other monetary target anchor, respectivley. *MB anchor refers intermeidtae exchaneg rate regime with monetary anchor.

Difference Across MP Regimes in SSA: Inflation Persistence
(Mean difference in inflation persistence to base case, 2014m1-2019m12)

Sources: IMF IFS and IMF staff calculations. Base case intermediate exchange rate regime and other monetary target anchor, respectivley. *MB anchor refers intermeidtae exchaneg rate regime with monetary anchor.
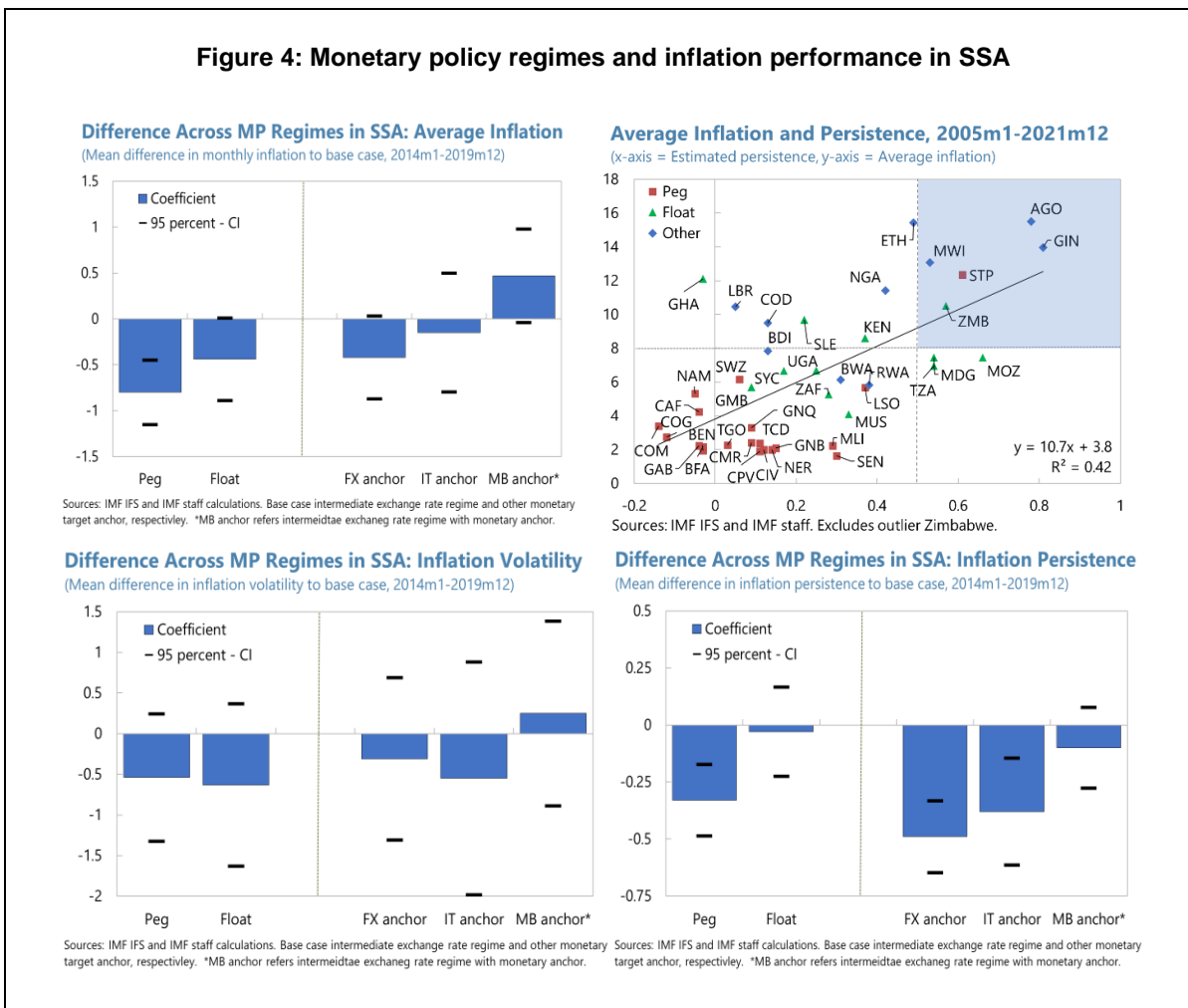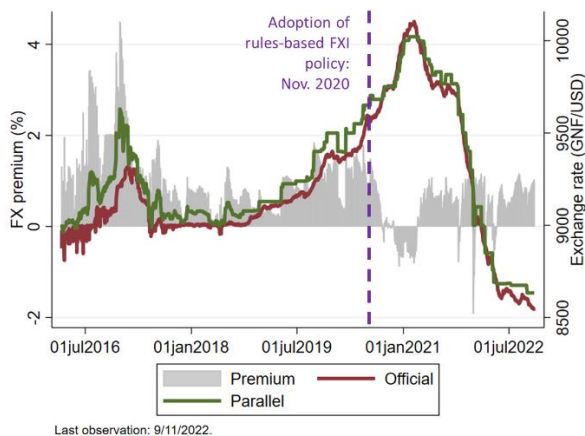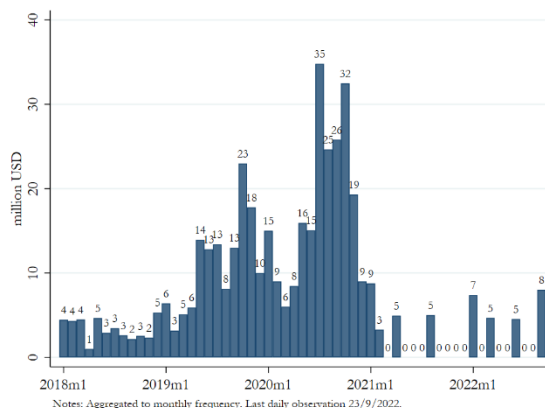
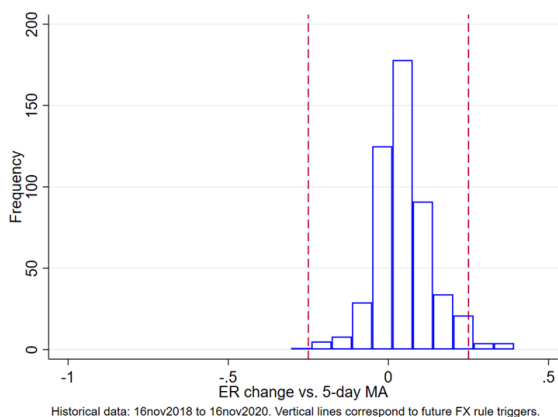**Figure 5. Recent exchange rate developments**

A. Official and parallel exchange rates
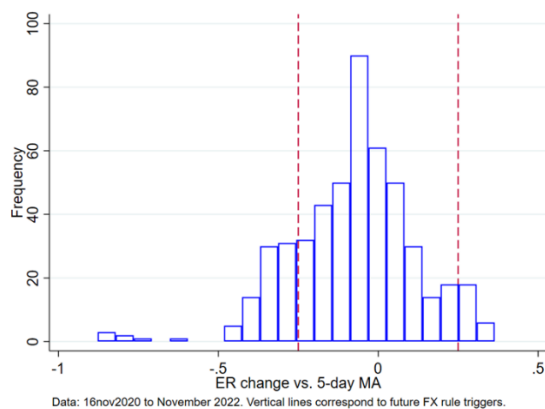(GNF per US dollar; premium in percent)

B. Gross monthly FX sales by the BCRG
(million US dollars)

C. Histogram of daily exchange rate movements; November 2018-20
(y-axis = frequency, x-axis percent change)

D. Histogram of daily exchange rate movements; November 2020-22
(y-axis = frequency, x-axis percent change)

Source: Authors' calculations based on data from BCRG.

domestic banks participating in the market. Operations in foreign exchange are generally not sterilized, and thus have an impact on liquidity conditions in domestic currency.

The BCRG has recently made efforts to introduce additional flexibility into the exchange rate regime, which should allow for greater scope to implement autonomous monetary policy. In that context, the BCRG adopted a rule-based foreign exchange intervention policy in November 2020. Under the rule, the central bank does not hold an auction to purchase (sell) foreign exchange unless the exchange rate has appreciated (depreciated) by more than 0.25 percent with respect to its 5-day moving average, with the amount not to exceed US$8 million. To ensure transparency in the BCRG's foreign exchange policy, the rule is public knowledge and is replicable

by market participants. In the two years prior to the rule's adoption, the trigger would only have been activated in about 2 percent of trading days, as opposed to actual FX sales over that period in 20 percent of trading days.

The authorities have been consistently applying the rule-based policy since November 2020.[11] The new policy has given the central bank a more passive role in the foreign exchange market, with monthly sales of foreign exchange substantially reduced (Figure 5, Panel B). It has also allowed for greater flexibility for the exchange rate to respond to market forces, with the distribution of daily exchange rate movements becoming substantially more disperse (Figure 5, Panels C and D). Notably, the BCRG no longer participates on both sides of the market in a single session, as both buyer and seller of foreign exchange. The additional flexibility in the exchange rate implied by the recent regime change should help in overcoming some of the shortfalls associated with the previous tightly managed exchange rate arrangements.

3. Theoretical determinants of inflation

To motivate our empirical specification, we use a stylized model to examine the importance of monetary factors in generating changes to the domestic price level. Following Durevall, Loening, and Birru (2013) and Kinda (2013) we model inflation as arising from disequilibrium in two sectors: the monetary and the external sector.[12] From a monetarist perspective, agents hold money for transaction purposes, as a store of value, or for speculation. In an open economy setting, inflation can also be affected by the exchange rate and foreign prices.

We define the inflation equation consistent with a small open economy with two sectors: a tradable goods sector and a non-tradable sector. The price level p_t is a weighted average of the price of non-tradable goods p^N, and tradable goods p^T:

$$p_t = \alpha p_t^N + (1 - \alpha)\, p_t^T, \tag{2}$$

where the variables are expressed in natural logarithm and $0 < \alpha < 1$ is the share of nontradable goods in total expenditures. The price of tradable goods in foreign currency is determined exogenously in the world market. Due to transport costs, their domestic price in Guinea will differ.[13] Additionally, a fraction of tradeables is invoiced with producer currency pricing and the remainder fraction, β, with limited pass-through due to local currency pricing or regulated domestic prices (with differences covered by the fiscal authority). Hence, purchasing power parity does not hold and the price of tradables can be expressed as a function of the exchange rate e_t (in domestic currency), transport costs, tc_t, and the foreign price level p_t^* adjusted by the

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[11] The BCRG also carries out regular opportunistic purchases of small amounts of foreign currency to build its international reserves position. These operations are not designed to influence the level or volatility of the exchange rate and thus do not constitute official intervention in the FX market.

[12] The Phillips curve is an alternative approach for modelling inflation. It models inflation as resulting from wage increase. Shocks to aggregate demand affect the employment level and wages, resulting in inflationary pressures. This approach may not be suitable for Guinea due to the potentially weak link between aggregate demand, employment, and wages.

[13] Carrière-Swallow and others (2023) show that international transport costs vary over time and across countries—they are particularly high for West African economies including Guinea—and their variation contributes significantly to global inflation.

pass-through measure γ, which reflects the extent of domestic price controls and local currency pricing.[14] The equilibrium condition in the external market is given by:

$$p_t^T = (1 - \beta + \beta\gamma)(e_t + tc_t + p_t^*). \tag{3}$$

The price of non-tradable goods is determined by the disequilibrium condition in the money market, with money supply m_t^s deviating from real money demand m_t^d, where m^s is the logarithm of broad money. An increase in money supply results in higher prices. Following Callen and Chang (1999), assuming that the demand for nontradable goods is a constant share φ of aggregate demand, the price of nontradables can be expressed as:

$$p_t^N = \varphi[m_t^s - m_t^d]. \tag{4}$$

Money supply m_t^s is the operational target for monetary policy and is set by the central bank to achieve its price stability objective. However, as discussed above, it is in practice closely related to the financing needs of the government budget. Real money demand m_t^d can be expressed as a function of real income y_t and a vector of rates of return measuring the opportunity cost of holding money, with the literature proposing a number of candidate proxies for inclusion.[15] We follow Diouf (2007) and consider inflation expectations $E(\pi_t)$, assuming the following log-linearized form:[16]

$$m_t^d = \eta y_t - \mu E(\pi_t). \tag{5}$$

As in Kinda (2013), we assume adaptative expectations for inflation, such that the expected values are equal to the realized value in the previous period $E(\pi_t) = \Delta p_{t-1}$. Substituting into equation 5, we arrive at the following real money demand function:

$$m_t^d = \eta y_t - \mu \Delta p_{t-1}. \tag{6}$$

An increase in real income is expected to stimulate money demand while an increase in expected inflation will cause a decline in money demand (as the opportunity cost of holding money is higher). Substituting equations 3, 4 and 6 into equation 2 leads to the following equation for the price level:

$$p_t = \alpha\varphi[m_t^s - \eta y_t + \mu \Delta p_{t-1}] + (1 - \alpha)(1 - \beta + \beta\gamma)(e_t + tc_t + p_t^*). \tag{7}$$

Hence, we can write the log price level as a function of money supply, real income, past inflation, the exchange rate, transport costs, and the foreign price level:

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[14] Burstein, Neves, and Rebelo (2003) document that distribution costs make up a large share of retail prices for the average consumer good in the United States and Argentina. While these are significant for tradable goods in the data, we do not consider them explicitly here. However, the combination of the trade cost term multipled with $\beta\gamma$ could also capture fixed deviations from full pass-through due to distribution costs.

[15] Durevall, Loening, and Birru (2013) used changes in the parallel US dollar exchange rate to reflect the fact that foreign currency is held as an alternative to local broad money in Ethiopia. In his analysis of inflation in Chad, Kinda (2013) used the gap between the central bank's discount rate and the time deposit rate to capture the opportunity cost of substituting between assets and money. In her study of inflation in Mali, Diouf (2007) considers the returns on five assets: broad money, domestic goods, U.S. dollar cash holdings, domestic bonds, and foreign bonds.

[16] As interest rates show limited variation and are of limited significance in Guinea, they are not considered here.

$$p_t = \mathrm{f}(m_t^s, y_t, \Delta p_{t-1}, e_t, tc_t, p_t^*). \tag{8}$$

Price pressures could arise from higher money supply, a depreciation of the exchange rate, or higher prices in trading partners. An increase in money supply in excess of real money demand is expected to cause prices to increase. Similarly, a depreciation of the exchange rate, higher prices in trading partners, or higher transport costs will result in higher import prices and cause domestic prices to increase as well. In this framework, higher real output is likely to cause prices to fall as money demand exceeds money supply, depressing non-traded good prices (a domestic supply shock). Higher past inflation (through inflation expectations) increase the opportunity cost of holding money, increasing excess money supply and thereby driving up current prices.

4. Empirical estimates

To shed light on the various determinants of inflation we use two estimation techniques. First, we estimate a vector auto regression with exogenous determinants (VARX) including the variables given in equation 8. Together with identifying assumptions on the reduced form errors from the VAR this allows us to decompose the inflation dynamics over the past into the relative importance of foreign factors (such as commodity prices, transport costs and the exchange rate) and domestic factors (such as monetary policy and domestic demand) in Guinea. Second, we use local projections to estimate the exchange rate passthrough, which provides another gauge of the possible effectiveness of monetary policy transmission via the exchange rate and related expenditure switching effects.

A. Vector autoregression (VARX) model

A Vector Autoregression model can be used to assess the contribution of various factors to inflation over time. It can be described by the equation:

$$A \cdot Y(L) = C \cdot X(L) + \varepsilon, \tag{9}$$

and includes the variables identified in the theoretical framework. Accordingly, the vector of endogenous variables Y includes (i) base money (BM) as the main monetary policy tool, (ii) broad money (M2) as a measure of money supply (m_t^s), (iii) the exchange rate, e_t, measured by the nominal effective exchange rate (NEER), (iv) the petrol price at the pump (P@P), which is regulated by government such that there is incomplete pass-through from foreign goods ($\beta\gamma(e_t + tc_t + p_t^*)$), (v) a measure of domestic output (y_t), and (vi) CPI inflation (p_t). The exogenous vector X contains the Baltic Dry index as a measure of global shipping cost (tc_t) and the global non-fuel commodity price index as a measure of the price of foreign goods ($(1-\beta)p_t^*$).[17]

Recall that Figure 2 documented a strong correlation between the growth rate of base money and the central bank's net credit to government. Estimating this model using net credit of the government (NCG) instead of base money in the vector of endogenous variables produces very similar results, since almost all variation in base money can be explained by changes in NCG. Hence, implicitly the fiscal dominance implies that no clear

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[17] In a robustness exercise we also considered rainfall as an exogenous supply factor that could impact domestic (food) prices. Results suggested only a minimal role for inflation dynamics once non-energy commodity prices and transport costs are accounted for. We therefore opted to drop weather conditions from the estimation to limit loss of degrees of freedom.

Table 2. Identifying assumptions for the VARX

	MP	Demand	P@P	FX shock
BM	>0			
M2	>0	>0	<0	<0
NEER	<0	>0	> - P@P	<0
P@P			>0	> - NEER
Y		>0		
CPI	>0	>0	>0	>0

Note: Rows denote responses; columns denote shocks. Signs are defined for shocks consistent with a price increase.

separation between monetary policy and fiscal motives is feasible in Guinea. However, base money is in principle under the full control of the central bank (as it could offset fiscal impulses from changes in NCG if it deemed this appropriate) and its variation—passive or active—is thus a reflection of monetary policy.

The sign restrictions described in Table 2 are used to identify shocks to monetary policy, demand, the domestic petrol price, and the exchange rate. An expansionary monetary policy shock is identified by a contemporaneous increase of base money, broad money, a depreciation of the NEER and an increase in CPI inflation. Demand shocks are identified as contemporaneously increasing output, broad money, inflation and leading to an appreciation of the exchange rate. The regulated petrol price shock is identified by an increase in the domestic price of petrol, an increase in inflation, and a fall in broad money as savings are used to pay higher import bills.[18] To ensure that the shock is not driven by a depreciation in the exchange rate, it is conditioned on the petrol price also increasing in foreign currency terms. A foreign exchange shock is identified by a contemporaneous fall in the value of the GNF, a drop in broad money (as depositors switch from local-currency to FX-denominated holdings), and an increase in the inflation rate as foreign goods in the consumption basket become more expensive. To distinguish the shock from the regulated petrol price shock, the change in the domestic price of petrol is constrained to not exceed the depreciation of the exchange rate. Exogenous shocks are given by (non-fuel) commodity prices and global transport prices.

The VAR model is estimated using quarterly data over the period 2004Q1 to 2021Q4.[19] We include the following variables in our estimations: p_t, is the overall consumer price index (CPI) and comes from the statistical agency of Guinea, INS. Base money and broad money, m_t^s, are measured in GNF millions and come from the BCRG. The exchange rate, e_t, is the nominal effective exchange rate taken from the IMF's Information Notice System. Real income, y_t, is measured by real GDP in constant GNF. Since official figures are only available on an annual basis, higher frequency data is used to proxy for quarterly variation in GDP from 2010 onwards.[20] Before 2010, a cubic interpolation method is used as no high frequency data is available. The petrol

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[18] Importantly, the price at the pump within a quarter is not considered exogenous to other variables in the system. This would ignore that the regulated price reacts to other developments, such as changes in the exchange rate due to other shocks.

[19] The choice is conditioned by data availability. Two lags are selected for the endogenous variables.

[20] Bauxite production explains more than 85 percent of the annual variation in overall output for the economy and is available at monthly frequency, which is used to construct a quarterly GDP series.

price at the pump, $\beta\gamma(e_t + tc_t + p_t^*)$, is measured in GNF. Data on real income and the domestic petrol price are obtained directly from the authorities. The Baltic Dry index is used as a measure of global shipping costs, tc_t, and is obtained from Haver Analytics. The global non-fuel commodity price index, $(1 - \beta)p_t^*$, is taken from the IMF's database. All variables are measures by the annual log difference.

The VAR estimation with sign restrictions yield impulse response functions for the four identified shocks (See Annex). Impulse response functions for the endogenous variables are depicted in the annex. Of the unrestricted variables, it is noteworthy that output growth does not react significantly to any of the shocks except for the petrol price, which provokes a lagged contraction in output. The transmission of shocks via the exchange rate is notable. For example, in response to a demand shock, as output expands, the increase in inflation is quickly reverted as the exchange rate appreciation brings prices back down. This reflects that a large fraction of output is made up of exported goods (gold and bauxite). Monetary policy shocks—while associated with similar absolute changes in base money growth as petrol price shocks—are associated with a more pronounced change in broad money and accordingly a stronger exchange rate response. This triggers a sharper increase in the inflation rate, which is shorter-lived than the petrol price shock. In quantitative terms, a one standard deviation shock to base money shifts the average inflation rate by about 1 percentage point one year after the shock. This response is largely driven by the average change in the NEER of 3 percent over that horizon given a roughly 40 percent import share in the CPI basket.

Together with the implied structural errors and the deterministic part from the exogenous factors, it is possible to decompose the evolution of the endogenous variables of interest, the money supply measure, the exchange rate, and the inflation rate into the identified drivers of inflation: monetary policy, demand, petrol price, FX shocks, the variation due to international commodity prices and transport costs. In what follows, we depict the historical contributions from these factors over time and the variance decomposition based on the pointwise mean response as the main reference metric.[21]

B. Decomposing inflation dynamics

Figure 6 depicts in the left column the variance decomposition and in the right column the historical decomposition of the three key variables in the VAR: broad money, NEER, and inflation.
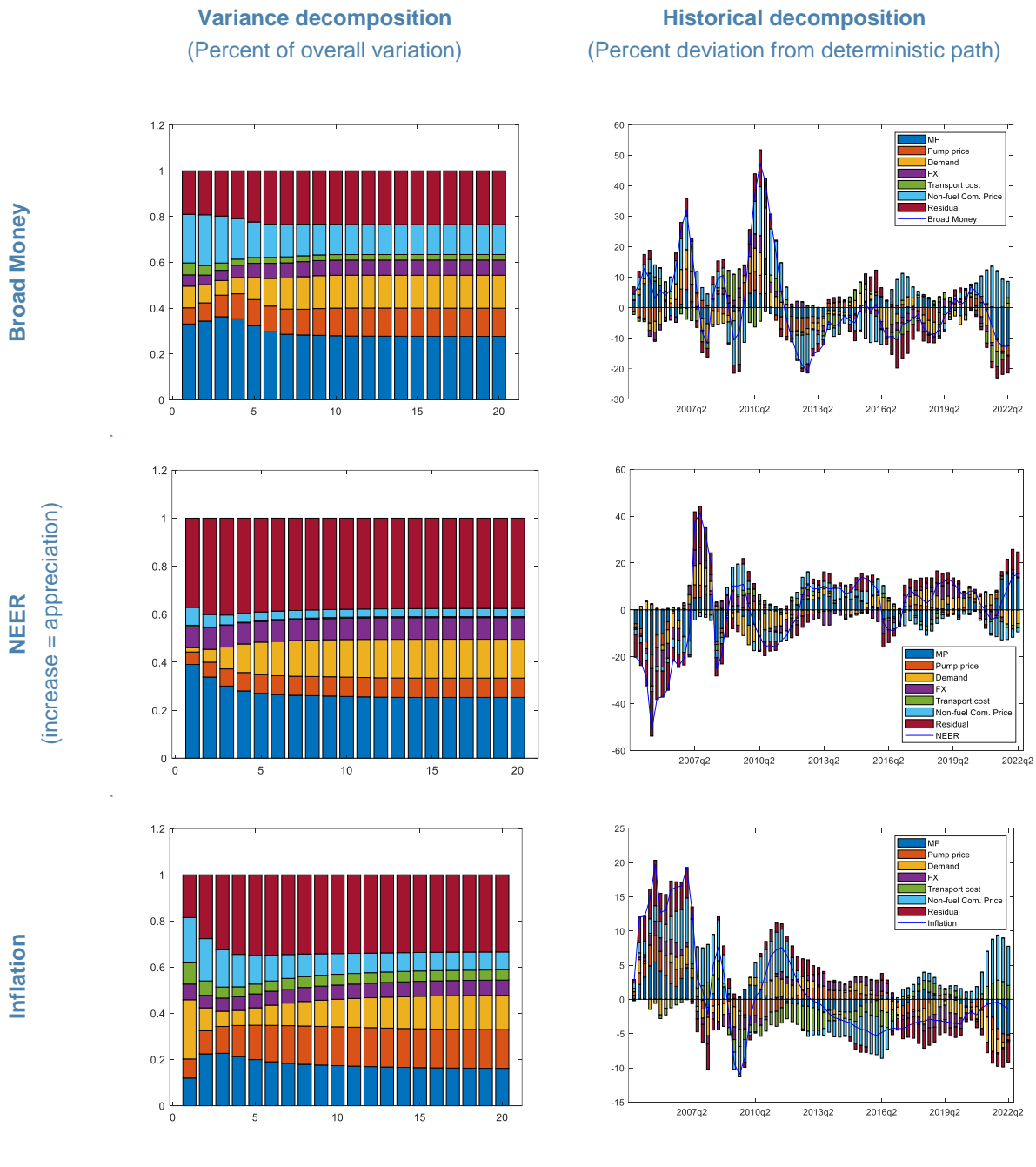
Judging by the variance decomposition, the identified shocks explain about 80 percent of the variation in broad money and inflation, and 60 percent of the NEER at the short-term horizon.[22] The lower explanatory power for the exchange rate is unsurprising given its multilateral nature.

The main contributor to average variation in broad money is the monetary shock, which accounts for about 30 percent, consistent with the close relationship between M2 and base money observed in Guinea. Demand shocks and non-fuel commodity price shocks contribute about 15 percent each, followed by shocks to the petrol price which contributes about 10 percent. Variation in transport costs play a negligible role for broad money. The contribution of exchange rate shocks is only about 5 percent, reflecting that the capital account is

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[21] Alternative metrics such as the median and closest to median model could be used and provide similar insights. The impulse response functions in the Annex show that this is in large part because the distribution is symmetric (i.e. mean and median are almost identical) and the model closest to the median for most responses is also very similar to the mean.
[22] For inflation, the explanatory power declines somewhat over longer horizons.

Figure 6: Historical and Variance Decompositions

Variance decomposition
(Percent of overall variation)

Historical decomposition
(Percent deviation from deterministic path)

Sources: IMF International Financial Statistics and IMF staff calculations.

not fully open and the presence of significant FX deposits, which makes the identification requirement of a decline in broad money in response to an FX shock somewhat stringent.[23]

Variation in the exchange rate is largely driven by monetary policy shocks and domestic demand, accounting for 30 and 20 percent of the variation, respectively. Exchange rate shocks account for about 10 percent of the variation. The residual for the NEER is rather large implying that some external non-identified factors explain part of the variation (e.g., global risk aversion). Shocks to petrol prices and transport costs play a limited role.

Finally, the inflation variation is explained to a large extent by the external factors, with non-fuel commodity prices accounting for 20 percent and transport costs almost another 10 percent of the variation at the short horizon. Petrol price shocks, while regulated domestically, ultimately account for another 15 to 20 percent depending on the horizon. Exchange rate shocks account for about 5 percent of the variation. Domestic demand shocks and monetary policy shocks account for between 15 and 20 percent each depending on the horizon. Over the longer horizon those factors diminish in importance as the residual becomes more significant, likely reflecting unaccounted external factors.

Despite the large contribution of external factors to inflation dynamics in Guinea, a robust relationship between monetary aggregates, the exchange rate, and inflation dynamics suggests an important role for monetary policy in steering inflation. This is evident from the fact that monetary shocks account for much of the variation in broad money and NEER. Furthermore, whenever there is a significant contribution of monetary shocks to broad money and the exchange rate, the inflation rate is visibly affected.

The historical decomposition reveals that this mechanism has been visible at least twice in Guinea's recent history. First, around 2005, when a loose monetary policy contributed to a strong depreciation of the currency and to high inflation. More recently, in 2021–22, a contractionary monetary policy reduced broad money growth and helped contain international price pressures through an appreciation of the Guinean franc, despite transport costs and non-fuel commodity prices rising to historical highs. Each time, the monetary shock contributed about a five-percentage point deviation of inflation from its deterministic path. While reflecting the prevalence of large monetary shocks at the time, the results also suggest a strong monetary policy transmission channel as described by the impulse responses in the Appendix.

Through much of the remainder of the sample, monetary policy was broadly neutral, with broad money, the NEER, and inflation all driven primarily by other factors.[24] Notably, an external factor—captured by a decline in non-fuel commodity prices—explains almost all the disinflation in Guinea during the period from 2012–16, with inflation slowing from more than 20 to below 10 percent. Monetary policy cannot take much credit for this successful period of disinflation, which is consistent with the observation in Figure 1 that Guinea's inflation remained throughout this period in the 90th percentile of countries in SSA. However, that moment was used to allow domestic petrol prices to adjust, pushing inflation up by 1 to 2 percentage points. This reflects the last and only moment in the sample—together with the pre-GFC period when global oil prices were rapidly rising—of significant petrol price contribution to higher inflation. Based on the estimated impulse response function, the 20 percent increase in the petrol price in June 2022 should put upward pressure on inflation in 2023.

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[23] A depreciation increases the local currency equivalent of the FX holdings in domestic banks, which were broadly stable around 30 percent throughout the period under analysis.

[24] The Annex provides the details of the individual shook contributions to inflation over time and identification uncertainty bands around these estimates.

C. Exchange-rate pass through using local projections

The historical decomposition based on the VARX suggests an important role for the exchange rate as a conduit for monetary policy in affecting inflation. To further investigate this dimension, we next turn to estimating the extent to which exchange rate changes pass-through to domestic inflation, irrespective of the origin of the shock. To estimate the coefficient of exchange rate pass-through in Guinea, we adapt the specification used in Carrière-Swallow and others (2021). We estimate the conditional response of the domestic CPI to a change in the exchange rate using a local projection specification (Jordà, 2005):

$$p_{t+h-1} - p_{t-1} = \alpha^h + \sum_{j=0}^{3}\left(\beta_j^h \Delta e_{t-j} + \vartheta_j^h gap_{t-j}\right) + \sum_{j=1}^{J}\rho_j^h \Delta p_{t-j} + \varepsilon_t^h, \tag{10}$$
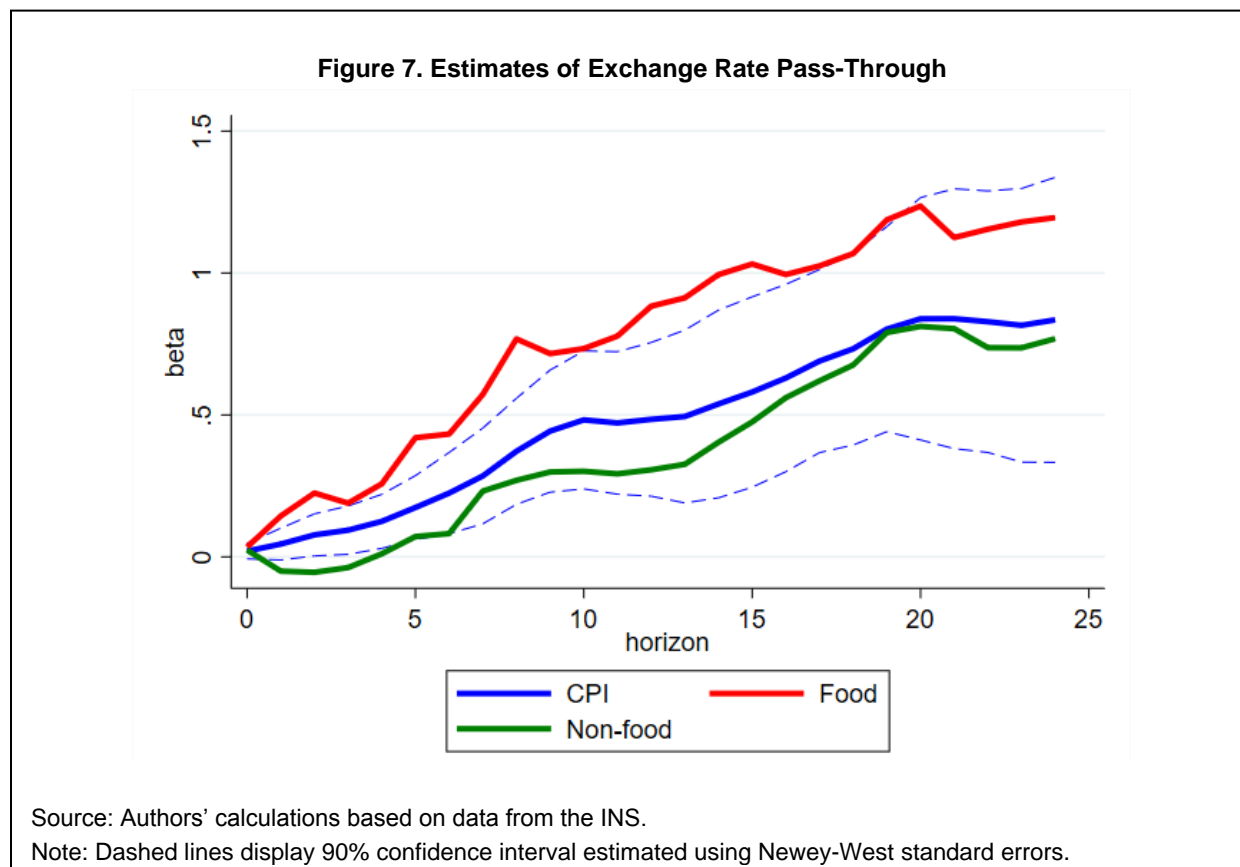
where Δe_t is the monthly change in the nominal effective exchange rate, gap_t is the output gap (the deviation of real GDP from its trend estimated using the Hodrick-Prescott filter), and p_t is a measure of the price index. We explore three different measures for the price index: overall CPI, CPI food, and CPI non-food prices. This allows us to better understand whether parts of the basket are subject to more limited pass-through due to the use of domestic regulations. The vector of parameters β_j^h is estimated by OLS and corresponds to the cumulative impulse-response function for horizons $h = \{0,\dots,24\}$ months. The analysis for the local projection model is conducted at monthly frequency given less stringent data constraints than in the VARX, with data covering the period from September 2010 to December 2021. Sources are as described above, with the addition of food and non-food CPI components, both obtained from the INS.

Estimated impulse-response functions are shown in Figure 7. They indicate that a one-percent depreciation of the nominal effective exchange rate is followed in the data by an increase in the level of the CPI by about 0.3 percent after six months, rising to 0.5 percent after one year, and to 0.8 percent after two years. That is, a one-percent depreciation is associated with a rate of inflation that is roughly 0.4 percent higher over the subsequent two years. This is broadly in line with the elasticity implied by the NEER and inflation responses to the identified monetary policy shock in the VAR analysis.

The coefficient of exchange rate pass-through is relatively high in Guinea compared to other countries.[25] The estimated coefficient of 0.5 (after 12 months) compares to a coefficient of about 0.3 in Carrière-Swallow and others (2021), which studied 30 emerging economies over 2000-19. Our estimate is also slightly higher than the share of imported goods in Guinea's CPI basket (0.4), suggesting complete pass-through to the domestic price of imported goods. The estimates suggest also some second-round effects from the exchange rate to the price of domestically-produced goods, which materializes over the second year following the exchange rate movement.

There is evidence that food prices in Guinea respond to the exchange rate more strongly than other goods. When we substitute the dependent variable in equation (9) for food and non-food subcomponents of the CPI, we obtain the results shown with green and red lines in Figure 7. Pass-through to food prices is higher than to other items, with a one percent depreciation followed by a 0.9 percent rise in food prices after one year. Under an assumption that all food is tradable, this would be consistent with near-complete pass-through of exchange rate fluctuations to local food prices after one year. Estimated point estimates are thus consistent with the fact that some items in the non-food CPI basket are subject to price regulations (including the local price of petrol)

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[25] See Aron, MacDonald, and Muellbauer (2014) and evidence of multiple studies referenced therein, including SSA-specific studies.

Figure 7. Estimates of Exchange Rate Pass-Through

Source: Authors' calculations based on data from the INS.
Note: Dashed lines display 90% confidence interval estimated using Newey-West standard errors.

or are priced to market. However, we note that the low precision of the estimates would not allow us to reject the null hypothesis that pass-through to food and non-food inflation are the same.

These results imply that the nominal effective exchange rate has an incidence on relative prices in Guinea, but that the real exchange rate adjusts less due to the strong response of the domestic price level. This may mitigate the expenditure switching channel in the face of adverse external shocks, which has been well documented in the empirical literature. Carrière-Swallow, Magud, and Yépez (2021) provide empirical evidence on the role of flexible exchange rates in supporting expenditure switching in a large sample of countries that includes advanced, emerging and developing economies. Namely, terms of trade shocks have much smaller impacts on domestic demand and output when the exchange rate is more flexible. Focusing on a panel of 79 low-income economies, Carare and others (2022) find that global demand shocks have much larger impacts on domestic output when the monetary regime targets a more rigid exchange rate. However, Towbin and Weber (2013) document limitations to this mechanism in the presence of significant foreign currency debt, which is the case in Guinea.

5. Conclusion

Central bankers in low-income countries and fragile states face severe challenges in delivering price stability. Traditional transmission mechanisms of monetary policy are often hampered and pressure to succumb to fiscal objectives is strong. Compared to richer countries, inflation is often high, persistent, volatile, and driven by

external developments. Consequently, many LICs and fragile states opt to "tie their hands" by pegging their currency and importing inflation rates from the anchor nation. However, this comes at the cost of foregoing a potentially powerful policy tool to shield the domestic economy from external shocks.

This paper has considered the case of Guinea, a low-income country that has recently suffered repeated shocks—including health related events and military coups—in the past two decades. Inflation in Guinea over the past two decades has been high and remarkably persistent, with the largest autoregressive coefficient among Sub-Saharan African countries. We analyze the main drivers of inflation dynamics and explore to which extent monetary policy has played a role. External factors such as international non-fuel commodity prices, transport costs, and oil prices explain most inflation dynamics, which has been well documented for other developing countries.

Our analysis reveals a robust relationship between monetary aggregates, the exchange rate, and inflation dynamics. This suggests that monetary policy—when implemented resolutely—has been effective in Guinea and can play a critical role in buffering the impact of external shocks on domestic inflation. We find that monetary policy transmits largely via the exchange rate channel. Inflation is closely associated with money growth, which in turn drives exchange rate movements. Estimates point to strong pass-through of exchange rate movements to domestic prices—which is stronger for food than for other items—with some evidence of second-round effects on domestic goods over the two-year horizon.

The strong transmission of monetary policy via the exchange rate was evident in 2021–22, when contractionary monetary policy helped appreciate the exchange rate. This almost offset the international price pressures from global supply shocks in the post-Covid environment, which we estimate would have otherwise added 6 percentage points to an already high inflation rate. Recent reforms to modernize the central bank's policy framework have likely contributed to this outcome. The exchange rate has become more flexible, with the BCRG implementing a simple and transparent FX intervention rule.

Despite broadly good performance amidst the shocks that hit Guinea, the BCRG has struggled in meeting its inflation objective over the past five years. Nevertheless, our analysis shows that if implemented strictly, tight monetary policy can contribute to attaining lower inflation in the near-term. Continuing to strengthen the operational and financial independence of the central bank would reduce the scope for fiscal dominance and strengthen the BCRG's ability to steer monetary conditions in pursuit of its price stability mandate.
Over the medium-term the BCRG may choose to transition from the current base money growth framework to an inflation targeting framework. Given Guinea's dependence on commodity exports and potential for economic diversification, moving towards an inflation targeting regime could contribute to price stability and macroeconomic stability. Indeed, regimes with more flexible exchange rates and strong nominal anchors have delivered lower and less persistent inflation without causing increased inflation volatility in SSA countries. A next step towards this objective should involve gradually making the exchange rate more flexible and allowing it to act increasingly as a shock absorber, while maintaining close control over monetary conditions through active operations.

Annex 1: Impulse Response Functions

Response to Demand shock

Response to FX shock
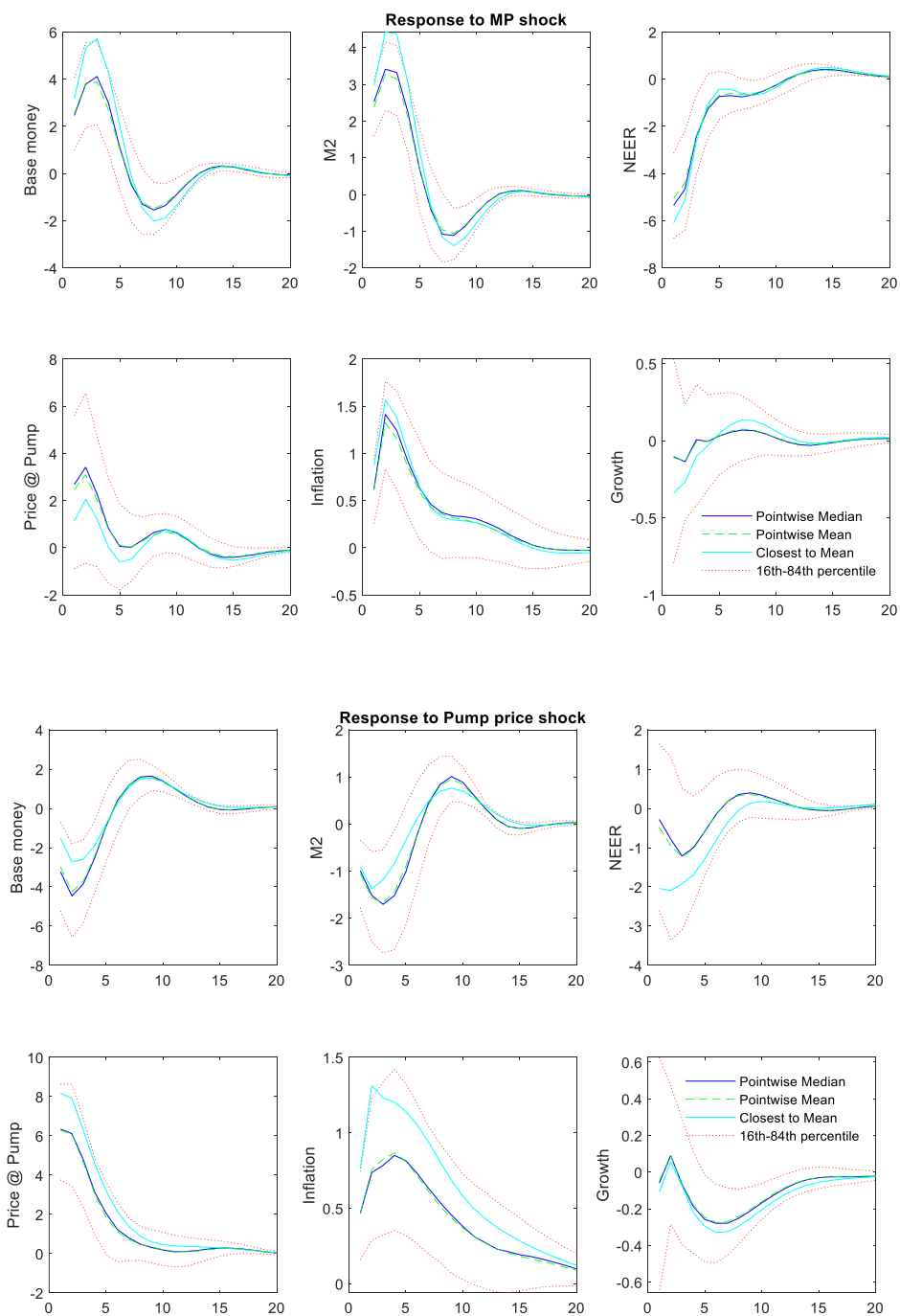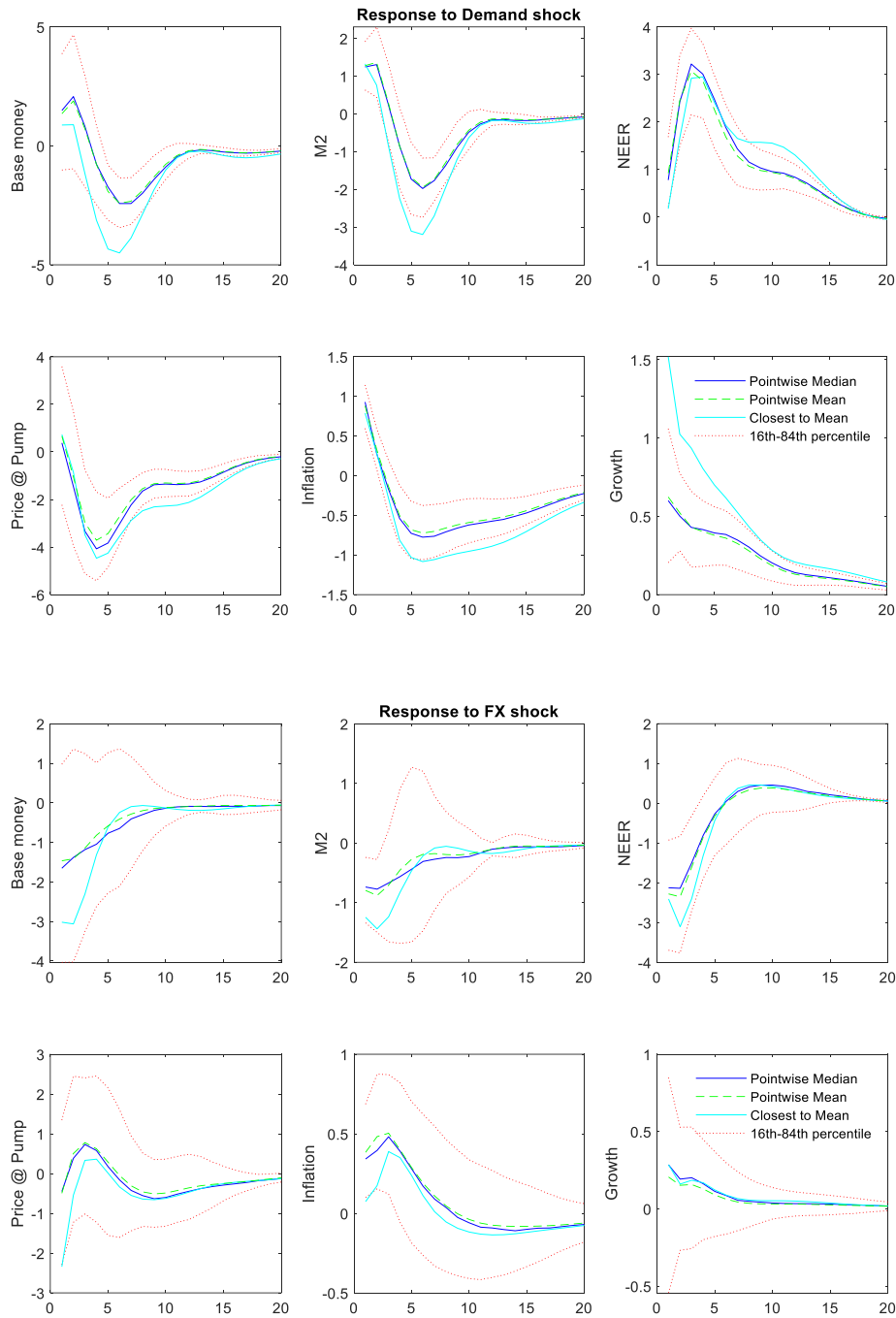
Annex 2: Contribution of Shocks to Inflation
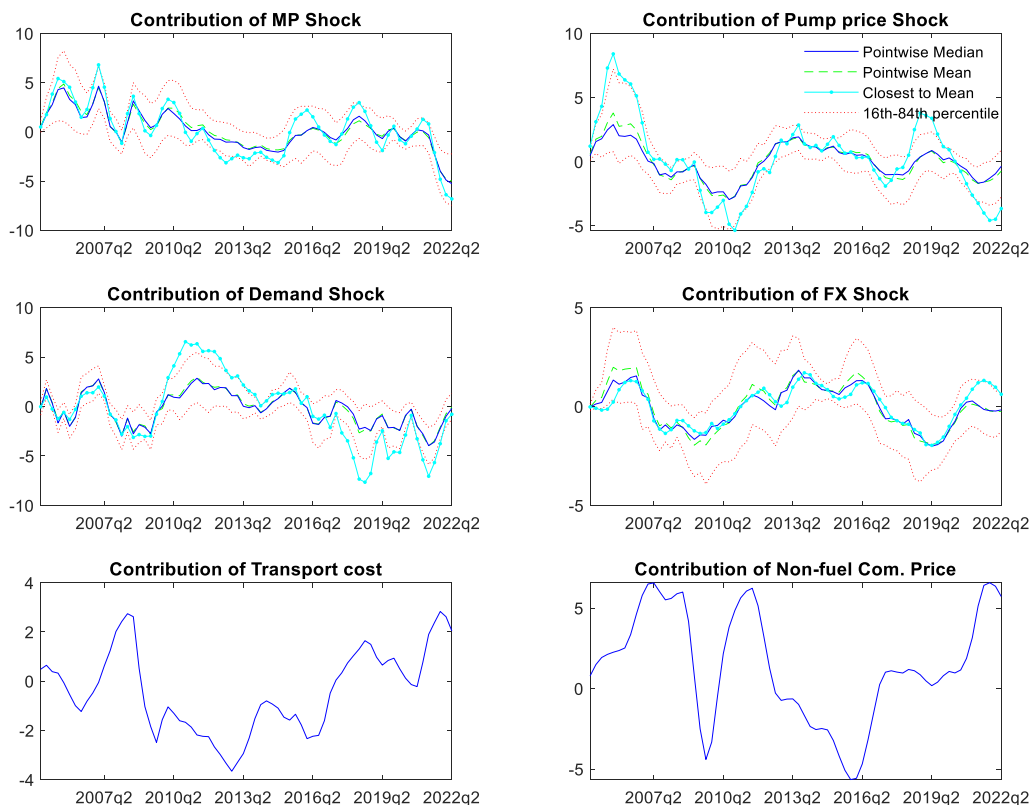
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