



**HAL**  
open science

## Commodity currencies revisited: The role of global commodity price uncertainty

Laurent Ferrara, Aikaterina Karadimitropoulou, Athanasios Triantafyllou,  
Theodora Bermpei

### ► To cite this version:

Laurent Ferrara, Aikaterina Karadimitropoulou, Athanasios Triantafyllou, Theodora Bermpei. Commodity currencies revisited: The role of global commodity price uncertainty. 2022. hal-04159791

**HAL Id: hal-04159791**

**<https://hal.science/hal-04159791v1>**

Preprint submitted on 12 Jul 2023

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Commodity currencies revisited: The role of global commodity price uncertainty

Theodora Bermpei

Laurent Ferrara

Aikaterina Karadimitropoulou

Athanasios Triantafyllou

2022-24 Document de Travail/ Working Paper

EconomiX - UMR 7235 Bâtiment Maurice Allais  
Université Paris Nanterre 200, Avenue de la République  
92001 Nanterre Cedex

Site Web : [economix.fr](http://economix.fr)  
Contact : [secreteriat@economix.fr](mailto:secreteriat@economix.fr)  
Twitter : @EconomixU



# Commodity currencies revisited: The role of global commodity price uncertainty

Theodora Bermpei<sup>a</sup>, Laurent Ferrara<sup>b†</sup>, Aikaterini Karadimitropoulou<sup>c</sup>, and Athanasios Triantafyllou<sup>d</sup>

<sup>a</sup>*Essex Business School, University of Essex, UK*

<sup>b</sup>*Skema Business School, CAMA and EconomiX University Paris Nanterre, Paris, France*

<sup>c</sup>*Department of Economics, University of Piraeus, Piraeus, Greece*

<sup>d</sup>*IESEG School of Management, Lille, France*

*September 7, 2022*

## **Abstract:**

Exchange rates of commodity exporting countries, generally known as commodity currencies, are often considered to be driven by some specific commodity prices. In this paper, we show that the uncertainty common to a basket of commodity prices is also a significant driver of exchange rate dynamics for a panel of commodity exporting countries. In particular, a positive shock on global commodity price uncertainty leads to a short-run depreciation of the effective exchange rate in commodity currency countries, followed by a medium-term overshooting. We document that this pattern is specific to commodity currencies and is not visible on benchmark currencies like the euro or the U.S. dollar, the latter acting as a typical safe haven currency. We refer to this pattern as the “commodity uncertainty currency” property.

**Keywords:** Commodity currencies, Uncertainty co-movement, Commodity prices, SVAR model

**JEL codes:** F43, F31, C50

---

† Corresponding Author, Skema Business School, Paris, France ([laurent.ferrara@skema.edu](mailto:laurent.ferrara@skema.edu)), CAMA and University Paris Nanterre - EconomiX. Laurent Ferrara acknowledges financial support from the French ANR (DEMUR research project ANR-20-CE26-0013).

## 1. Introduction

Major commodity-producing economies, as Australia or Norway, strongly rely on the exports of raw commodities (agricultural, energy or metals) as a main source of income. In this respect, business cycles in those commodity-rich economies heavily depend on fluctuations in global commodity prices. In particular, there is a widespread literature showing that the currencies of major commodity-exporting countries exhibit significant comovement with global commodity prices, known as the ‘commodity currency property’ (see e.g. Bodart *et al.*, 2012; Cashin *et al.*, 2004; Chen and Rogoff, 2003; Chen and Lee, 2018; Clements and Fry, 2008; Coudert *et al.*, 2015; Zhang *et al.*, 2016; among others). According to theoretical and empirical findings of the literature on ‘commodity currencies’, rising (falling) commodity prices result in an appreciation (depreciation) of the commodity currency in the medium-run; the main transmission channel being the improvement in terms of trade (i.e. increasing income from commodity exports because of higher commodity export prices, see e.g. Chen and Rogoff, 2003; Chen and Lee, 2018). Another strand of the literature supports the view that a short-run effect might also exist, as foreign exchange (FX) market participants anticipate an immediate appreciation of the commodity currency after the occurrence of a commodity price shock (see Chen and Rogoff, 2003; Devereux and Smith, 2021; Ferraro *et al.*, 2015; Zhang *et al.*, 2016). For instance, Ferraro *et al.* (2015) empirically verify the existence of oil-currencies relationships in the very short-run, by showing that oil prices are robust predictors of the exchange rates of countries whose most significant commodity export is oil, at daily, monthly and quarterly forecast horizons. Devereux and Smith (2021) identify a new channel through which rising commodity export prices result in an immediate appreciation of the respective commodity currency of small open inflation targeting economies. Indeed, they show that this appreciation can be attributed to a systematic monetary

policy intervention to rein in domestic inflationary pressures occurring after large commodity price increases. While the literature has extensively shown that the terms of trade fluctuations comove with the currency of major commodity-exporting economies, little is known about the respective effects of global commodity price uncertainty shocks.

Three key arguments motivate our paper. First, following the findings of the literature mentioned above, we move the current strand of the ‘commodity currencies’ literature one step further by examining the dynamic effects of agricultural, metals and energy commodity price uncertainty shocks on ‘commodity currencies’. As underlined by Delle Chiaie et al. (2022) and Ferrara et al. (2022), there is empirical evidence of a common cycle for commodity prices, for both level and volatility. Here, we aim at extracting the common volatility behavior, which we identify to be uncertainty on commodity prices. In this respect, we estimate a two-factor Bayesian Dynamic Factor Model capturing comovement in major agricultural, metals and energy commodity futures markets. As in Ferrara et al. (2022), the first factor captures uncertainty comovement across the entire cross-section of agricultural, energy and metals markets, quantifying global commodity price uncertainty, while the second factor captures market-specific commodity price uncertainty (namely, agricultural, metals and energy price uncertainty, respectively). In a second step, we examine the dynamic impact of global and market -specific uncertainty on the real broad effective exchange rates of major industrialized commodity-producing economies (namely Australia, Canada, New Zealand and Norway) for which the relevant literature has extensively shown their ‘commodity currency’ property (Chen and Rogoff, 2003; Cashin *et al.*, 2004; among others). Our choice for this set of commodity currencies stems from the fact that they are representative examples of small open economies characterized by (i) well-developed and relatively liquid financial markets for a lengthy period (at least from the early nineties which is when our sample

starts), (ii) floating currencies since the early eighties and (iii) an inflation targeting regime since the early nineties. In addition, all four countries can be described as commodity-producing economies, because of the large share of their production and exports accounted for by primary commodities for most of the time-period under investigation (Chen and Rogoff, 2003; Coudert *et al.*, 2015).

Second, recent literature has shown that the exchange rates of commodity-producing economies become more sensitive to commodity terms of trade shocks in times of heightened uncertainty in global commodity markets (Coudert *et al.*, 2015). Unlike equity price returns (whose distributions are negatively skewed), commodity price return distributions are positively skewed with commodity investors and producers being more fearful of the right (instead of the left) tail of the return distribution, with commodity volatility risk and the corresponding prices being (instead of negatively) positively correlated (see for example Gorton and Rouwenhorst, 2006; Pindyck, 2004; Triantafyllou *et al.*, 2015). Consequently, rising uncertainty in commodity markets is associated with increased convenience yields for holding physical inventories and with more vulnerability to price spikes commodity markets (see Bobenrieth *et al.*, 2013; Deaton and Laroque, 1992; Gordon *et al.*, 2013; Milonas and Thomadakis, 1997; Triantafyllou *et al.*, 2020). In this way, a ‘commodity uncertainty currency’ channel might take place, since, at least in the medium-run, the demand for ‘commodity currencies’ is likely to increase in case investors anticipate a higher probability of commodity inventory stock-outs and price spikes in times of heightened uncertainty in global commodity markets.

Third, the financialization of commodity markets, starting from the late nineties, highlights the importance of understanding the effects of comovement in commodity markets. While in the early eighties, commodity markets were partly disconnected and segmented from equity and bond

markets, the financialization of commodities transformed commodity markets into a separate asset class. This led them to become more integrated with financial markets and also contributed to a stronger comovement between agricultural, metals and energy commodity price returns and volatility (Basak and Pavlova, 2016; Tang and Xiong, 2012). For all those reasons it is of interest for commodity investors and policymakers to examine the macroeconomic effects of rising commodity uncertainty comovement on major commodity currencies. Our testable hypothesis in this paper is that the synchronization of uncertainty across commodity markets will have a significant short- and medium-run effect on commodity currencies, with the sign of the effect being dependent on the hedging needs and behavior of FX market participants in response to commodity price movements.

In this paper, we empirically point out for the first time in the literature that commodity price uncertainty does matter for commodity currency fluctuations. More specifically, our SVAR analysis highlights that a global commodity price uncertainty shock, that is a shock common to all types of commodity prices, results in an instantaneous depreciation of commodity currencies, followed by a medium-run appreciation. It turns out that this pattern is specific to commodity currencies, as other benchmark currencies like the euro and the U.S. dollar do not react in the same way. The euro tends to be neutral to this type of shock, while the U.S. dollar acts as a safe haven currency by appreciating in the wake of a global commodity price uncertainty shock, as it does after a VIX shock (Georgiadis et al., 2021). In this respect, we will refer to this stylized fact as the “commodity uncertainty currency” property. The economic interpretation of our findings possesses its roots on the investment under uncertainty implications, according to which investors postpone their investments on risky projects (the risky commodity currencies in our case) up until

the commodity price uncertainty shock is being resolved (Bloom, 2009; Pindyck, 1991). Hence, the resolution of global commodity price uncertainty shocks ultimately leads FX investors to revert to commodity currencies, increasing the demand for commodity currencies and ultimately resulting to appreciation of the currency of commodity-producing economies in the medium-run. Moreover, since our sample of countries are advanced small open economies with flexible exchange rate regimes and inflation targeting monetary policy rules, our analysis contributes to assess the importance of an alternative channel through which commodity price uncertainty could affect commodity currencies, namely the monetary policy channel (Devereux and Smith, 2021; Dornbusch, 1976; Bjørnland, 2009)<sup>1</sup>. We show that monetary policy reactions, as measured by central bank interest rates, to this type of uncertainty shock are in line with the first part of this pattern (i.e. the short-term depreciation), but there is no clear evidence as regards to the second part of the movement (i.e. the medium-term appreciation). We rather attribute this medium-term bounce-back to the classical growth-option theory put forward in Bloom (2014), according to which investors expect high opportunities once the commodity uncertainty vanishes, leading to a strong currency demand.

Last, once we account for the global commodity price uncertainty, we get that market-specific uncertainty shocks tend to diverge in the short-run: agricultural and metals' shocks lead to a depreciation of commodity currencies, while energy shocks generate a significant appreciation. This finding shows that FX investors do not treat energy price uncertainty as a potential threat for commodity currencies, but, as an investment opportunity arising via the growth-option channel of uncertainty shocks (Bloom, 2014). This in turn leads FX investors to increase their demand for

---

<sup>1</sup> For instance, Bernanke et al. (1997) show that the recessionary effect of oil price shocks is largely attributed to the systematic reactions of the Fed in order to rein in inflationary pressures of those shocks, while the recent findings of Triantafyllou and Dotsis (2017) show that the Fed funds rate increases significantly after a large increase in option implied volatility of major global commodity markets.



commodity currencies after the occurrence of energy price uncertainty shocks, and, ultimately, their speculative demand pressures resulting in an appreciation of the commodity currencies.

The rest of the paper is organized as follows. Section 2 describes the data and outlines the empirical methodology. Section 3 presents the empirical results, while Section 4 provides various robustness checks. Finally, Section 5 concludes.

## **2. Data and Methodology**

### **2.1 Commodity futures data**

We get daily series for GSCI (Goldman Sachs Commodity Index) nearby commodity futures prices, retrieved from Datastream. The nearby commodity futures prices are often used as proxies for the commodity spot prices since they always converge to the corresponding commodity spot prices (Fama and French, 1987). More specifically, we obtain twelve daily GSCI series for agricultural (corn, cotton, soybeans, wheat), metals (copper, gold, silver, platinum) and energy (crude oil, heating oil, petroleum, gasoline) futures prices. The daily commodity futures dataset covers the period from January 1994 to June 2021.

### **2.2 Macroeconomic data**

In this empirical work, we focus on four well-known commodity-exporting countries, namely Australia, Canada, New Zealand and Norway, and we consider the U.S. and the euro area as benchmarks. For all those countries the target variable is the real broad effective exchange rate, meaning that an increase (decrease) in the exchange rates is associated with an appreciation (depreciation) of the local currency. For each country, we will construct a SVAR model that also includes quarterly series for the growth rate of consumer price indexes (CPI, all items), domestic

short-term (policy) rates, the growth rate of total exports and the growth rate of real GDP. The macroeconomic time series dataset spans the period from 1994q1 to 2021q2 and is obtained from the Federal Reserve Bank of Saint Louis (FRED) database.

### 2.3 Commodity price uncertainty

We estimate commodity price uncertainty as the quarterly realized variance of the daily returns of the commodity prices according to the following equation:

$$RV_{t,T} = \frac{1}{T} \sum_{i=1}^T \left( \frac{F_{t+i} - F_{t+i-1}}{F_{t+i-1}} - \overline{\frac{F_{t+i} - F_{t+i-1}}{F_{t+i-1}}} \right)^2 * 252 \quad (1)$$

where  $F_t$  is the GSCI commodity future price on the trading day  $t$ . The realized variance  $RV$  is multiplied by 252 (the number of trading days during one calendar year) in order to be annualized.

### 2.4 Dynamic Factor Model

We deploy a two factor Dynamic Factor Model (DFM) for the estimation of a global commodity price uncertainty factor and a commodity group-specific price uncertainty factor. In more detail, using a similar approach with that of Ferrara et al. (2022), we extract these two latent factors capturing the global and group-specific comovements in the realized variance (RV) of agricultural (corn, cotton, soybeans, wheat), metals (copper, gold, silver, platinum), and energy (crude oil, heating oil, petroleum, gasoline) commodity price returns.

The specification and estimation methods draw from Kose et al. (2003) and Karadimitropoulou and León-Ledesma (2013), adapted to our factor structure. As previously mentioned, our model

contains (i) a common commodity price uncertainty factor, (ii) a group-specific commodity price uncertainty factor and (iii) an idiosyncratic component. We observe one variable (the realized variance) for each of the 12 commodities, from 1994q1 to 2021q2.

Our data are a panel of commodity volatility series,  $RV_{c,t}$ , where the subscript  $c$  indexes the commodity, with  $c = 1, \dots, C$ , and  $t = 1, \dots, T$ , so that  $RV_{c,t}$  is the realized variance for any commodity  $c$  at time  $t$ . We assume that  $RV_{c,t}$  can be described by the following dynamic factor model:

$$RV_{c,t} = \beta_c^C F_t^C + \beta_c^G F_{g,t}^G + \varepsilon_{c,t} \quad (2)$$

where  $g$  indexes the group-specific commodities, with  $g = 1, \dots, G$ .  $F^C$  represents the common commodity factor and  $F^G$  denotes the group-specific commodity factor. Coefficients  $\beta^C$  and  $\beta^G$  are the factor loadings on the common and group-specific factors, respectively.

Finally,  $\varepsilon_{c,t}$  is the error term and is assumed to be cross-sectionally non-correlated at all leads and lags but can be serially correlated. The error term is supposed to follow an AR( $p$ ) process :

$$\varepsilon_{c,t} = \sum_{l=1}^p \varphi_{c,l} \varepsilon_{c,t-l} + \varepsilon_{c,t} \quad (3)$$

where  $\varepsilon_{c,t}$  are distributed as  $N(0, \sigma_c^2)$  and the autoregressive order  $p$  is selected to be  $p=3$ . The two unobserved factors  $F^C$  and  $F^G$  are also assumed to follow AR( $p$ ) processes:

$$F_t^C = \sum_{l=1}^p \varphi_l^C F_{t-l}^C + v_t^C \quad (4)$$

$$F_{g,t}^G = \sum_{l=1}^p \varphi_{g,l}^G F_{g,t-l}^G + v_{g,t}^G \quad (5)$$

with  $p=3$  and where  $v_t^C, v_{g,t}^G \sim N(0, \sigma_c^2)$  and  $N(0, \sigma_{g,G}^2)$  respectively. Finally, the innovations  $\varepsilon_{c,t}$ ,  $v_t^C$ , and  $v_{g,t}^G$  are supposed to be mutually orthogonal across all equations in the system.

The model described by equations (2) to (5) is estimated through a Bayesian approach with Gibbs sampling, which is a Markov Chain Monte Carlo (MCMC) method for approximating the joint

and marginal distributions by sampling from conditional distributions. Using a MCMC procedure, we can generate random samples for the unknown parameters and the unobserved factors from the joint posterior distribution. This is feasible as the full set of conditional distributions is known, that is, parameters given data and factors, and factors given data and parameters.<sup>2</sup> The first factor captures the global (common to all global commodity markets) price uncertainty co-movement (referred to as GLUN, global uncertainty, in the remaining of the paper), while the second factor captures the group-specific commodity price uncertainty comovement, namely the agricultural price uncertainty (AGUN), the metal's price uncertainty (MTUN) and the energy price uncertainty (ENUN).

## 2.5 Structural VAR modelling

To measure the dynamic effects of commodity price uncertainty shocks on commodity currencies, we estimate in a second step a structural VAR (SVAR) model, in which, except from the exogenously determined commodity price and uncertainty shocks, we also include domestic inflation, policy rates, export growth and real GDP growth as endogenous variables. Our SVAR model is given in equation (6) below:

$$A_0 Y_t = c + A_1 Y_{t-1} + \dots + A_k Y_{t-k} + \varepsilon_t \quad , \quad (6)$$

where  $c$  is a vector of constants,  $Y_t$  is the vector of endogenous variables,  $A_0$  is the matrix of contemporaneous variables,  $A_1$  to  $A_k$  are matrices of coefficients and  $\varepsilon_t$  is the vector of serially uncorrelated disturbances, with zero mean and variance-covariance matrix  $E(\varepsilon_t, \varepsilon_t') = \sigma_\varepsilon^2 I$ . Following Hamilton (2003), we allow a full year (4 quarters of lags) in the SVAR in order to allow

---

<sup>2</sup> For further details on the selected methodology, see Kose et al. (2003).

for sufficient dynamics driving the dynamic interactions between commodity price and uncertainty shocks and the real economy. We estimate an 8-variable SVAR model with the following ordering:

$$Y_t = [ VIX_t \text{ COMRET}_t \text{ GLUN}_t \text{ FX}_t \text{ INFL}_t \text{ IR}_t \text{ EXP}_t \text{ GDP}_t ]$$

where VIX is the VIX index, COMRET is the quarterly growth rate of the broad GSCI commodity price index, GLUN is the global commodity price uncertainty factor previously estimated, FX stands for the quarterly growth rate of the real effective exchange rate, INFL is the domestic inflation rate measured as the annual growth rate of Consumer Price Index, IR is the change in the domestic monetary policy (short-term) rate, EXP is the growth rate of total exports and GDP is the quarterly growth rate of real Gross Domestic Product. We estimate the same SVAR model for Australia, Canada, New Zealand, and Norway. We finally estimate the same set of SVAR models assessing sequentially the effects of agricultural, metals and energy-specific commodity price uncertainty shocks on commodity currencies. To do so, we use instead of GLUN, the AGUN, ENUN and MTUN factors (the group-specific agricultural, energy and metals price uncertainty factors respectively), and instead of COMRET, we include AGRET, ENRET and METRET which are the quarterly log-returns of the quarterly GSCI agricultural, energy and metals commodity price index respectively.

To recover orthogonal shocks, we use a classical Cholesky decomposition. We assume that a global financial uncertainty shock (a VIX shock) is driving uncertainty in global commodity markets, hence we place the VIX first in our SVAR ordering of variables. Our assumption on the VIX driving commodity market uncertainty within the quarter is in line with the recent findings in the commodity literature according to which the changes in the VIX cause fluctuations in the option-implied volatility of major global commodity futures markets (Robe and Wallen, 2016; Covindassamy et al., 2017). Moreover, by placing the COMRET and GLUN second and third

variables in the SVAR, we assume strict exogeneity of first and second moment shocks in commodity markets on the domestic economies under investigation. This assumption is in line with the relevant literature, according to which the small open inflation targeting economies (like those included in our analysis) are assumed to be (commodity) price takers and not price makers<sup>3</sup>. Lastly, the assumptions behind our SVAR ordering are that shocks instantaneously influence the (highly flexible) exchange rate market, then consumer prices and then quantities (exports and real GDP growth). We impose that monetary policy reaction takes place after observing inflationary pressures taking into consideration the fact that all our selected countries in the analysis have been carrying out inflation targeting monetary policy since the early 1990s.

### 3. Empirical analysis

#### 3.1 Descriptive statistics

In this section we provide some descriptive statistics for the time series involved into our analysis. More specifically, **Table 1** below shows the descriptive statistics of the commodity related variables used in the SVAR analysis, including the VIX, while **Figure 1** shows the estimated GLUN, AGUN, ENUN and MTUN factors along with their 66% confidence bounds as obtained from our Dynamic Factor Model.

[Insert Table 1 and Figure 1 Here]

---

<sup>3</sup> Some studies in the literature (see Zhang *et al.*, 2016) identify bi-directional linkages between commodity prices and their corresponding commodity currencies, implicitly assuming that large commodity-producers and exporters could influence global commodity prices. Our SVAR results do not qualitatively change when relaxing the strict exogeneity assumption of commodity-related shocks, allowing for exchange rates to have an instantaneous effect on commodity price fluctuations. These additional results can be provided upon request.

From **Table 1** we show that we reject the hypothesis of a unit root at 1% significance level for all our commodity related variables used in our analysis, implying thus that our SVAR models only deal with stationary time series (all macro variables are similarly shown to be stationary). The global commodity uncertainty (proxied by the estimated GLUN factor) exhibits large spikes during recessionary periods, including the Great Recession of 2007-2008 and the recent COVID-19 period. The estimated ENUN factor also spikes during the COVID-19 period, capturing the increased uncertainty surrounding energy markets and the many sudden swings in energy prices during the COVID outbreak. The MTUN factor spikes during the 2006 commodity boom period, during the 2008 Great Recession and on the recent COVID-19 outbreak, suggesting a strong business-cycle component of metals price fluctuations (Fama and French, 1988; Kucher and McCoskey, 2017; among others). On the other hand, as expected, our AGUN factor does not exhibit significant spikes during recessions and displays more regular variations, reflecting the fact that agricultural price uncertainty is partly driven by crop and harvesting periods (Karali and Thurman, 2010; Triantafyllou *et al.*, 2015; among others).

### **3.2 Response of commodity currencies to commodity price uncertainty shocks**

In this section we present the results of the SVAR model showing the dynamic impulse response functions (IRFs) of commodity currencies, namely the Australian (AUS), Canadian (CAN), New Zealand (NZEAL) and Norwegian (NOR) real effective exchange rates, to a global commodity price uncertainty shock (GLUN shock). **Figure 2** below shows the estimated IRFs of AUS, CAN, NZEAL and NOR real exchange rates along with their respective 66% bootstrapped confidence intervals.

[Insert Figure 2 Here]

The estimated IRFs of **Figure 2** show a statistically significant response of our set of commodity currencies to a global commodity price uncertainty shock. More specifically, the Australian and New Zealand exchange rates depreciate approximately by 1.2% and 1.0% respectively in response to a one standard deviation in the GLUN factor; the response remaining negative and statistically significant for two quarters after the GLUN shock. Canadian and Norwegian exchange rates reduce much less in response to a GLUN shock; the negative effect still being short-lived. Overall, our findings are the first to show the negative short-run response of commodity currencies to global commodity price uncertainty shocks. While the relevant literature thus far has extensively shown that commodity currencies exhibit significant positive comovement with global commodity prices (i.e. rising commodity prices result in an appreciation of the commodity currency, see Chen and Rogoff, 2003, Coudert *et al.*, 2015; Zhang *et al.*, 2016; among others), we additionally show here in opposition that rising uncertainty in global commodity markets has a negative short-run effect on commodity currencies. This empirical finding is in line with the theoretical and empirical literature on investment under uncertainty, according to which investors, after observing a rise in commodity market uncertainty, initially postpone their investment in ‘risky’ commodity currencies up until the uncertainty shock is resolved (Bloom, 2009; Pindyck, 1991). Another possible channel of transmission to exchange rates of a global uncertainty shock goes through the monetary policy reaction (see Section 3.3.).

We also note that our baseline SVAR results presented in **Figure 2** clearly show a subsequent rebound of commodity currencies few quarters after the initial GLUN shock. More specifically,



according to our SVAR analysis, a positive GLUN shock results in an initial depreciation of the commodity currencies in the short-run (1-2 quarters after the shock) followed by a subsequent appreciation in the medium-run (4-6 quarters after the shock), with the effect of the GLUN shock turning from negative to positive about 4 quarters after the shock. For instance, the response of the Australian dollar is significantly negative for the first two quarters after the GLUN shock, then becomes positive five quarters after the shock; the Australian dollar reaching an appreciation of about 0.7%. These results are also in line with the literature focusing on the macroeconomic impact of uncertainty shocks, according to which a positive macroeconomic uncertainty shock leads to an immediate drop and a subsequent bounce-back of economic activity in the medium-run (Bloom, 2009)<sup>4</sup>, especially in advanced economies (Carrière-Swallow and Céspedes, 2013).

This medium-term bounce-back on commodity currencies is likely to come from the uncertainty resolution channel, according to which the resolution of uncertainty reduces the hedging needs of financial market participants (Beber and Brandt, 2009). Hence, the resolution of the global uncertainty is likely to lead FX investors to revert to commodity currencies, increasing the demand for commodity currencies and ultimately generating an appreciation of the currency of commodity-producing economies in the medium-run. In addition, the positive medium-run impact of GLUN shocks on commodity currencies is in line with the theoretical and empirical insights of the relevant literature on commodity currencies, according to which there is a medium-term cointegrating relationship between commodity prices and commodity currencies. Indeed, it turns out that commodity price increases are associated with improved commodity terms of trade of commodity-rich economies in the medium-run (Bodart et al., 2012; Cashin et al., 2004; Chen and Rogoff, 2003).

---

<sup>4</sup> In his theoretical model, Bloom (2009) provides analytical explanations on the theoretical channels through which uncertainty shocks could lead to initial decline and a long run rebound of economic activity.

### 3.3 Responses of output, trade and monetary policy to commodity uncertainty

In order to disentangle the possible channels through which commodity price uncertainty impacts the currencies of commodity-rich economies, we report the IRF of output, trade and the policy rate to a GLUN shock estimated from our baseline SVAR model presented in Section 2. **Figure 3** below reports the estimated IRFs of real GDP growth, inflation, exports growth and monetary policy rate for our set of commodity-rich economies.

[Insert Figure 3 Here]

As we can see from **Figure 3**, it turns out that all the countries share similar patterns in their responses, except the fact that New Zealand appears to be more volatile. Overall, there is a significant short-run drop for macroeconomic variables, that is inflation, output and exports, but without any subsequent rebound in the medium-run. The fact that output and prices go in the same direction leads us to think that a global commodity price uncertainty shock is likely to act as a negative demand shock in the short-run (see also Ferrara et al., 2022). While the significant reduction of short-run economic activity in commodity-rich economies might be a potential explanation of the short-run currency depreciation, there is no clear evidence that the subsequent overshoot in currencies might be related to a strong medium-term economic recovery.

However, when focusing on the IRFs of the central bank interest rates of the four countries presented in the second column of **Figure 3**, we note that the responses tend to somewhat mimic the shape of the currency responses presented in **Figure 2**, even if they are not always clearly

significant, except for New Zealand. Thus, this suggests that monetary policy can be a driver of the response of commodity currencies after a global commodity shock, even if the force driving the short-run depreciation is stronger than the one driving the medium-run appreciation.

Those results reinforce the view that the main channel through which commodity price uncertainty leads to a medium-term appreciation is that foreign exchange investors treat commodity price uncertainty shocks as an opportunity to invest in commodity currencies in the medium-run, that is once the uncertainty shock fades away.

### **3.4 Commodity currencies vs non-commodity currencies**

To assess whether the significant effects of commodity price uncertainty shocks only hold for commodity-producing economies, we conduct the same type of SVAR analysis for two major non-commodity currencies, namely the U.S. dollar and the euro (in real effective terms). Moreover, following the relevant literature that identifies the role of the U.S. dollar as the safe haven currency in times of heightened macroeconomic uncertainty (Georgiadis *et al.*, 2021), we also present the responses of U.S. and euro real exchange rates to a VIX shock along with the respective responses of a GLUN shock<sup>5</sup>. **Figure 4** below shows the time series plots of the GLUN factor vs a commodity currency (Australian exchange rate) and a non-commodity currency (U.S. dollar).

[Insert Figure 4 Here]

By eyeballing **Figure 4** it seems that, while the spikes of GLUN quite often coincide with subsequent spikes of the U.S. dollar (highlighting the safe haven property), the opposite seems to

---

<sup>5</sup> Furthermore, in our SVAR model we make the assumption that the VIX is driving the global commodity market uncertainty.

prevail for the Australian dollar. The opposite reactions of U.S. and Australian dollars to GLUN spikes are more pronounced in turbulent periods, including the 2007-2008 Great Recession and the recent COVID-19 outbreak. To confirm this empirical observation, **Figure 5** below reports the estimated IRFs of euro and U.S. dollar to GLUN and VIX shocks.

[Insert Figure 5 Here]

We observe that, in line with the relevant literature, the U.S. dollar significantly appreciates after a positive VIX shock, confirming the role of the U.S. dollar as a safe haven currency during financial turmoil. Interestingly, we show that the U.S. dollar also appreciates in the short-run after a global commodity price uncertainty shock (GLUN shock, top left in **Figure 5**). In this way we show that the U.S. dollar is not only a safe haven asset in times of heightened financial uncertainty, but also in times of increasing global commodity price uncertainty. Interestingly, the inverse hump shaped response of the U.S. dollar to GLUN and VIX shocks (an initial appreciation followed by a medium-run depreciation) is the exact opposite of the commodity currencies' response. This result suggests that FX investors, when faced with high commodity price uncertainty, shift from commodity currencies (risky FX assets) to safe haven currencies (as the U.S. dollar) in order to hedge their exposure on commodity price uncertainty. This results to an immediate depreciation of commodity currencies and immediate appreciation of the typical safe haven currency. In the medium-run (i.e. after about one year), when the uncertainty shock fades away, that is uncertainty is resolved on global commodity markets, investors shift away from the U.S. dollar and go back towards commodity currencies. This movement results in a medium-run appreciation of commodity currencies as well as a medium term depreciation of the safe haven currency. As a

benchmark, we also estimate the response of the euro to GLUN and VIX shocks. It turns out that we report a non-significant response to both type of uncertainty shocks. This finding strengthens the common wisdom that the euro is less sensitive to global shocks and is not considered by market participants, at least so far, as a safe haven currency.

### **3.5 Agricultural, metals and energy commodity price uncertainty**

We continue our empirical analysis by assessing the impact of uncertainty shocks on market-specific commodities, once the global uncertainty component has been removed (see also Ferrara et al., 2022). Practically, we estimate SVAR models by sequentially replacing the GLUN factor by the AGUN, ENUN and MTUN factors as our endogenous variable capturing uncertainty in agricultural, energy and metals commodity markets respectively. In this way we examine the dynamic impact of commodity group-specific uncertainty on major commodity currencies.

All our selected commodity-producing countries export a wide range of agricultural, metals and energy commodities. Australia and Canada are more industrialized economies mainly concentrated on the production and exports of metals and energy commodities, while New Zealand is focused on the production of agricultural products, playing a significant role as a major exporter of agricultural commodities. On the other hand, Norway is among the largest crude oil exporters in the world. Given this type of commodity dependencies of those economies, we expect for instance, that the exchange rates of New Zealand and Norway will be more responsive to AGUN and ENUN shocks respectively. **Figure 6** below shows the results of our market-specific commodity uncertainty SVAR models.

[Insert Figure 6 Here]

The estimated IRFs presented in **Figure 6** show a significant short-run negative impact of metals price uncertainty shocks on commodity currencies, followed by a significant bounce-back behavior of commodity currencies about five quarters after the initial MTUN shock. This pattern of short-term depreciation followed by medium-term appreciation is similar the one obtained after the common commodity price uncertainty shock. The currency responding the most strongly to MTUN shocks is the Australian dollar: it depreciates by approximately 1% two quarters after the MTUN shock and then appreciates by 0.4% six quarters after the initial MTUN shock. This result is somewhat expected, given the fact that Australia has been for many years a major producer of precious metals, being the richest country in the world in terms of gold resources. Interestingly, our SVAR analysis identifies a short-run positive response of commodity currencies to ENUN shocks, showing in this way the unique nature of energy commodities like crude oil and natural gas. For instance, according to our results, the Australian dollar appreciates by approximately 1.3% after a one standard deviation ENUN shock. Even more interestingly, we find that the New Zealand dollar also appreciates by approximately 0.6% two quarters after an ENUN shock. The latter finding is puzzling given the fact that New Zealand is not concentrated on the production of energy commodities, hence one would expect the New Zealand dollar to be relatively immune to energy price uncertainty shocks. The fact that the exchange rates of both energy and non-energy producing economies appreciate in response to energy price uncertainty shocks suggests that FX investors do treat energy commodities differently. Indeed, investors seem to not interpret energy price uncertainty as a potential threat for commodity currencies, but instead as a potential opportunity (growth option channel of Bloom, 2014) to invest in commodity currencies with the expectation that the energy sector prices will be booming in the near future, increasing thus their demand for commodity currencies after the occurrence of ENUN shocks.

Finally, the IRFs presented in **Figure 6** show that AGUN shocks lead to a significant depreciation of commodity currencies on impact but the effect rapidly fades away after one or two quarters.

#### **4. Robustness checks**

In this section we report the various robustness checks we conducted for our SVAR models. First, we carried out a subsample analysis using the pre- and post-2004 sample for the estimation of the SVAR. Indeed, the year 2004 is often considered as the start of the financialization of commodity markets (see Delle Chiaie et al., 2022). We do not observe any significant changes in our IRFs estimated over both sub-samples. Second, instead of the VIX index, we used various alternative proxies for global economic uncertainty in our SVAR model, including the global Economic Policy Uncertainty (EPU) index of Baker et al. (2016) and the global geopolitical risk index of Caldara and Iacoviello (2022). Again, we didn't observe any significant changes on the IRFs. Third, following the strand of the literature identifying the terms of trade as the major channel through which commodity price fluctuations impact the exchange rate of commodity producing economies (Bodart *et al.*, 2012; Cashin *et al.*, 2004; Chen and Rogoff, 2003; Chen and Lee, 2018; Coudert *et al.*, 2015), we substituted export growth by terms of trade as our endogenous variable capturing trade shocks in the SVAR model. Again, our results remain qualitatively unchanged. Fourth, we additionally performed the SVAR analysis using alternative variable orderings and our results remain qualitatively the same. Fifth, motivated by the strand of the literature which identifies the reverse channel of causality between exchange rates and commodity prices (Chen *et al.*, 2010; Chen and Lee, 2018; Clements and Fry, 2008), we endogenized commodity price uncertainty by allowing exports and terms of trade shocks to have an instantaneous effect on

commodity uncertainty. The results of our model with endogenously determined commodity price uncertainty shocks also remain roughly identical.

Finally, in order to implicitly examine the indirect effect of the COVID-19 outbreak on the dynamic relationship between commodity uncertainty and commodity currencies, we performed the same SVAR analysis as the one presented in Subsection 3.2 for the pre-COVID period but with our time series ending in 2019q4. In this way we implicitly examined whether the inclusion (or not) of the COVID period into our time series sample is likely to either amplify or to tame the impact of commodity price uncertainty shocks on exchange rate fluctuations. We get that while the dynamic impact of commodity price uncertainty shocks on commodity currencies remains similar, the safe haven property of the U.S. dollar significantly deteriorates if we exclude the COVID-19 outbreak from our analysis. These results are in line with those of Georgiadis et al. (2021) who identify the significant safe haven property of the U.S. currency during the COVID-19 period.

## **5. Conclusions**

In this paper, we show that a global commodity price uncertainty shock results in a short-run depreciation for a panel of commodity currencies, followed by a medium run appreciation. This pattern appears to be specific to commodity currencies, as other benchmark currencies like the euro and the U.S. dollar do not react in the same way. The euro tends to be neutral to this type of shock, while the U.S. dollar acts as a safe haven currency by appreciating in the wake of a global commodity price uncertainty shock, as it does after a VIX shock (Georgiadis et al., 2021). We refer to this pattern as the “commodity uncertainty currency” property.



We show that macroeconomic fundamentals and monetary policy reactions to this type of uncertainty shock are in line with the first part of this pattern (i.e. the short-term depreciation), but there is no clear evidence as regards the second part of the movement, i.e. the medium-term appreciation. We attribute this medium-term bounce-back to the classical growth-option theory put forward in Bloom (2014), according to which investors expect high opportunities once the commodity uncertainty vanishes, leading to a strong currency demand.

Last, once we account for the global commodity price uncertainty shock, we get that market-specific uncertainty shocks tend to diverge in the short-run: agricultural and metals' shocks lead to a depreciation of commodity currencies, while energy shocks generate a significant appreciation.

## References

- Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *Quarterly Journal of Economics*, 131(4), 1593-1636.
- Basak, S., & Pavlova, A. (2016). A model of financialization of commodities. *The Journal of Finance*, 71(4), 1511-1556.
- Beber, A., & Brandt, M. W. (2009). Resolving macroeconomic uncertainty in stock and bond markets. *Review of Finance*, 13(1), 1-45.
- Bernanke, B. S., Gertler, M., Watson, M. (1997). Systematic monetary policy and the effects of oil price shocks. *Brookings Papers on Economic Activity*, 1997(1), 91-157.
- Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica*, 77(3), 623-685.
- Bloom, N. (2014). Fluctuations in uncertainty. *Journal of Economic Perspectives*, 28(2), 153-76.
- Bobenrieth, E., Wright, B., & Zeng, D. (2013). Stocks-to-use ratios and prices as indicators of vulnerability to spikes in global cereal markets. *Agricultural Economics*, 44(s1), 43-52.
- Bodart, V., Candelon, B., & Carpentier, J. F. (2012). Real exchanges rates in commodity producing countries: A reappraisal. *Journal of International Money and Finance*, 31(6), 1482-1502.
- Bjørnland, H. C. (2009). Monetary policy and exchange rate overshooting: Dornbusch was right after all. *Journal of International Economics*, 79(1), 64-77.
- Caldara, D., & Iacoviello, M. (2022). Measuring geopolitical risk. *American Economic Review*, 112(4), 1194-1225.
- Cashin, P., Céspedes, L. F., & Sahay, R. (2004). Commodity currencies and the real exchange rate. *Journal of Development Economics*, 75(1), 239-268.
- Carrière-Swallow, Y., & Céspedes, L. F. (2013). The impact of uncertainty shocks in emerging economies. *Journal of International Economics*, 90(2), 316-325.
- Chen, Y. C., & Rogoff, K. (2003). Commodity currencies. *Journal of international Economics*, 60(1), 133-160.
- Chen, Y. C., Rogoff, K. S., & Rossi, B. (2010). Can exchange rates forecast commodity prices?. *The Quarterly Journal of Economics*, 125(3), 1145-1194.
- Chen, Y. C., & Lee, D. (2018). Market power, inflation targeting, and commodity currencies. *Journal of International Money and Finance*, 88, 122-139.
- Clements, K. W., & Fry, R. (2008). Commodity currencies and currency commodities. *Resources Policy*, 33(2), 55-73.
- Coudert, V., Couharde, C., and Mignon, V. (2015). On the impact of volatility on the real exchange rate–terms of trade nexus: Revisiting commodity currencies. *Journal of International Money and Finance*, 58, 110-127.
- Covindassamy, G., Robe, M. A., & Wallen, J. (2017). Sugar with your coffee? Fundamentals, financials, and softs price uncertainty. *Journal of Futures Markets*, 37(8), 744-765.

- Deaton, A., & Laroque, G. (1992). On the behaviour of commodity prices. *Review of Economic Studies*, 59(1), 1-23.
- Delle Chiaie, S., Ferrara, L., & Giannone, D. (2022). Common factors of commodity prices. *Journal of Applied Econometrics*, 37(3), 461-476.
- Devereux, M. B., & Smith, G. W. (2021). Testing the Present-Value Model of the Exchange Rate with Commodity Currencies. *Journal of Money, Credit and Banking*, 53(2-3), 589-596.
- Dornbusch, R. (1976). Expectations and exchange rate dynamics. *Journal of Political Economy*, 84(6), 1161-1176.
- Fama, E. F., & French, K. R. (1987). Commodity Futures Prices: Some Evidence on Forecast Power, Premiums, and the Theory of Storage. *Journal of Business*, 55-73.
- Fama, E. F., & French, K. R. (1988). Business cycles and the behavior of metals prices. *Journal of Finance*, 43(5), 1075-1093.
- Ferrara, L., A. Karadimitropoulou & A. Triantafyllou (2022), Commodity price uncertainty co-movement: Does it matter for global economic growth? CAMA Working Paper No. 08/2022.
- Ferraro, D., Rogoff, K., & Rossi, B. (2015). Can oil prices forecast exchange rates? An empirical analysis of the relationship between commodity prices and exchange rates. *Journal of International Money and Finance*, 54, 116-141.
- Georgiadis, G., Müller, G., & Schumann, B. Dollar dominance and the international adjustment to global risk. ECB Working Paper
- Gorton, G., & Rouwenhorst, K. G. (2006). Facts and fantasies about commodity futures. *Financial Analysts Journal*, 62(2), 47-68.
- Gorton, G. B., Hayashi, F., & Rouwenhorst, K. G. (2013). The fundamentals of commodity futures returns. *Review of Finance*, 17(1), 35-105.
- Hamilton, J. D. (2003). What is an oil shock?. *Journal of Econometrics*, 113(2), 363-398.
- Kara, E. (2017). Does U.S. monetary policy respond to oil and food prices?. *Journal of International Money and Finance*, 72, 118-126.
- Karadimitropoulou, A., & León-Ledesma, M. (2013). World, country, and sector factors in international business cycles. *Journal of Economic Dynamics and Control*, 37(12), 2913-2927.
- Karali, B., & Thurman, W. N. (2010). Components of grain futures price volatility. *Journal of Agricultural and Resource Economics*, 167-182.
- Kilian, L., Rebucci, A., & Spatafora, N. (2009). Oil shocks and external balances. *Journal of international Economics*, 77(2), 181-194.
- Kose, M. A., Otrok, C., & Whiteman, C. H. (2003). International business cycles: World, region, and country-specific factors. *American Economic Review*, 93(4), 1216-1239.
- Kucher, O., & McCoskey, S. (2017). The long-run relationship between precious metal prices and the business cycle. *Quarterly Review of Economics and Finance*, 65, 263-275.

- Milonas, N. T., & Thomadakis, S. B. (1997). Convenience yields as call options: an empirical analysis. *The Journal of Futures Markets*, 17(1), 1.
- Robe, M. A., & Wallen, J. (2016). Fundamentals, derivatives market information and oil price volatility. *Journal of Futures Markets*, 36(4), 317-344.
- Tang, K., & Xiong, W. (2012). Index investment and the financialization of commodities. *Financial Analysts Journal*, 68(6), 54-74.
- Pindyck, R. S. (2004). Irreversibility, Uncertainty, and Investment. *Journal of Economic Literature*, 29, 1110-1148.
- Pindyck, R. S. (2004). Volatility and commodity price dynamics. *Journal of Futures Markets*, 24(11), 1029-1047.
- Triantafyllou, A., Dotsis, G., & Sarris, A. H. (2015). Volatility forecasting and time-varying variance risk premiums in grains commodity markets. *Journal of Agricultural Economics*, 66(2), 329-357.
- Triantafyllou, A., & Dotsis, G. (2017). Option-implied expectations in commodity markets and monetary policy. *Journal of International Money and Finance*, 77, 1-17.
- Triantafyllou, A., Dotsis, G., & Sarris, A. (2020). Assessing the vulnerability to price spikes in agricultural commodity markets. *Journal of Agricultural Economics*, 71(3), 631-651.
- Zhang, H. J., Dufour, J. M., & Galbraith, J. W. (2016). Exchange rates and commodity prices: Measuring causality at multiple horizons. *Journal of Empirical Finance*, 36, 100-120.

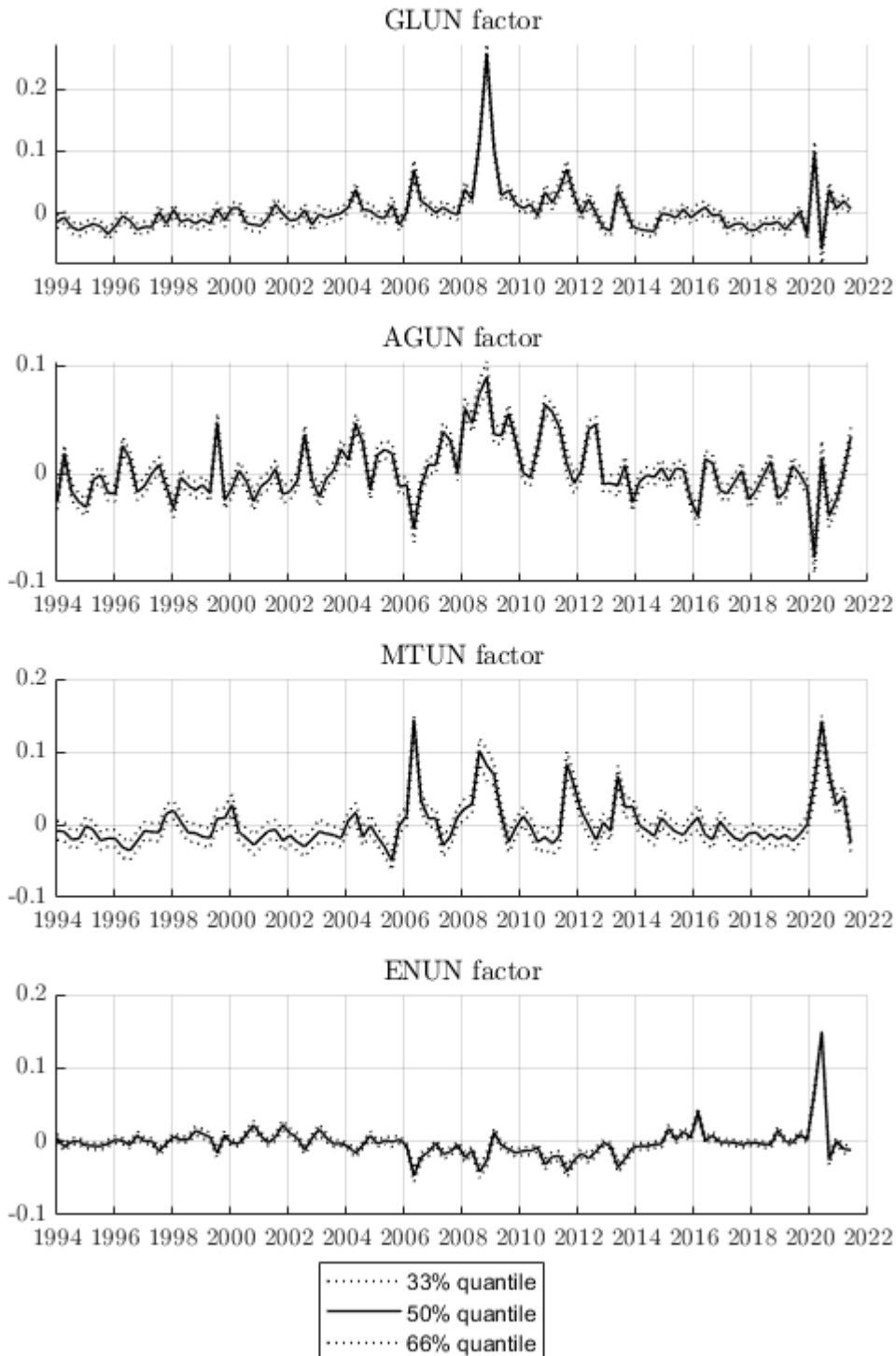
**Table 1. Descriptive statistics**

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	ADF test
GLUN	-0.0001	-0.006	0.258	-0.059	0.034	3.90	26.50	-6.625***
AGUN	-0.0004	-0.007	0.089	-0.078	0.027	0.76	3.87	-6.958***
MTUN	0.0001	-0.009	0.144	-0.050	0.031	2.35	9.93	-6.174***
ENUN	-0.0006	-0.003	0.150	-0.046	0.023	3.64	23.08	-7.613***
AGRET	-0.0100	-0.018	0.213	-0.389	0.082	-0.25	6.22	-8.865***
ENRET	-0.0008	0.023	0.357	-0.677	0.156	-1.33	6.96	-8.632***
METRET	0.0032	-0.005	0.150	-0.160	0.058	0.46	3.29	-8.680***
VIX	0.1949	0.174	0.586	0.103	0.072	1.89	9.41	-4.378***

**Note:** In the Augmented Dickey-Fuller (ADF) unit root test we denote with \*, \*\* and \*\*\* the rejection of the unit root hypothesis at the 10%, 5% and 1% confidence level respectively. The descriptive statistics presented in this table correspond to the monthly full (Jan 1990-Apr 2022) dataset.

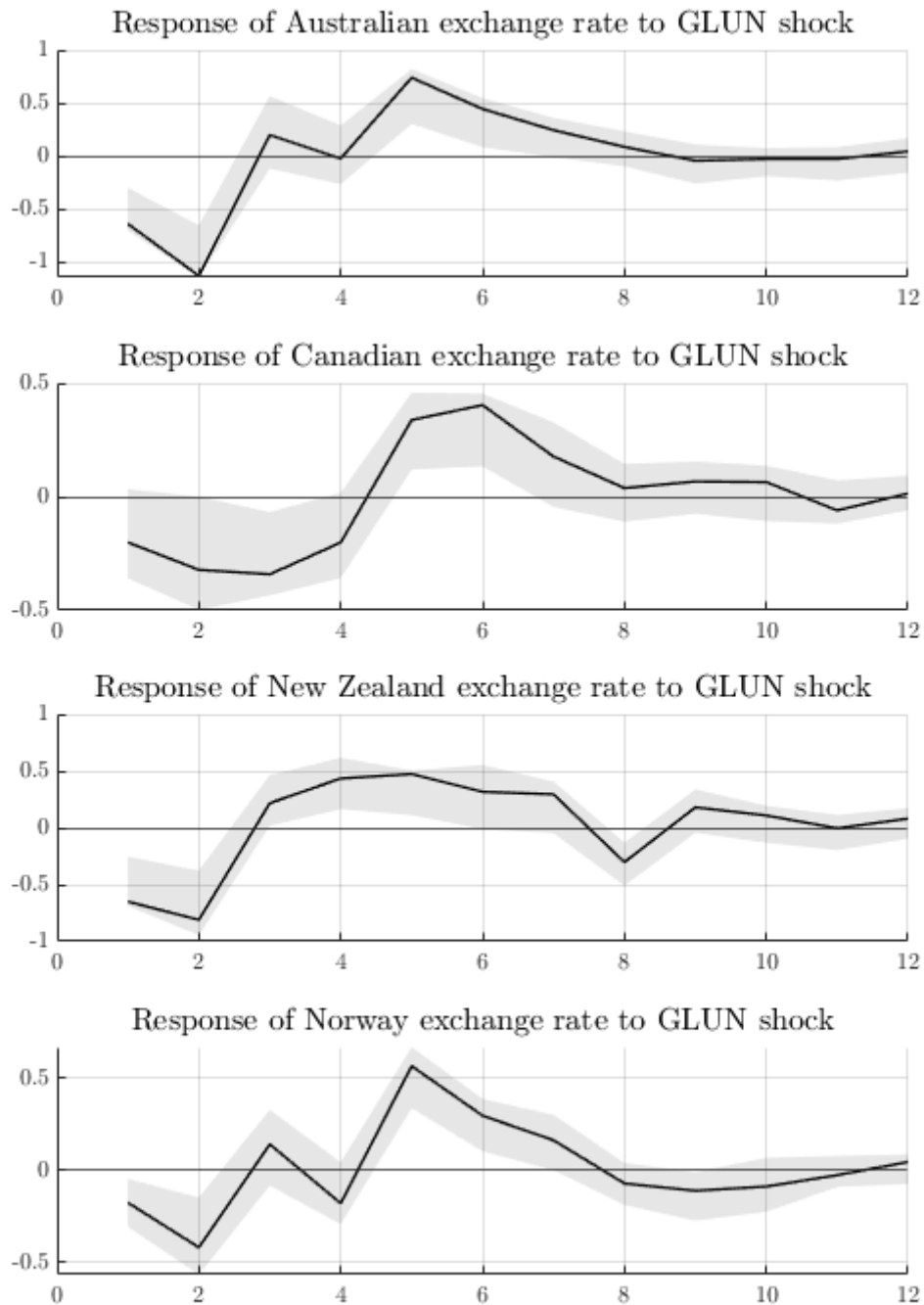
**Figure 1. Global, agricultural, energy and metals commodity price uncertainty factors**

This plot shows the quarterly series of the estimated global commodity price uncertainty (GLUN), agricultural price uncertainty (AGUN), metals price uncertainty (MTUN) and energy price uncertainty (ENUN) factors estimated via our Bayesian Dynamic Factor Model.



**Figure 2. Response of commodity currencies to GLUN shock**

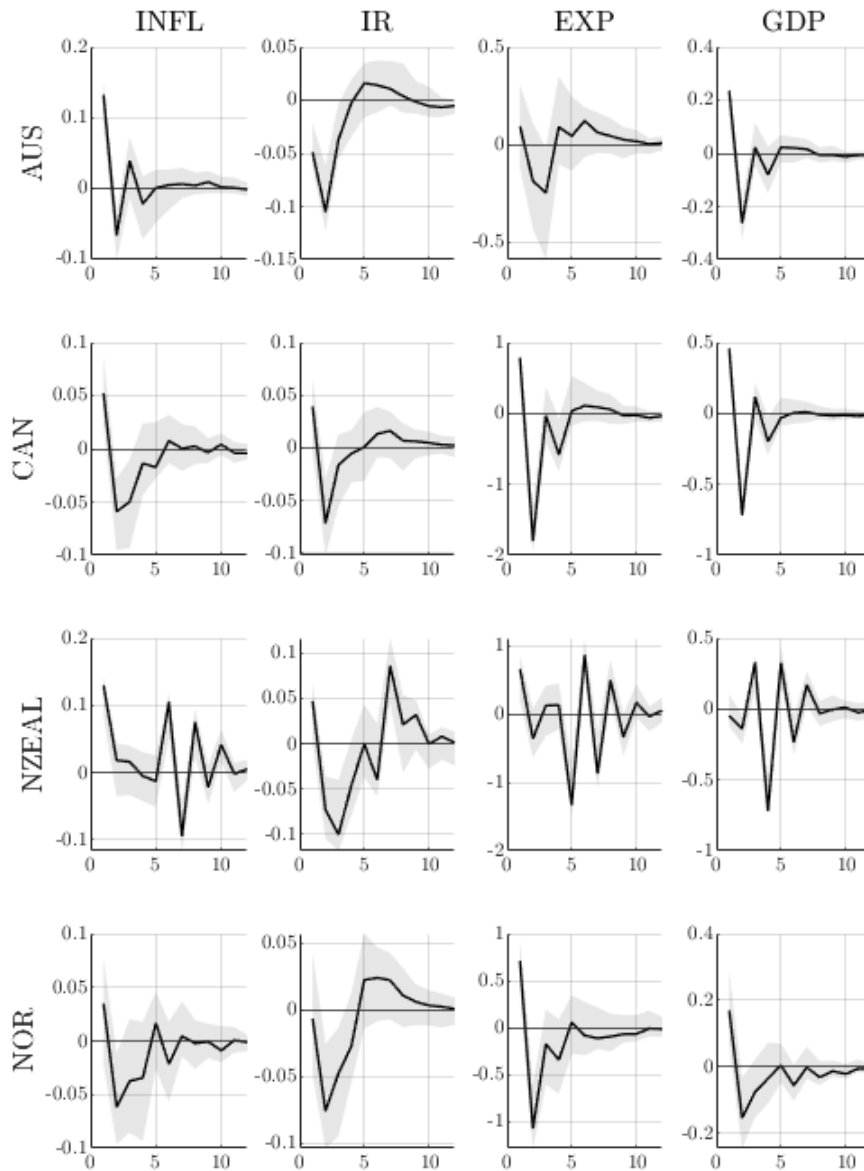
This graph shows the estimated Orthogonalized Impulse Response Functions of the quarterly growth rate of Australia, Canada, New Zealand and Norway real broad effective exchange rates to a positive one standard deviation shock in GLUN. The estimated responses are expressed in percentages (%). The shaded area shows 68% bootstrapped confidence intervals using 1000 repetitions.



**Figure 3. Response of output, inflation, trade and monetary policy to GLUN shock**

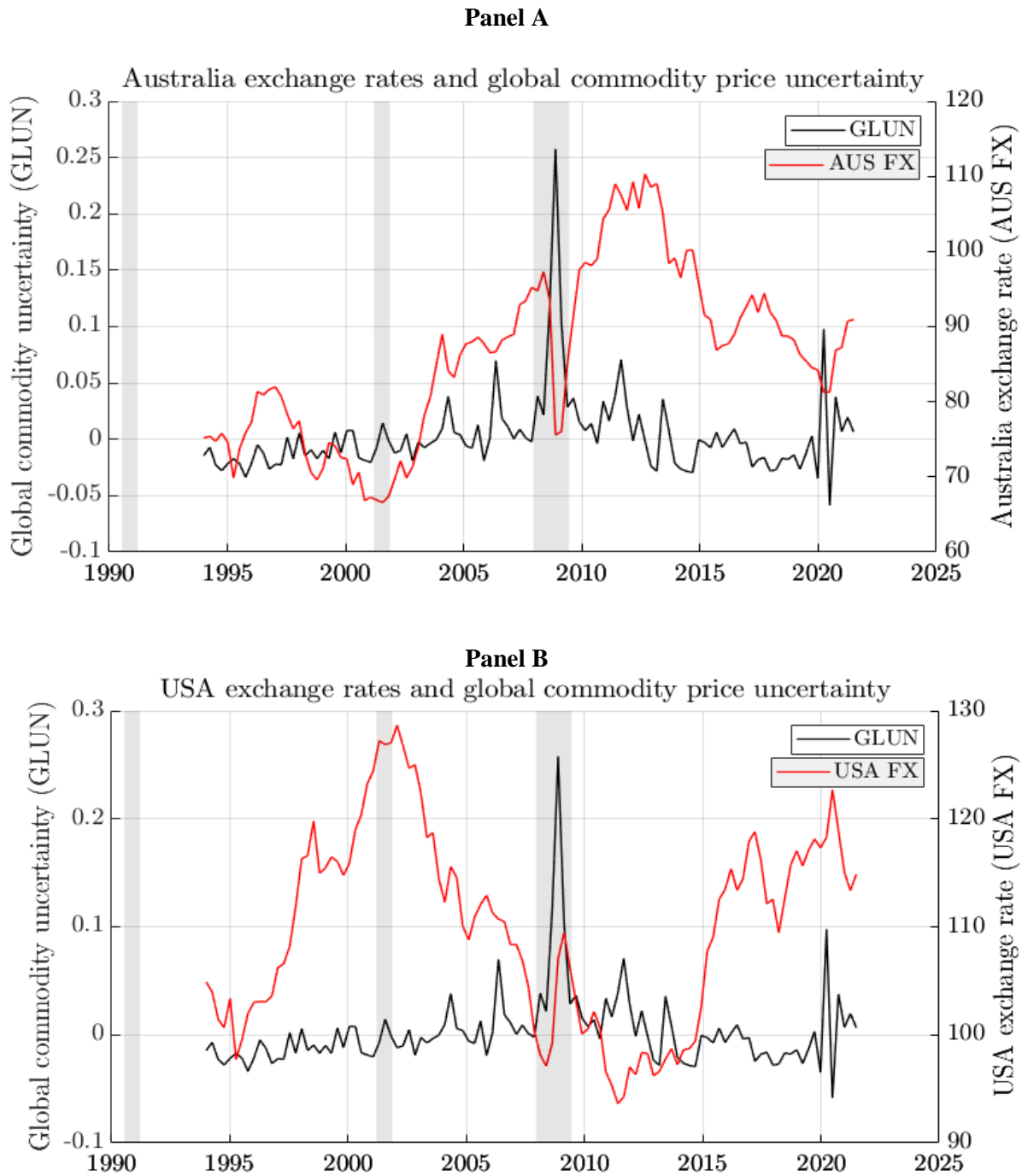
This graph shows the estimated Orthogonalized Impulse Response Functions of the quarterly growth rate of Australia, Canada, New Zealand and Norway real GDP growth (GDP), inflation (INFL), exports growth (EXP) and of the short-term (policy) rate (IR) to a positive one standard deviation shock in GLUN. The estimated responses are expressed in percentages (%). The shaded area shows the 68% bootstrapped confidence intervals using 1000 repetitions.

Responses of inflation, output, trade and monetary policy to GLUN shock

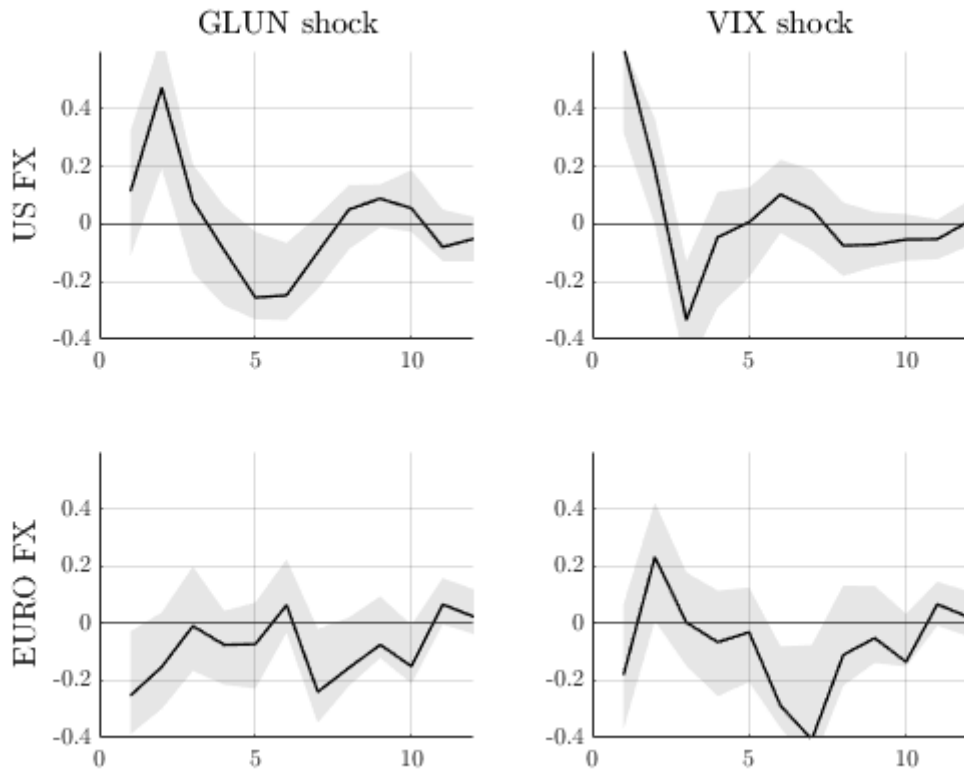




**Figure 4. Australian and U.S. exchange rates and global commodity price uncertainty**



**Figure 5. Response of U.S. and Euro (non-commodity currencies) exchange rates to GLUN shock**  
 This graph shows the estimated Orthogonalized Impulse Response Functions of the quarterly growth rate of U.S. A and EURO real broad effective exchange rates to a positive one standard deviation shock in GLUN. The estimated responses are expressed in percentages (%). The shaded area shows the 68% bootstrapped confidence intervals using 1000 repetitions.



**Figure 6. Response of commodity currencies to AGUN, ENUN and MTUN shocks**

This graph shows the estimated Orthogonalized Impulse Response Functions of the quarterly growth rate of Australia, Canada, New Zealand and Norway real broad effective exchange rates to a positive one standard deviation shock in AGUN, ENUN and MTUN. The estimated responses are expressed in percentages (%). The shaded area shows the 68% bootstrapped confidence intervals using 1000 repetitions.

