Do commodity price volatilities impact currency misalignments in commodity-exporting countries?

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Abstract

This paper aims to investigate the relationship between misalignments of real effective exchange rates and real commodity price volatilities in a sample of 46 commodity-exporting countries by considering financial development as the transition variable. We first estimate currency misalignments as deviations of the observed real effective exchange rates from their equilibrium values estimated using the behavioural equilibrium exchange rate (BEER) approach. Then, we rely on panel data and a smooth-transition regression model to estimate commodity price volatilities' non-linear impacts on currency misalignments. Our results indicate that the estimated coefficients are highly significant, and demonstrate that real commodity prices' volatility has a non-linear impact on currency misalignments depending on the country's degree of financial development.

1. Introduction

Financial investors deal with commodities as an asset category similar to equities or bonds. When investing in futures markets, financial investors should be adverse to different types of risks, such as portfolio or currency risk. In particular, a specific risk in an international context can involve fluctuations in exchange rates. For instance, fluctuations in the real effective exchange rate appear to be a crucial variable in determining trade capabilities and economic stability among countries with income primarily derived from commodity exports. Many empirical studies have proven that the real prices of commodity exports are the preponderant factor in determining commodity-exporting countries' real exchange rates (Amano & van Norden, 1998a; 1998b; Chen & Rogoff, 2003; Cashin et al., 2004; Cayen et al., 2010).[1] Therefore, policymakers and financial investors must fully understand the relationship between movements among commodities' real prices and fluctuations in real exchange rates. This paper aims to better capture the relationship between this volatility in real commodity prices and the real exchange rates of commodity-producing countries—in both the short- and long-term—by paying particular attention to the non-linearity impacts. Thus, we follow original works by Chen and Rogoff (2003) and Cashin et al. (2004), which demonstrate that commodities' real prices are a preponderant factor in determining the real exchange rates for commodity-exporting countries.

Since the oil shocks of the 1970s, commodity prices' movements have been attributed to fundamental factors linked to changes in supply and demand.[2] Recently, several investigations—including those by Irwin and Sanders (2010), Inamura et al. (2011), Céspedes and Velasco (2012), and Hong et al. (2015)—have highlighted the main factors that affect commodity prices: commodity demand growth fluctuations in such emerging markets as China and India, interruptions in oil production, demand elasticity, and the increased cost of biofuels. However, the multiple and rapid slumps and increases among all major commodity prices since 2002 suggest that many macroeconomic and financial factors must be considered to better understand recent commodity price movements (Mayer, 2009; Hong & Yogo, 2012; Cheng & Xiong, 2013).[3] Further, since the 2008 global crisis it has become more difficult for policymakers and researchers to assess the reasons for, and impacts of, commodity price movements.[4] A range of empirical studies—such as works by Büyüksahin and Robe (2011), Inamura et al. (2011), and Silvennoinen and Thorp (2013), among others—has emphasized the increasing correlation between commodities and financial markets, supporting the idea that financial investors affect commodity price movements.[5] Recently, several such financial actors as investment banks, retail investors, hedge funds, and mutual and pension funds have invested in commodity futures, highlighting the relevance of the purported "financialization of commodities." For example, Domanski and Heath (2007) highlighted the increasing

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[1] See, for example, Coudert et al. (2015) or Boubakri et al. (2019) for a complete literature review.

[2] See, for example, Killian (2008) for a literature review.

[3] See Henderson et al. (2015) for a literature review.

[4] For example, prices in the oil sector increased from $72 to $160 in 18 months (from January 2007 to June 2008). Subsequently, they decreased from $160 to $50 in the next six months.

[5] See, for example, Chari and Christiano (2017) and Cheng and Xiong (2013).

number of contracts in derivative commodity markets, which tripled between 2002 and 2005.[6] Clearly, this ongoing financialization process must be developed to an extent that warrants the continuing supervision and regulation of commodity markets, as well as diversifying and reducing portfolio risks.[7] For example, Baker and Routledge (2012) developed a dynamic model to demonstrate that dynamic risk-sharing can generate wide variations in both prices and risk premia in the commodity market.[8]

This paper's objective is twofold. First, it aims to interpret how real commodity prices interact under a new context of commodity market financialization. Second, it will evaluate the impact on currency misalignments by considering how financial markets are developed. The misalignment of real exchange rates is a primary pillar in commodity-exporting countries' trade strategies; specifically, undervaluing currencies reinforces commercial competitiveness, which stimulates domestic production and exports while reducing imports. A notable empirical example is that of the Chinese government, which has undervalued the yuan against the other major currencies for decades, and especially the US dollar.[9] This effectively facilitated China's exports and its rapid economic growth (Cline, 2010). In contrast, an overvalued currency typically indicates an increased probability of a possible currency crash (Frankel & Rose, 1996). Additionally, persistent misalignments may distort the relative prices of traded versus non-traded goods, which may generate economic instability (Edwards, 1989).

This paper contributes to existing literature by demonstrating how commodity price movements affect currency misalignments among commodity-exporting countries by incorporating a new "commodity financialization" process in the analysis. We aim to capture commodity market volatilities' non-linear effects on exchange rate misalignments. Our empirical study is based on a sample of 46 commodity-exporting countries divided into four panels: food and beverages, energy, metals, and raw materials. We rely on the panel smooth transition regression (PSTR) model proposed by González et al. (2005) to consider the potential non-linear relationship between commodity price volatilities and exchange rate misalignments. Our main findings reveal that commodity price volatilities tend to slightly increase real exchange rate misalignments when a country is financially better developed. These findings also confirm a change in the relationship between commodity and currency markets that may be induced by increasing financial depth as well as the intensification of commodities' financialization in the post-2000 era.

The remainder of this paper is structured as follows: Section 2 presents our empirical methodology and describes the data in general, and its statistical properties in particular. Section 3 presents our results and their implications. Section 4 concludes.

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[6] Mayer (2009) demonstrated that the number of contracts for commodity futures and options markets increased more than threefold between 2002 and mid-2008. Moreover, Masters and White (2008) noted that commodity index investments increased between 2003 and 2008, from 13 to 370 billion USD.

[7] For a literature review on the financialization of commodities, see Cheng and Xiong (2013) and Zarembalver and Neumann (2015).

[8] See also Basak and Pavlova (2016) for a commodity-financialization model.

[9] For example, Frankel (2005) found that the yuan was undervalued by 36% in 2000; Shröder (2013) also provides a review.

2. Empirical methodology and data description

2.1. The sample of countries, commodity price index, and financial development level

We consider monthly data, from January 1994 to December 2016, for a sample of 46 commodity-exporting countries divided into four panels: food and beverages, energy, metals, and raw materials.: Algeria, Argentina, Australia, Bahrain, Bolivia, Brazil, Cameroon, Canada, Chile, Colombia, Ethiopia, Ghana, Honduras, Iceland, India, Indonesia, Iran, Ivory Coast, Kenya, Kuwait, Malawi, Malaysia, Mali, Mexico, Morocco, Mozambique, Niger, Norway, Oman, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Saudi Arabia, Senegal, South Africa, Thailand, Togo, Tunisia, Turkey, Uganda, United Arab Emirates, Uruguay, Venezuela, and Zambia.

We select the commodity price index in accordance with the main type of commodity exported by each country. All price indices are extracted from the International Monetary Fund's (IMF) database (*Primary Commodity Prices*).

As previously mentioned when discussing the PSTR model, we introduced a financial transition variable to consider the commodity markets' increasing financialization, although the choice of the financial development variable must also be discussed. Indeed, different methods have been used to measure financial development.[10] As demonstrated by, for example, Boubakri et al. (2016), de facto measures seem to be more appropriate. Regarding the de facto measure, we follow Levine et al. (2000)[11] and measure the degree of financial development by the ratio of M2 to GDP, taken from the World Bank database (*World Development Indicators*). We also use the ratio of private credit to GDP as an alternative indicator and as robustness checks of the financial development level. This ratio is taken from the World Bank database (*World Development Indicators*).

2.2. Empirical methodology

This study aims to assess the impact of real commodity prices' volatility on currency misalignments by considering the level of financial development as a transmission channel. We evaluate this relationship by considering the PSTR model proposed by González et al. (2005). We denote the dependent variable as $|MIS_{i,t}|$, with the monthly real effective exchange rate misalignments expressed as absolute values; thus, the PSTR model is as follows:

$$|MIS_{i,t}| = \alpha_i + \beta_0 \Delta\, ComPI_{i,t} + \left[\beta_1 \Delta\, ComPI_{i,t} * F\left(S_{i,t}; \gamma, c\right)\right] + \varepsilon_{i,t} \qquad (1)$$

for $t = 1, \ldots, T$ and $i = 1, \ldots, N$, with t denoting time and i the country. Further, α_i denotes the country fixed effects and $\Delta\, ComPI_{i,t}$ represents the volatility of the real commodity price index, and is proxied by the absolute value of the monthly variation in the real commodity price index; it also corresponds to the exogenous variable that determines whether the transition function F is active; $S_{i,t}$ represents the transition variable, defined here as the level

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[10] For example, Ligonnière (2018) provides further discussion.

[11] Levine (2005) and Svirydzenka (2016) demonstrated that several indicators can be used to assess the financial development level, but the ratio of M2 to GDP seems to be the most common in literature.

of financial development; and $\varepsilon_{i,t}$ is an independent and identically distributed (i.i.d.) error term. The transition function $F(S_{i,t}; \gamma, c)$ is a continuous function of $S_{i,t}$ and is normalized to be bound between zero and one; these extreme values are associated with regression coefficients β_0 and $\beta_0 + \beta_1$. This transition function is given as originally noted by González et al. (2005):

$$F(S_{i,t}; \gamma, c) = \left(1 + exp\left(-\gamma \prod_{j=1}^{m}(S_{i,t} - c_j)\right)\right)^{-1} \qquad (2)$$

where c_j ($j = 1, 2, \dots, m$) are the threshold parameters ($c_1 \leq c_2 \leq \cdots \leq c_m$) and γ is the slope parameter of the transition function. According to González et al. (2005) it is usually sufficient in practice to consider $m = 1$ (logistic) and $m = 2$ (logistic quadratic). In the case of $m = 1$, the dynamics are asymmetric, and the two extreme regimes are associated with the transition variable's low and high values; the change is centered around the threshold (c_1). In the case of $m = 2$, the dynamics are symmetric and the transition function's minimum is at $(c_1 + c_2)/2$; it attains a value of one at both low and high values of the transition variable.

2.3. Equilibrium exchange rate and currency misalignments

Various concepts of equilibrium exchange rates exist, from the short-term market equilibrium to the incredibly long-term universal price convergence.[12] We account for the long-term relationship between the real exchange rate and its determinants by following the behavioral equilibrium exchange rate (BEER) methodology introduced by MacDonald (1997, 2000) and Clark and MacDonald (1998). For example, the IMF has adopted this approach (Isard, 2007), as it appears less normative than other methodologies—such as the fundamental equilibrium exchange rate (FEER)—and yields excellent empirical results.[13] The BEER methodology's real effective exchange rate is expressed as a function of three fundamental variables:[14]

$$LREER_{i,t} = \mu_i + \theta_1 LBS_{i,t} + \theta_2 NFA_{i,t} + \theta_3 LToT_{i,t}^{com} + u_{i,t} \qquad (3)$$

where $LREER_{i,t}$ is the logarithm of the real effective exchange rate, $LBS_{i,t}$ is the country's productivity (the Balassa-Samuelson effect) expressed as a logarithm, $NFA_{i,t}$ denotes its net foreign asset position as a percentage of GDP, and $LToT_{i,t}^{com}$ signifies its real commodity trade terms expressed as a logarithm; α_i accounts for individual fixed effects and $u_{i,t}$ is an i.i.d. error term.

Real effective exchange rates are provided by the Bank for International Settlements and Bruegel databases.

The Balassa-Samuelson effect, or *productivity differential,* is approximated by the GDP per capita, measured in purchasing power parity (PPP) relative to the trading partners. The GDP-PPP and GDP data variables are both extracted from the IMF's International Financial Statistics database.[15]

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[12] For example, Bénassy-Quéré et al. (2010) or Bussière et al. (2010) provide further discussion.

[13] For example, Driver and Westaway (2005) and Durand and Lopez (2012) provide further discussion.

[14] For example, Clark and MacDonald (1998), Chinn (2005), and Ricci et al. (2008) provide further discussion.

[15] As a robustness check, we also use Balassa-Samuelson effect data from the *EQCHANGE* database (Cepii). The results are available upon request from the authors, and are quite similar.

The net foreign asset position (NFA) refers to the value of the sum of foreign assets held by monetary authorities and deposit-money banks, less the value of foreigners' domestic assets; this is expressed as a percentage of GDP. The NFA series data are obtained from an updated, extended version of the dataset constructed by Lane and Milesi-Ferretti (2007) for the period from 1980 to 2015.[16] We compute the variable for the last year (2016) by adding the previous NFA position to the contemporaneous current account, and we consider the variable as a percentage of GDP. Data on the current account and GDP (in US dollars) are taken from the IMF's World Economic Outlook database.

The real commodity terms of trade are calculated in the same way as in work by Cashin et al. (2004). Consequently, the real commodity terms of trade are a weighted average price of the country's three main exported commodities, deflated by the manufactured unit value.

The real exchange rate misalignment, noted as $MIS_{i,t}$, is computed as follows:

$$MIS_{i,t} = \hat{u}_{i,t} = LREER_{i,t} - LREER_{i,t}^{EST} \tag{4}$$

where $LREER_{i,t}^{EST}$ is the real effective (estimated) equilibrium exchange rate.

3. Results

We must use monthly data to investigate the long- and short-term relationships between real commodity price volatilities and exchange rate misalignments. Therefore, we reconstruct our variables of interest—relative productivity, net foreign assets, and the real commodity trade terms—at a monthly frequency using a typical interpolation procedure.[17]

3.1. The long-term relationship and currency misalignments

We first apply cross-section dependence and several panel unit root and cointegration tests, showing that our four series (LREER, LToT^{com}, NFA and LBS) can be considered as unit root processes and are cointegrated.[18] We then estimate the cointegrating relationship in equation (3).

As ordinary least squares (OLS) estimates are biased and depend on nuisance parameters, we use the dynamic OLS (DOLS) procedure introduced by Kao and Chiang (2000) and Mark and Sul (2003) in the panel cointegration context. We also use the BKN estimation procedure proposed by Bai et al. (2009). The DOLS procedure involves augmenting the cointegrating relationship with the regressors' lead and lagged differences to control for endogenous feedback effects. While this approach accounts for a certain form of cross-sectional dependence through possible time effects, the procedure developed by Bai et al. (2009) specifically addresses this property. Further, the BKN technique captures cross-sectional dependence by introducing unobservable common factors in the errors. An iterative procedure jointly estimates the cointegration coefficient and these factors.

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[16] For more information, see http://www.philiplane.org/EWN.html and work by Lane and Milesi-Ferretti (2007).

[17] We also use the proportional Denton method, which is both robust (Chen, 2007) and recommended in IMF or Federal Reserve Bank publications (Kinda, 2011; Liu et al., 2011).

[18] To save space, complete results are available upon request from the authors.

We use the DOLS and BKN procedures to obtain estimation results for the cointegrating relationship, as Table 1 indicates.

Table 1: Results of the cointegrating relationship

	DOLS Method	BKN Method
LBS	0.119***	0.116***
	(7.439)	(7.504)
NFA	0.081***	0.080***
	(17.711)	(19.062)
LToT^{com}	0.033***	0.046***
	(5.047)	(7.016)

Notes: Estimation of equation (3):

$$LREER_{i,t} = \mu_i + \theta_1 LBS_{i,t} + \theta_2 NFA_{i,t} + \theta_3 LToT_{i,t}^{com} + u_{i,t}$$

t-statistics are given in parentheses. Significant coefficient at 1% (***), 5% (**) or 10% (*).

Regardless of whether the DOLS or BKN procedures are used, the three fundamental variables' estimated coefficients exhibit the expected signs and are significant at conventional levels. Subsequently, an increase in relative productivity, the NFA position, and commodity trade terms lead to an appreciation of the real effective exchange rate. The commodity terms of trade seem to be an important determinant of the real effective exchange rate, as Cashin et al. (2004) demonstrate. Moreover, the currencies among our commodity-dependent countries can be considered "commodities currencies," as the long-term elasticity of the real effective exchange rate versus the (commodity) terms of trade is positive and significant. We also note that the estimated cointegrating coefficients' values are smaller when the BKN procedure is applied. Indeed, Bodart et al. (2012) demonstrated that when correcting for the bias induced by cross-sectional dependence, the considered fundamentals still have significant long-term impacts, but these are reduced compared to the effect obtained using the DOLS methodology.

We then check whether our results for the entire panel might be masking some heterogeneity across countries following the types of commodity they export; first, we subdivided our panel into four groups depending on the nature of the main commodity each country exports: food and beverages, metals, raw materials, and energy. We then estimated the long-term relationship for these country sub-groups, and Table 2 presents the estimated coefficients.

The findings confirm that commodity trade terms are a significant determinant of the real effective exchange rate for the four commodity panels, except for the energy panel, with mixed results for the relative productivity and NFA position. They are sometimes non-significant (*LBS* for raw materials and energy, and *NFA* for energy only).

We use these estimated coefficients to calculate each panel's equilibrium exchange rates. Currency misalignments are then derived following Equation (6) as the difference between the observed real effective exchange rates and their equilibrium value.[19]

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[19] For brevity, we do not report figures that display the evolution of observed and equilibrium real effective exchange rates and their associated misalignments. These results are available from the authors upon request.

Table 2: Results of the cointegrating relationship for subgroups of countries
according to the commodity classification

	Food and beverages	Metals	Raw materials	Energy
LBS	0.405***	0.325***	0.107**	0.182**
	(13.461)	(4.277)	(0.042)	(0.023)
NFA	0.102***	0.145***	0.018	0.100***
	(15.884)	(7.983)	(0.448)	(3.504)
LToT^{com}	0.055***	0.033**	0.051***	-0.052
	(3.916)	(1.732)	(0.008)	(-1.561)

Notes: Estimation of equation (3):

$$LREER_{i,t} = \mu_i + \theta_1 LBS_{i,t} + \theta_2 NFA_{i,t} + \theta_3 LToT_{i,t}^{com} + u_{i,t}$$

This equation is estimated using only the DOLS procedure.[20] *t-statistics* are given in parentheses. Significant coefficient at 1% (***), 5% (**) or 10% (*).

3.2. The non-linear relationship: The PSTR estimation results

We now assess the short-term non-linear relationship between real commodity price volatilities and currency misalignments. However, studying non-linear relationship requires a specific modeling strategy. According to González et al. (2005), the modeling process involving panel data must first test linearity against the PSTR alternative. If linearity in our study is rejected, the real commodity price volatilities' impacts on currency misalignments differ depending on whether the financial development level (i.e. transition variable) is low or high.[21] The results reveal that the null hypothesis of linearity is rejected in favor of the PSTR alternative with two regimes.[22] These findings emphasize the volatility of real commodity prices, which differently impact the currency misalignments depending on the level of financial development. Table 3 displays the PSTR estimation results.

First, we use the de facto measure of financial development as the transition variable, measured by the ratio of M2 to GDP. The results are highly significant for all panels and indicate the following: (i) real commodity price volatilities significantly impact currency misalignments; and (ii) this impact is non-linear, and takes different signs depending on the level of the financial transition variable. Also, Table 3 reveals a significant heterogeneity between the four panels with thresholds ($\hat{c}$) varying from 0.272 (metals) to 0.408 (food and beverages). The threshold value - as connected with the level of financial development - reveals an important heterogeneity in terms of the dynamics and impacts between commodity price volatilities and currency misalignments. As the different countries in the four panels have heterogeneous levels of financial development, their real commodity price volatilities differently affect the currency misalignments.

We now focus on the estimated coefficient of our exogenous variable, which is real commodity price volatility. First, the estimated coefficient for the metals panel is positive for the periods when countries are financially less developed (regime 1). Consequently, when the

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[20] Results using the BKN procedure are very similar and are available upon request from the authors.

[21] To save space, results of linearity tests are not reported here but are available upon request to the authors.

[22] The linearity test also provides the appropriate order *m* of the logistic transition function. The results indicate that the dynamic is asymmetric ($m = 1$) for all panels.

commodity price volatility rises, this will increase currency misalignments. Regarding the second regime, when a country has a better level of financial development, commodity price volatility negatively affects currency misalignments. This indicates that the commodity-exporting countries' financial development toward risk diversification can reduce currency misalignments when commodity prices are highly volatile.

Table 3: Estimation results of the PSTR model (full sample period: 1994-2016)

	Food and beverages		Metals		Raw materials		Energy	
	Regime		Regime		Regime		Regime	
	1	2	1	2	1	2	1	2
Transition variable: $M2/GDP$								
$\Delta ComPI$	-0.189***	0.488***	1.197***	-0.234***	-0.461***	0.146***	-1.425***	0.179***
$\hat{c}$	0.408		0.272		0.285		0.340	
$\hat{\gamma}$	1331.8		1223.7		3352.3		91.4	
Transition variable: $Private\ credit/GDP$								
$\Delta ComPI$	-0.061	1.781***	0.230***	-0.256***	-0.818***	0.082***	-0.629**	0.047***
$\hat{c}$	0.498		0.302		0.134		0.508	
$\hat{\gamma}$	27.9		3369.5		3498.7		103.7	

Notes: Estimation of equation (1):

$$\left|MIS_{i,t}\right| = \alpha_i + \beta_0 \Delta ComPI_{i,t} + \left[\beta_1 \Delta ComPI_{i,t} * F\left(S_{i,t}; \gamma, c\right)\right] + \varepsilon_{i,t}$$

$\left|MIS_{i,t}\right|$ stands for the misalignment expressed in logarithm (in absolute terms). $\Delta ComPI$ is the commodity price index volatility. $\hat{c}$ represents the estimated threshold value, and $\hat{\gamma}$ is the estimated slope parameter of the transition function. Significant coefficient at 1% (***), 5% (**) or 10% (*).

Second, we observe different behaviors for the other three panels—energy, food and beverages, and raw materials—compared to the metals panel, as the exogenous variable's estimated coefficient is negative in the first regime and positive in the second. Therefore, the greater the real commodity prices' volatility for the periods when countries are poorly developped financially, the smaller the gap between the real exchange rate and its equilibrium value. Alternatively, the estimated coefficient is positive for the periods when a country is better developed financially (regime 2). For instance, in the energy panel's second regime, a rise of 10 percent in the commodity price volatility will induce an increase of 1.79 percent in currency misalignments. This result may be explained by the fact that the financial development process and commodity financialization can reverse this effect, and primarily during periods of high discrepancy in financial markets, which can accentuate these currency misalignments when commodity prices are more volatile. These results are consistent with those of Reinhart and Smith (2002) and Tille (2005),[23] which demonstrate that higher financial development can lead to highly volatile exchange rates and persistent deviations from an exchange rate equilibrium. Moreover, these three panels' results can be explained by the type of exchange rate regime, as a majority of raw materials- and energy-exporting countries have adopted pegged exchange rates, whether *de jure* or de facto, with bands of

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[23] For example, Caporale et al. (2011) provide a literature review.

fluctuations allowed in some cases.[24] Even with high financial development, a fixed exchange rate cannot cushion a higher commodity price volatility. In this case, the exchange rate cannot be a shock absorber (Devereux, 2004). In contrast, and as Edwards and Levy-Yeyati (2005) demonstrated, a flexible exchange rate can be a shock absorber.

To test the robustness of our results, and based on the data set availability, we select another financial development indicator: private credit to GDP. This measure is defined as the credit issued to the private sector by banks and other financial intermediaries, divided by GDP, and constitutes a measure of general financial intermediary activities provided to the private sector. The lower part of Table 3 presents the PSTR model's estimation results following the same approach as previously. The results confirm commodity price volatilities' non-linear impact on currency misalignments. Indeed, the food and beverages, raw materials and energy panels reveal that this impact is negative in the first regime, then becomes positive when the transition variable reaches the threshold value (in the second regime). These results corroborate the previous measure (M2/GDP) and demonstrate our results' robustness. The results for the metals panel are also identical for both measures—the M2/GDP ratio and private credit/GDP ratio, as the impact is positive in the first regime and negative in the second. Our findings are consistent with previous studies (Fratzscher et al., 2014; Coudert & Mignon, 2016) and support the idea that the real commodity price volatilities impact the real exchange rate misalignements when considering the financial development level as an important transmission channel.

4. Conclusion

This paper investigated the relationship between commodity price volatilities and real effective exchange rate misalignments among 46 commodity-exporting countries between January 1994 and December 2016. In considering the commodity market's financialization process, it seems that a country's level of financial development may be important as a transmission channel from real commodity price volatilities to currency misalignments. Our results not only indicate that the estimated coefficients are highly significant, but also highlight that real commodity prices' volatility has a non-linear impact on currency misalignments depending on the country's degree of financial development. The results also demonstrate different dynamics based on the type of commodity the country exports and its level of financialization. Specifically, the PSTR specification revealed that the real price index's volatility is a significant driver of currency misalignments for all panels. In summary, our results highlight the importance of the financialization channel when analyzing real commodity price fluctuations' impacts on the currency misalignments across commodity-exporting countries. However, the impact intensity differs from one panel to another. One should not solely focus on a country's level of financial development when analyzing the relationship between real commodity prices and the real effective exchange rate. Indeed, other transmission channels may be tested as well, as for instance, trade capabilities among others.

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[24] For example, Reinhart and Rogoff (2004) or Ilzetzki et al. (2017) discuss the classifications of exchange rate regimes.

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