APPLIED COMMODITY PRICE ANALYSIS, FORECASTING, AND MARKET RISK MANAGEMENT

The Effects of Brazilian Real Fluctuations on Global Soybean Prices

Leonard Twizeyimana, and Felipe Grimaldi Avileis

Suggested citation format:

Twizeyimana, L., and Avileis, F.G. 2026. “The Effects of Brazilian Real Fluctuations on Global Soybean Prices.” Proceedings of the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management, Chicago, Illinois, April 20-21, 2026. [http://www.farmdoc.illinois.edu/nccc134/paperarchive]

The Effects of Brazilian Real Fluctuations on Global Soybean Prices

Leonard Twizeyimana[1]**, Felipe Grimaldi Avileis**[2]

Paper prepared for the NCCC-134 Conference on Applied Commodity Price Analysis, Forecasting, and Market Risk Management, 2026.

[1]Department of Agricultural Economics, University of Nebraska-Lincoln. Email: 37284785@nebraska.edu
[2]Department of Agricultural Economics, University of Nebraska-Lincoln. Email: favileis2@unl.edu

The Effects of Brazilian Real Fluctuations on Global Soybean Prices

Abstract: *This paper examines the transmission mechanism through which exchange rate fluctuations in the Brazil Real (BRL) influence the global benchmark price of soybeans. Using an Instrumental Variables (IV) approach with 5-year sovereign credit default swap (CDS) spreads, the empirical design isolates exogenous movements in the Brazilian Real exchange rate. Results demonstrate that a 1% depreciation of the Brazilian Real against the US dollar leads to a 0.51% decline in global soybean futures prices. The magnitude of the pass-through is a function of a country's short run supply elasticity and global production share, which we classify as the country's ability of exerting short-hedging pressure in futures markets. We confirm this by running the same model on cocoa futures, in which Brazil is a small and inelastic producer, and showing that there is no price response after a currency shock. Altogether, our findings complement the dominant currency paradigm literature (Gopinath et al, 2016) by highlighting that bilateral exchange rates of large producers can affect commodity prices, regardless of the currency the product is invoiced. For global agricultural producers, these findings highlight a significant source of market risk that must be taken into account, especially in countries with high levels of political and fiscal risk.*

Keywords: Currency Commodity, Soybean Futures, Exchange Rate Pass-Through, Sovereign Risk, Credit Default Swaps, Instrumental Variables.

1 Introduction

The global soybean market has undergone a major shift over the last decades. Historically, the United States dominated both the production and export of soybean, a situation that left domestic producers largely exposed only to US production fundamentals and the strength of the US dollar (USD) (Thraen et al., 1992). However, Brazilian production and exports surpassed the United States in the mid-2010s, driven by an increase of approximately 430% in production (CONAB, 2026). As Brazil's market share has expanded to over 60% of global exports (Bukowski and Swearingen, 2026), its domestic market conditions play an important role in determining the global price of soybeans and can expose US farmers to different sources of risk.

Given this shift in market structure and Brazil's more volatile political and fiscal environment, it is crucial to understand how the increased role of Brazil in determining global benchmark prices can affect producers in the US and other producing countries. While the effects of Brazilian increased production and cost competitiveness on prices (Valdes et al., 2023) and volatility (Avileis and Mallory, 2022) have been studied, other important Brazilian based channels have not.

An important channel is the link between exchange rates and commodity prices. While the literature extensively documents the "commodity currency" phenomenon, in which a country's exchange rate is determined by the global prices of its primary exports, analysis of the inverse "currency commodity" effect (Clements and Fry, 2008) remains limited. This is especially important for a country like Brazil, whose currency, the Brazilian Real (BRL), is very volatile, with significant exposure to domestic political and fiscal instability (Banco Central do Brasil, 2021). Not only is the BRL volatile, it has also lost significant value since its creation in 1994, depreciating by almost 50% against the USD between 2015 and 2026.

As Brazil is the world's largest soybean producer, the South American country can be seen as the marginal supplier of the oilseed (Nigatu and Adjemian, 2016). Thus, global producers may be exposed to fluctuations in one of the world's most volatile currencies. The effect of local exchange rates on global prices are important because it directly affects hedging effectiveness, especially for US and other farmers outside of Brazil, and, given the volatile nature of the BRL, can significantly increase commodity price risk even for agents outside of Brazil.

This work focus on answering two questions. First, through what mechanisms and conditions can a local currency affect global commodity markets? Second, how large are the effects of fluctuations in the BRL/USD exchange rate on global soybean prices? In combination, this paper not only measures the effects of exchange rate fluctuations on commodity markets, but also describes the mechanisms and conditions for these effects to happen, supporting farmers, traders, and policymakers.

Our currency commodity conceptual framework shows that when a single nation commands a large share of global production, movements in the exchange rate of its currency against the global trade currency influence global supply and pricing. The framework predicts that the effect of a country's currency on global prices is proportional to two factors: (i)The country's share of global supply; and (ii)The country's supply elasticity. Put together, these two factors can be thought of as how much hedging pressure a country can exert. The larger and more elastic the supply of a country is, the more hedging demand is generated when the currency moves. We conclude that this hedging pressure (e.g., when farmers sell futures) leads to global prices responses (de Roon et al., 2000).

In the context of the Brazilian soybean markets, a depreciation of the Brazilian Real against the US dollar increases the local currency revenue for Brazilian producers as they receive higher prices in BRL. This price signal stimulate domestic producers to bring more supply to the market (e.g., selling inventories) and increases producers' short-hedging demand to lock in higher localized returns. This combined hedging pressure drives down US dollar-denominated futures prices on global commodity markets.

Measuring the size of this exchange rate pass-through, however, presents a significant empirical challenge due to endogeneity concerns. Because the soybean complex accounts for approximately 40% of Brazil's total export earnings (Colussi et al., 2024), the Brazilian Real and global soybean prices are jointly determined. Favorable global soybean prices generate substantial export revenues that appreciate the Real, while a depreciating Real concurrently lowers global soybean prices through the supply and hedging channels mentioned above. Consequently, standard Ordinary Least Squares (OLS) regressions produce biased estimates rather than capturing the true impact of Brazilian Real exchange rate movements on the global commodity prices.

To solve this problem, this paper adopts an Instrumental Variables (IV) approach to isolate exogenous movements in the Brazilian Real exchange rate. The empirical design constructs a novel instrument using fiscal and political shocks to Brazil's 5-year sovereign credit default swap (CDS) spreads. These spreads capture investors' perceptions of sovereign default risk, which spike in response to political and fiscal shocks,such as election uncertainty, changes in fiscal rules, and corruption investigations (Kesse, 2017). By restricting the instrument to large CDS movements, the methodology isolates exchange rate movements driven exclusively by non-commodity reasons (Verduzco-Bustos and Zanetti, 2026). This provides a source of variation that is strongly correlated with the Brazilian Real but unrelated to global agricultural supply and demand shocks.

To strengthen identification, we control for changes in the Dollar Index (DXY), thus controlling for movements specific to the USD, the VIX, to asses market varying risk premia, and Brent futures for broader macroeconomic and energy market effects. Furthermore, to validate the conceptual framework, the empirical design incorporates cocoa as a placebo commodity. Because Brazil's global production share of cocoa is minimal, the framework predicts that domestic currency shocks should not affect international cocoa pricing.

The results are in line with our theoretical predictions. The IV estimate shows that a 1% depreciation of the Brazilian Real against the US dollar leads to a 0.51% drop in global soybean futures prices. A Wu-Hausman test supports the IV framework, proving that standard OLS estimation suffers from endogeneity and underestimates this effect. Additionally, the placebo test using cocoa futures reinforces our predictions, as these same domestic currency shocks have no significant impact on global cocoa prices, proving that a large global production share and elastic domestic supply is needed for this price transmission to occur.

We use the impeachment process of former Brazilian president Dilma Roussef in 2015/16 to exemplify the magnitude of these currency shocks on soybean prices. Since protest against federal economics policies started in 2016, until the impeachment vote in August 2016, the BRL depreciated by around 20%. Our estimated point that this led to a 10% reduction in soybean futures prices, which is a loss of about $\$1/bu$ to the global benchmark solely due to BRL/USD exchange rate fluctuations.

This paper contributes to the literature in three ways. First, we complement a vast macroeconomics literature on the interaction of commodities and exchange rates (Clements and Fry, 2008; Chen et al., 2010; Chan et al., 2011; Kohlscheen et al., 2017; Chen and Lee, 2018), and dominant currency paradigm (Gopinath et al., 2020), by showing the conditions in which non-dominant currency fluctuations affect commodity prices. Second, we show how the soybean production increase in Brazil can affect global markets to indirect channels, such as exchange rates. This result is important to inform hedgers (e.g., US farmers) about new sources of price risk in oilseed markets. Additionally, policymakers need to take into account how foreign political and fiscal instability can directly affect US grain and oilseed markets.

Third, this paper contributes on novel empirical methods by introducing a new instrument to disentangle commodity and currency moves: fiscal and political shocks to CDS rates. We show that these shocks carry relevant information to exchange rate moves, while being orthogonal to commodity moves, supporting our identification strategy.

Altogether, this paper helps explain how political and financial instability in major producing nations drives global commodity prices, by affecting exchange rates. For agricultural stakeholders, especially farmers in competing countries like the United States, these findings highlight an unconventional source of market risk. Standard hedging strategies are designed to handle physical supply risks, weather events, and broad US dollar changes, but they fail to protect against foreign political risk. Ultimately, this study shows that tracking the domestic political and financial health of key global producers is essential for effective risk management.

2 Background

2.1 Global Soybean Production and Exports

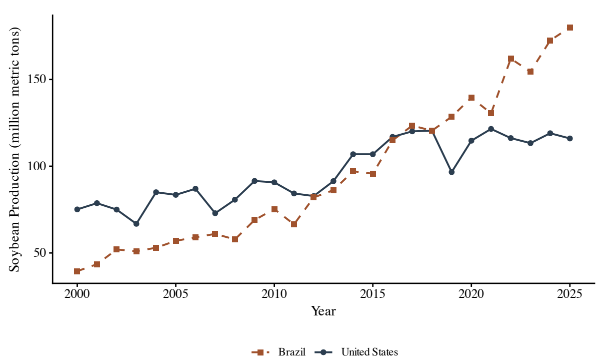
Soybean is one of the most important crops in the global agricultural economy, serving as a vital source of edible oil and protein for human and animal nutrition, as well as a feedstock for biofuel production (Sharma et al., 2012; Shea et al., 2020). Historically, the United States dominated its global production and trade; for example, in 2000, the United States accounted for approximately 40% of global production and 42% of the global export. Brazil, on the other hand, accounted for 25% of global production and held a 32% export market share during the same period[3]. This dominance allowed the United States to function as a price maker, with the global price predominantly dependent on US fundamentals and the dollar. Consequently, this left US producers exposed only to domestic market risks (Thraen et al., 1992).

The global production and export shares of the United States have since declined; in fact, Brazil surpassed the US as the largest exporter of soybean in the 2012/2013 marketing year (Valdes et al., 2023). However, the crop remains vital for US producers. It is the second-most planted crop, ranking only behind corn. In 2024 alone, soybeans generated over $47 billion in cash receipts for US farmers (USDA, ERS, 2025). Illinois, Iowa, Minnesota, Indiana, and Nebraska are the top five states in the country for soybean production.

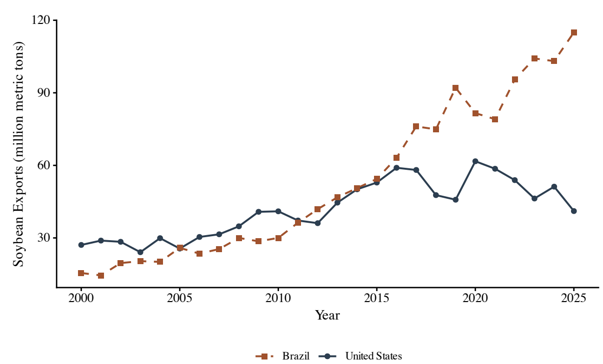
[3] Production and export market shares are the author's calculations based on volume data from Colussi et al. (2024) and USDA (2025)

The rise of Brazil as a preeminent competitor to the United States was achieved through the expansion of soybean acreage in states such as Rio Grande do Sul, Paraná, and Mato Grosso, as well as through technological advancements. These included the introduction of soybean varieties better suited to Brazilian soil and climate, alongside improved access to fertilizers and pesticides (Sentelhas et al., 2015). The construction of transport infrastructure, such as highways and ports to move the harvest from farms to markets, and a favorable exchange rate also facilitated this transition from the second-largest to the largest exporter of soybeans. Furthermore, this growth has not subsided. Bukowski and Swearingen (2026) project that Brazil will account for 42% of global production and 62% of the export market in the 2026/2027 marketing year. By comparison, the US is expected to hold a 27% production share and a 23% export share.

This dramatic shift has transformed Brazil into a dominant supplier in the global soybean market (Nigatu and Adjemian, 2016). Its dominant share in both the production and exportation of soybeans allows Brazil to influence global prices. Given this structural shift, it is crucial to understand how the changing status of the US, moving from the predominant global price maker to competing with and surrendering market share to Brazil, affects global prices and domestic producer revenues.



(a) Global Soybean Production



(b) Global Soybean Exports

Figure 1: Soybean Market Trajectories: Brazil vs. the United States, 2000–2025

Source: US Department of Agriculture, Foreign Agricultural Service, Production, Supply and Distribution Online (PS&D) Oilseeds Data Module.

2.2 Brazil's Exchange Rate Dynamics

The primary channel through which Brazil could influence global markets is the transmission of its domestic political and fiscal shocks into them. Domestic policy changes, political instability, and fiscal adjustments could alter international investor confidence, driving the depreciation or appreciation of the Brazilian Real. These currency fluctuations, in turn, could shift the relative competitiveness of Brazilian agricultural exports on the world stage. To understand this potential transmission channel, it is essential first to examine the evolution of the real over time and its relationship with Brazil's export commodities.

Prior to 1999, Brazil operated under a crawling peg exchange rate regime, implementing frequent currency devaluations against the dollar to offset domestic inflation and maintain the export competitiveness of local products (Bonomo and Terra, 2001). However, contagion from the Asian and Russian financial crises in the late 1990s triggered a flight to safety, driving up demand for the dollar. This capital flight forced the Central Bank of Brazil to deplete its foreign reserves to defend the peg, ultimately leading to its abandonment in favor of a floating exchange rate regime in January 1999 (Ferreira and Tullio, 2002). According to Saqib (2002), the timing of this collapse was driven by political factors. Specifically, a divided coalition government and upcoming elections delayed fiscal adjustments and an orderly exchange rate correction, thereby rendering the collapse inevitable. In response to this 1999 crisis, Brazil adopted its "macroeconomic tripod" (a policy framework comprising a floating exchange rate, inflation targeting, and primary fiscal surplus targets), which Bresser-Pereira (2015) notes has governed the country's monetary policy ever since. This shift laid the groundwork for the modern economic environment, within which this paper examines Brazil's role in the global soybean market.

To implement this new system and signal responsible policymaking to international markets, the Central Bank began pursuing strict inflation targeting aligned with the government's broader fiscal announcements. Additionally, to legally enforce the fiscal surplus targets of this framework, the government enacted the 2000 Fiscal Responsibility Law, which imposed strict borrowing and spending constraints on both federal and subnational authorities. Despite these structural attempts to stabilize the economy, Ogawa et al. (2018) notes that the BRL/USD exchange rate continues to exhibit high volatility.

As Bahmani-Oskooee et al. (2013) and Zerihun et al. (2020) demonstrate, this volatility becomes pronounced in response to domestic political and fiscal shocks. Consequently, these internal sovereign risk fluctuations serve as a primary conduit through which Brazilian domestic dynamics spill over into foreign exchange adjustments. This high volatility stems from domestic events and policy shocks that alter the country's risk profile, such as changing borrowing and taxation policies, expansions of welfare programs such as the Bolsa Familia Program, the approval of the national debt ceiling, elections, and investigations into political figures. Indeed, empirical evidence demonstrates that for emerging markets, country-specific political risk is the single most powerful component of sovereign risk driving local currency depreciation (Kesse, 2017). As Daehler et al. (2021) outline, when investors perceive that political and fiscal fundamentals increase the odds of sovereign default, confidence drops. This spike in sovereign risk induces a widespread withdrawal of capital, heightened demand for the US dollar, and the subsequent depreciation of the Real. Conversely, a political or fiscal shock that improves the country's sovereign debt profile strengthens investors' confidence and ultimately results in a stronger Real. Sovereign risk is therefore intrinsically connected to exchange rates through these domestic fiscal and political shocks. Figure 2 plots the historical trajectory and volatility of the Real.

Figure 2: USD/BRL Exchange Rate, 2000–2024

Note: Figure plots daily USD/BRL exchange rate from the adoption of the floating exchange rate regime in 2000 through 2024. Source: Bloomberg.

2.3 The Currency-Commodity Transmission Channel

For a globally traded commodity, understanding its price determination requires analyzing the link between global prices and the exchange rate movements of the producing nations. Chan et al. (2011) find a contemporaneous correlation between global commodity prices and the exchange rate movements of major exporting countries. High commodity prices are associated with currency appreciation in these nations, whereas low prices correspond with a depreciating local currency. Additionally, because currency markets are forward-looking, exchange rates reflect market expectations about future economic conditions. Consequently, Chen et al. (2010) demonstrate that exchange rate fluctuations in commodity-exporting countries predict future global commodity price movements. Building upon this dynamic, recent econometric forecasting confirms that including commodity currency exchange rates improves the predictive accuracy of global agricultural price models, as global prices react to currency-driven shifts in export competitiveness (Crespo Cuaresma et al., 2021). These findings highlight a distinct transmission mechanism for commodities that differs from the Dominant Currency Paradigm (DCP) (Gopinath et al., 2020), which excludes commodity goods to show that non-commodity trade is driven by a single dominant currency, usually the US dollar.

Motivated by this transmission mechanism, this paper develops a conceptual framework to understand the link between the global price of a commodity and the exchange rate of a producing nation's currency against the US dollar. Specifically, the framework illustrates how the international benchmark price ($P_{g,t}$) interacts with the local currency of each producer country. Building on this framework, the subsequent empirical approach evaluates whether currency volatility, induced by the Brazilian Real's responsiveness to domestic fiscal and political shocks, interacts with global benchmark price of soybean, given Brazil's status as its dominant producer and exporter.

3 Conceptual Framework

For a globally traded good, global supply at time t, Q_t, is the sum of the output across all n producing countries, as represented by Equation (1):

$$Q_t = \sum_{i=1}^{n} q_{i,t} \tag{1}$$

All producers sell their output on the international market. Consequently, global supply dictates the international benchmark price, $P_{g,t}$, which is typically denominated in US dollars. Equation (2) shows how the global benchmark price is a function of global supply and is strictly decreasing in global supply; that is, the negative derivative ($P_g'(Q_t) < 0$) means that when supply increases, ceteris paribus, the benchmark price decreases.

$$P_{g,t} = P_g(Q_t), \quad P_g'(Q_t) < 0 \tag{2}$$

While the benchmark price $P_{g,t}$ is denominated in US dollars, producers receive payments in their local currencies. Consequently, the prevailing exchange rate determines the domestic price level in each exporting nation. Let $r_{i,t}$ denote the exchange rate of country i's currency per US dollar at time t, representing the units of local currency required to purchase one US dollar. Similarly, let $P_{i,t}$ represent the local currency price that producers in country i receive per unit. A depreciation of the local currency (an increase in $r_{i,t}$) yields a higher local price ($P_{i,t}$) for domestic producers at any given global benchmark price. Equation (3) shows how these variables interact:

$$P_{i,t} = P_{g,t} \cdot r_{i,t} \tag{3}$$

Producers in country i determine their individual supply, $q_{i,t}$, based on the observed local price. Equation (4) establishes the relationship between the individual supply function and the local price. The positive derivative ($q_i'(P_{i,t}) > 0$) signifies that domestic supply is strictly increasing in local producer prices:

$$q_{i,t} = q_i(P_{i,t}), \quad q_i'(P_{i,t}) > 0 \tag{4}$$

When the exchange rate of a local currency changes, the global price responds according to the transmission channel defined in Equation (5):

$$\frac{\partial P_{g,t}}{\partial r_{i,t}} = \underbrace{\frac{\partial P_{g,t}}{\partial Q_t}}_{<0} \cdot \underbrace{\frac{\partial Q_t}{\partial q_{i,t}}}_{1} \cdot \underbrace{\frac{\partial q_{i,t}}{\partial r_{i,t}}}_{>0} < 0 \tag{5}$$

Multiplying Equation (5) by $\frac{Q_t}{Q_t}$ and $\frac{q_{i,t}}{q_{i,t}}$ yields the global price elasticity with respect to country i's exchange rate, as formulated in Equation (6):

$$\varepsilon_{P_{g,t},r_{i,t}} = \underbrace{\frac{P_g'(Q_t)Q_t}{P_{g,t}}}_{<0} \cdot \underbrace{\left(\frac{\partial q_{i,t}}{\partial r_{i,t}} \cdot \frac{r_{i,t}}{q_{i,t}}\right)}_{i\text{'s supply elasticity w.r.t. } r_{i,t}} \cdot \underbrace{\left(\frac{q_{i,t}}{Q_t}\right)}_{i\text{'s production share}} < 0 \tag{6}$$

Finally, letting $\varepsilon^{\text{sup}}_{r_{i,t}}$ denote country i's supply elasticity with respect to $r_{i,t}$ and $s_{i,t}$ represent its production share ($\frac{q_{i,t}}{Q_t}$) produces the final Equation (7):

$$\varepsilon_{P_{g,t},r_{i,t}} = \underbrace{\frac{P'_g(Q_t)Q_t}{P_{g,t}}}_{<0} \cdot \varepsilon^{\text{sup}}_{r_{i,t}} \cdot s_{i,t} < 0 \tag{7}$$

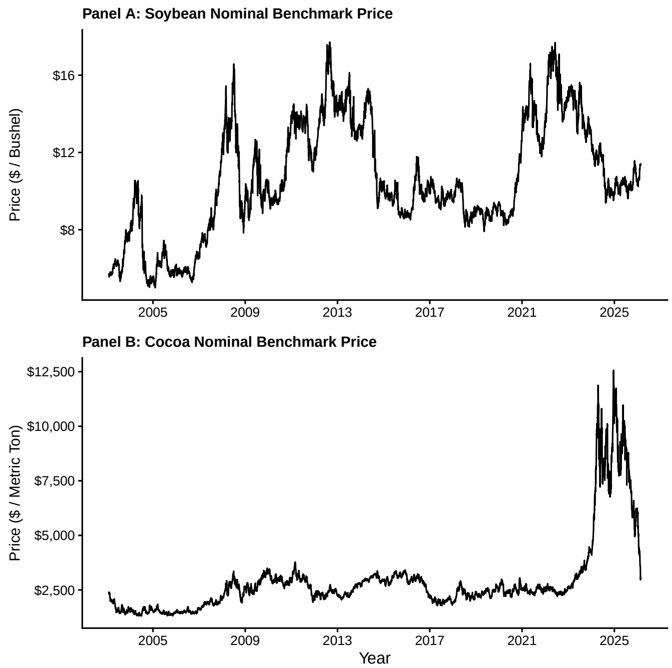
As Equation (7) illustrates, a country's ability to influence the global benchmark price via its exchange rate depends on its total share of global production ($s_{i,t}$) and its domestic elasticity of supply with respect to the exchange rate movements ($\varepsilon^{\text{sup}}_{r_{i,t}}$) (Chen et al., 2010). This transmission mechanism operates through both supply and hedging channels. When $r_{i,t}$ increases (depreciating the local currency), domestic producers observe higher local currency prices. This price signal induces producers to expand output. To lock in these higher returns, producers increase their short hedging demand, generating hedging pressure. As articulated by the Hedging Pressure Hypothesis (Cootner, 1967; Hirshleifer, 1990), this short hedging demand from producers depresses equilibrium futures prices (de Roon et al., 2000). The aggregate impact on global prices depends on the magnitude of this short hedging demand, which equals the domestic supply elasticity with respect to the exchange rate scaled by the country's global production share.

4 Data

This paper estimates the effects of Brazilian Real exchange rate movements ($r_{i,t}$), driven by Brazil-specific political and fiscal shocks, on the global benchmark price of soybean ($P_{g,t}$). The empirical analysis utilizes daily data spanning from January 2003 to December 2025. The Chicago Mercantile Exchange (CME) Group provides the daily end-of-day settlement prices for soybean, while Bloomberg supplies the BRL/USD exchange rate data. To isolate the exchange rate variations driven by internal sovereign risk fluctuations, an instrumental variable is constructed using Brazil's 5-year Credit Default Swap (CDS) spread, which Bloomberg also provides.

To account for other factors affecting the global benchmark price, three additional control variables from Bloomberg are incorporated. The US Dollar Index (DXY) captures broad US dollar strength and controls for US-specific economic shifts, such as changes in Federal Reserve monetary policy (Amatov and Dorfman, 2017). Controlling for the DXY accounts for the exchange rate mechanism whereby a strengthening US dollar reduces the local currency purchasing power of foreign buyers, which softens global commodity demand. To account for global market risk, the model uses the CBOE Volatility Index (VIX), which measures investors' expectations of future market uncertainty (Dutta et al., 2024). Controlling for the VIX accounts for systemic risk-off episodes where institutional investors pull capital away from commodity markets in response to elevated market uncertainty. Finally, Brent crude oil controls for broader energy trends, capturing supply-side input shifts since energy costs directly pass through into agricultural production inputs, such as fertilizers and fuel (Nazlioglu and Soytas, 2011). Additionally, cocoa is included as a placebo commodity, utilizing daily pricing data from the Intercontinental Exchange (ICE). Because Brazil's global production share ($s_{i,t}$) of cocoa is minimal and producers contract most volume at harvest, local exchange rate fluctuations should not affect international pricing of the commodity. Cocoa therefore serves as an ideal placebo to test the statistical validity of the conceptual framework. Finally, binary indicator variables account for major structural shocks: a global financial crisis dummy equals 1 from December 1, 2007, to June 30, 2009, and a COVID-19 pandemic dummy equals 1 from November 1, 2019, to June 30, 2020.

Figure 3: Historical Futures Prices: Soybean and Cocoa



Source: Chicago Mercantile Exchange (CME) Group (Soybeans) and Intercontinental Exchange (ICE) (Cocoa) via Bloomberg.

The initial dataset contains missing observations resulting from non-aligned national trading calendars. To resolve these discrepancies, the panel is expanded to a continuous Monday-through-Friday calendar, and missing values are forward-filled up to a maximum threshold of three calendar days. This threshold imputes short holiday closures while preventing stale prices from carrying over through extended data gaps or market outages.

Weekly log returns are constructed from the forward-filled daily series in two steps. First, applying a log transformation to each continuous variable $X_{d,t}$ yields $x_{d,t} = \ln(X_{d,t})$, where $X_{d,t}$ includes the commodity futures prices ($P_{g,t}$), the exchange rate ($r_{i,t}$), sovereign credit default swap spreads, the VIX, and crude oil prices. The binary crisis indicators enter the model directly in levels without transformation. This log transformation stabilizes variance, which scales with the level of soybean and control variables series, and produces a stationary series in first differences. Both outcomes serve as standard requirements for consistent OLS and IV estimation (Hamilton, 1994; Bhar, 2015).

Second, week-over-week log returns are computed within each weekday d as

$$\Delta x_{d,t} = x_{d,t} - x_{d,t-1} \tag{8}$$

where t indexes the week and $d \in \{\text{Mon}, \ldots, \text{Fri}\}$. Differencing within the weekday rather than across consecutive calendar days serves two purposes. It removes the systematic day-of-week effects documented in futures markets (Gibbons and Hess, 1981; Helms et al., 1984), and ensures that $\Delta x_{d,t}$ spans exactly one week, granting the lag structure in the dynamic panel a consistent interpretation. Combining the returns from all five weekday series into a single panel allows for robust estimation, while incorporating weekday fixed effects into every specification absorbs any remaining day-of-week variation in mean returns (French and Roll, 1986).

Table 1 reports summary statistics for the weekly log returns over the full sample period, January 2003 to December 2025. All series are derived from the five-weekday panel described above. Commodity returns exhibit low mean growth and moderate weekly volatility, while the Brazil 5-year CDS spread shows the largest dispersion among all variables, reflecting the episodic fiscal and political stresses observed during the sample period.

Table 1: Summary Statistics: Weekly Log Returns, 2003–2025

Variable	N	Mean	SD	Min	Max
$\Delta x_{\text{Soybean}}$	5,995	0.001	0.035	-0.299	0.139
Δx_{Cocoa}	5,995	0.001	0.047	-0.296	0.225
Δx_{BRL}	5,996	0.000	0.021	-0.112	0.193
Δx_{DXY}	5,996	0.000	0.011	-0.080	0.053
Δx_{VIX}	5,995	-0.000	0.143	-0.660	1.141
Δx_{Brent}	5,995	0.001	0.050	-0.426	0.414
$\Delta x_{\text{BR.CDS.5Y}}$	5,995	-0.002	0.084	-0.612	0.874

Notes: $\Delta x_{d,t} = x_{d,t} - x_{d,t-1}$ denotes the week-over-week log return for weekday d in week t. The panel combines the Monday through Friday observations for each series. N reflects the number of weekday-week observations after removing missing values. Soybean represents the global benchmark price ($P_{g,t}$). BRL designates the BRL per US dollar exchange rate ($r_{i,t}$); an increase denotes local currency depreciation. DXY is the US Dollar Index. BR.CDS.5Y is the Brazil 5-year sovereign credit default swap spread. VIX captures the CBOE Volatility Index. Brent reflects the daily end-of-day settlement price for Brent crude oil futures.

5 Empirical Approach

5.1 First Stage Estimation and Instrument Validity

A commodity currency is a currency whose exchange rate is driven by the global prices of its primary export commodities, appreciating during booms and depreciating during downturns. Conversely, a currency commodity describes the inverse phenomenon where the exchange rate of dominant producers influences global prices (Clements and Fry, 2008). The Brazilian Real fits both profiles. The soybean complex, which encompasses whole soybean, soybean oil, and soybean meal, generated over $67.3 billion, representing 40 percent of the nation's total export earnings in 2023 (Colussi et al., 2024), meaning soybean revenue plays an important role in Brazil's exchange rate flows. Simultaneously, given Brazil's dominant position in the global soybean market, its currency movements could feed back into the global benchmark price ($P_{g,t}$). This empirical approach focuses on identifying if the Real can affect global soybean prices and by how much. However, because the two directions operate simultaneously, a simple OLS regression of soybean prices on the exchange rate yields biased estimates due to endogeneity bias. This paper therefore adopts an instrumental variables (IV) strategy to identify this transmission mechanism and isolate the effect of Brazilian Real exchange rate movements on global prices.

Instrument Construction

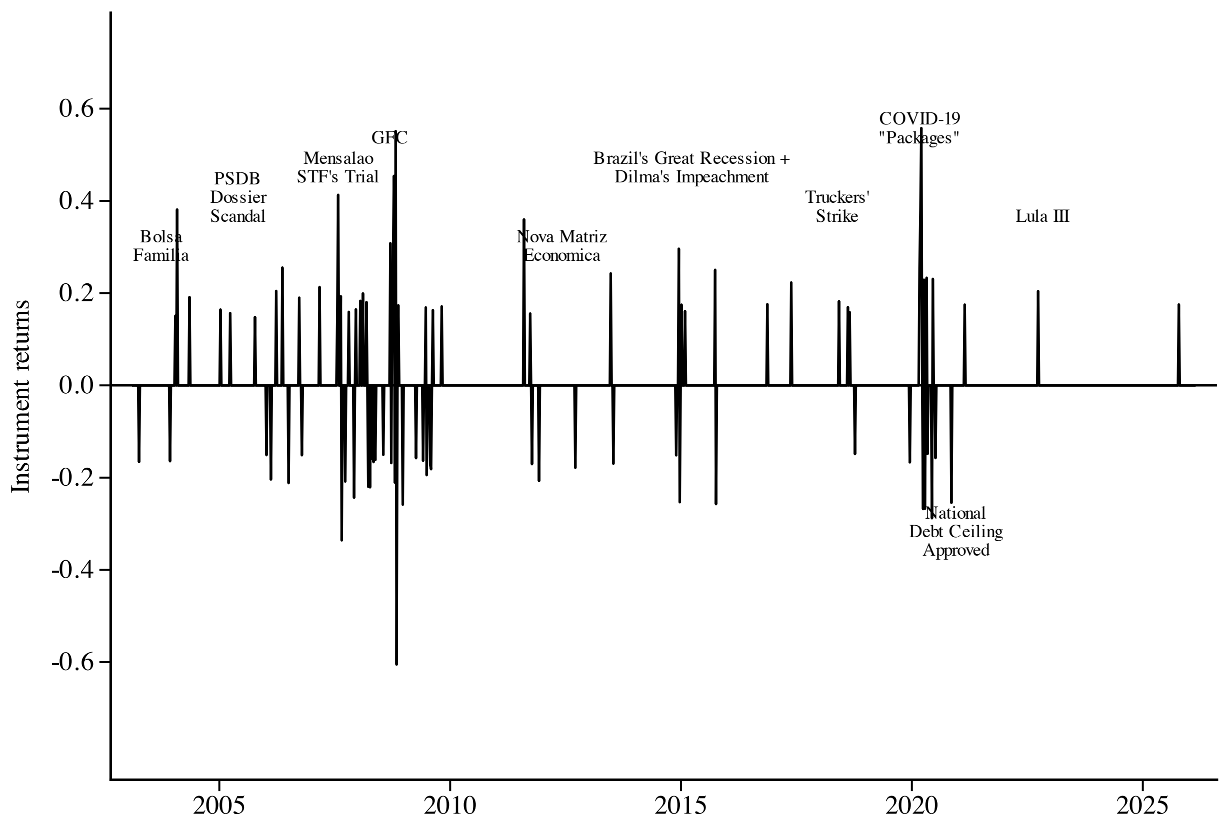
The empirical strategy requires an instrumental variable that satisfies the two standard IV conditions: relevance and the exclusion restriction (Bai and Ng, 2010). To construct this instrument, 5-year sovereign credit default swap (CDS) spreads are utilized, which reflect market assessments of Brazil's default risk. These spreads rise when investors perceive deteriorating fiscal or political conditions and fall when conditions improve. Because these assessments respond primarily to domestic Brazilian events (such as fiscal policy announcements, election outcomes, corruption investigations, and central bank decisions), the CDS spread provides a source of variation plausibly orthogonal to global soybean supply and demand shocks.

To reinforce this exclusion restriction, the approach of Verduzco-Bustos and Zanetti (2026) is followed. Because soybean exports are a critical source of foreign currency for Brazil, high global soybean prices could improve the nation's fiscal balance and lower CDS spreads. This creates a potential reverse causality channel from soybean prices to CDS rates, an endogenous relationship that this paper must overcome. Therefore, rather than using the continuous CDS return ($\Delta \ln \mathrm{CDS}_t$) directly, the instrument is restricted to large CDS movements driven exclusively by discrete domestic shocks. Specifically, the instrument is set to zero on all weeks where the absolute CDS return falls within 1.75 standard deviations of the mean. Formally, letting $\bar{\mu}$ and σ denote the full-sample mean and standard deviation of the weekly CDS return, the instrument Z_t takes the following form:

$$Z_t = \mathbf{1}\left(\left|\frac{\Delta \ln \mathrm{CDS}_t - \bar{\mu}}{\sigma}\right| > 1.75\right) \times \Delta \ln \mathrm{CDS}_t \tag{9}$$

Figure 4 plots the instrument over the full sample. The threshold identifies specific risk-increasing events associated with Brazilian Real depreciation and risk-reducing events associated with Brazilian Real appreciation.

Figure 4: Instrument Returns and Identified Brazil-Specific Fiscal and Political Shock Days, January 2003–December 2025



Notes: Positive spikes correspond to days where investors perceive political or fiscal events as risk-increasing, prompting them to demand higher default risk premiums and triggering local currency depreciation. Negative spikes correspond to risk-reducing events, lowering default risk premiums and triggering local currency appreciation.

First Stage Specification

In the first stage, we regress the weekly log return of the exchange rate ($\Delta x_{\text{BRL},d,t}$) on the instrument, lagged exchange rate returns, and a vector of controls ($\mathbf{X}_{d,t}$) comprising the weekly log returns of the DXY US dollar index, the VIX, and Brent crude oil. The model also includes weekday fixed effects (δ_d) and dummy variables ($\mathbf{D}_t$) to account for the global financial crisis (December 2007 to June 30, 2009) and the COVID-19 pandemic (November 1, 2019 to June 30, 2020). The Akaike Information Criterion (AIC) determines the optimal number of lags, alongside the Ljung-Box test to confirm that residual autocorrelation is resolved. Finally, the estimation applies Newey-West standard errors with a bandwidth equal to the floor of 1.5 times the selected number of lags, correcting for both heteroskedasticity and autocorrelation (Newey and West, 1987). The first-stage regression takes the following form:

$$\Delta x_{\text{BRL},d,t} = \alpha + \gamma Z_t + \sum_{k=1}^{p} \phi_k \Delta x_{\text{BRL},d,t-k} + \mathbf{X}'_{d,t}\beta + \delta_d + \mathbf{D}'_t\lambda + \varepsilon_{d,t} \tag{10}$$

To ensure the selected 1.75 standard deviation threshold is not the driver of the primary findings, the empirical model is also tested using alternative instrument thresholds set at 1.5 and 2.0 standard deviations. The first-stage results and subsequent instrumental validity hold robustly across all threshold specifications.

Instrument Relevance and Exclusion Restriction Validity

To confirm the relevance of the instrument (Z_t), the robust Wald F-statistic for the null hypothesis that the instrument coefficient equals zero ($\mathbf{H}_0 : \gamma = 0$) is evaluated against both the conventional threshold of 10 (Stock et al., 2002) and the Stock–Yogo critical values for weak instrument bias (Stock and Yogo, 2005). A strong first-stage relationship demonstrates that domestic political and fiscal shocks directly influence local foreign exchange movements, satisfying the relevance condition required for valid, unbiased IV estimation.

Regarding the exclusion restriction—which requires that the instrument affects global commodity prices ($\Delta x_{\text{Soybean}}$ and Δx_{Cocoa}) only through the exchange rate (Δx_{BRL})—three structural arguments support its validity. First, as established in Equation (9), discrete domestic shocks drive identification rather than the continuous co-movement between Brazilian fiscal conditions and commodity markets. Second, the control vector ($\mathbf{X}_{d,t}$) absorbs other factors most likely to generate correlated movements in both CDS spreads and commodity prices, including broad US dollar appreciation (DXY), risk-off capital flights (VIX), and energy supply-side cost shocks (Brent). Third, the raw correlation between the weekly CDS return ($\Delta \ln \text{CDS}_t$) and the weekly soybean return is negligible (0.02) throughout the sample, suggesting that the reverse feedback channel from commodity prices to sovereign risk at a weekly frequency is weak. Finally, a formal Wu-Hausman test is specified to evaluate the null hypothesis of OLS exogeneity for both soybean and cocoa, testing whether an IV framework is statistically required to achieve consistent and unbiased parameter estimates.

Second Stage Specification

In the second-stage, we regress the weekly log return of the global commodity futures price on the instrumented exchange rate return from the first stage. This specification includes lagged commodity price returns, contemporaneous and lagged global control returns, weekday fixed effects, and crisis indicators. Letting $\Delta \hat{x}_{\text{BRL},d,t}$ denote the fitted values from Equation (10), $\Delta x_{c,d,t}$ the weekly log return of commodity c (where $c \in \{\text{Soybean}, \text{Cocoa}\}$) for weekday d in week t, and $\mathbf{X}_{d,t}$ the vector of controls comprising the weekly log returns of the DXY US dollar index, the VIX, and Brent crude oil, the second-stage equation takes the following form:

$$\Delta x_{c,d,t} = \delta + \beta_1 \Delta \hat{x}_{\mathrm{BRL},d,t} + \sum_{k=1}^{p} \theta_k \Delta \hat{x}_{\mathrm{BRL},d,t-k} + \sum_{k=1}^{p} \phi_k \Delta x_{c,d,t-k} + \sum_{k=0}^{p} \gamma_k \mathbf{X}_{d,t-k} + \delta_d + \mathbf{D}_t' \lambda + \varepsilon_{d,t} \tag{11}$$

The coefficient of interest is the contemporaneous pass-through, β_1, which measures the percentage change in the global benchmark price of soybean when the Brazilian Real depreciates by 1% against the US dollar due to Brazil-specific political and fiscal conditions. Because the Brazilian Real operates as a currency commodity, a depreciation of the local currency lowers the US dollar cost of Brazilian exports, stimulating domestic supply and exerting downward pressure on US dollar-denominated futures prices. A 1% local currency depreciation therefore implies a negative β_1. Because Brazilian producers receive more reais per bushel at any given US dollar price, the resulting supply response exerts downward pressure on the global equilibrium price, directly capturing the transmission magnitude predicted by Equation (7) in the conceptual framework.

Furthermore, this specification allows us to compare the pass-through effects between our primary market (soybean) and our placebo market (cocoa) to validate the conceptual framework. Because Brazil's global production share of cocoa is minimal and domestic supply remains highly inelastic, domestic currency shocks should not transmit into international cocoa pricing. Consequently, unlike the soybean model, we expect the standard OLS estimates for cocoa to reveal a zero pass-through relationship.

This specification also incorporates contemporaneous log returns for the DXY, VIX, and Brent crude oil to absorb the global strength of the US dollar, investor risk appetite, and global commodity conditions. Controlling for these factors removes channels that could introduce omitted variable bias. The literature shows that a 1% rise in the DXY leads to a negative impact on agricultural commodity prices, whereas a 1% rise in the crude oil price drives an increase in agricultural commodity prices through higher input costs (Baffes and Haniotis, 2016). Furthermore, the model includes lagged variables to capture delayed information transmission across the value chain.

6 Results and Discussion

This paper empirically examines how fluctuations in the Brazilian Real exchange rate affect international agricultural prices. Table 2 presents the baseline Ordinary Least Squares (OLS) estimates alongside the Instrumental Variables (IV) estimates for both the primary market (soybean) and the placebo market (cocoa). Comparing these two models demonstrates the importance of the IV approach, which corrects for the endogeneity between exchange rates and commodity prices to isolate the specific impact of domestic Brazilian shocks on global markets.

Table 2: OLS and IV Estimates of Exchange Rate Pass-Through, Soybean and Cocoa

	Soybean		Cocoa	
Variable	OLS	IV	OLS	IV
Δx_{BRL}	-0.31^{***}	-0.51^{***}	-0.03	-0.13
	(0.02)	(0.08)	(0.03)	(0.11)
Δx_{DXY}	-0.27^{***}	-0.17^{***}	-0.74^{***}	-0.68^{***}
	(0.04)	(0.06)	(0.06)	(0.08)
Δx_{Brent}	0.11^{***}	0.10^{***}	0.08^{***}	0.07^{***}
	(0.01)	(0.01)	(0.01)	(0.01)
Δx_{VIX}	-0.01^{**}	0.00	-0.03^{***}	-0.02^{***}
	(0.00)	(0.00)	(0.00)	(0.01)
Observations	6,002	6,002	6,007	6,007
R^2	0.12	0.10	0.06	0.06
First-stage F	—	118	—	118
Wu-Hausman (p)	—	0.02	—	0.38

Notes: Newey-West robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively. All specifications include weekday fixed effects and binary indicators for the global financial crisis (December 2007 to June 30, 2009) and the COVID-19 pandemic (November 1, 2019 to June 30, 2020). The estimation utilizes the CDS-based instrument defined in Equation (9). First-stage F represents the robust Wald statistic for the null hypothesis that the instrument coefficient equals zero. Wu-Hausman p denotes the p-value of the endogeneity test; rejection supports IV over OLS.

For soybean, the IV estimate of the pass-through coefficient, β_1, is -0.51 and is statistically significant at the 1% level. This estimate indicates that a 1% depreciation of the Brazilian Real ($r_{i,t}$) against the US dollar results in a 0.51% decline in the global benchmark price ($P_{g,t}$). This empirical result confirms that exchange rate shocks driven by internal political and fiscal dynamics in an exporting nation transmit into international commodity pricing, confirming that the pass-through exists and its direction as derived in Equation (7) (Clements and Fry, 2008).

The OLS estimate of -0.31 is smaller in absolute terms than the IV estimate, demonstrating that a standard OLS framework underestimates the price impact of exchange rate movements. The Wu-Hausman test statistically confirms this discrepancy, rejecting the null hypothesis of OLS exogeneity with a p-value of 0.02. This outcome confirms that isolating the domestic sovereign risk variations of the Brazilian Real is required to capture unbiased parameter estimates (Nakamura and Nakamura, 1981).

Because Brazil accounted for approximately 40% of global soybean exports in 2023 (Colussi et al., 2024), its vast share of global production (s i,t) creates a conduit through which domestic currency fluctuations alter global benchmark prices. Consequently, soybean producers in competing nations, such as the United States, are exposed to an external price risk channel stemming from fiscal and political developments within Brazil—a risk for which standard commodity market hedging instruments fail to account.

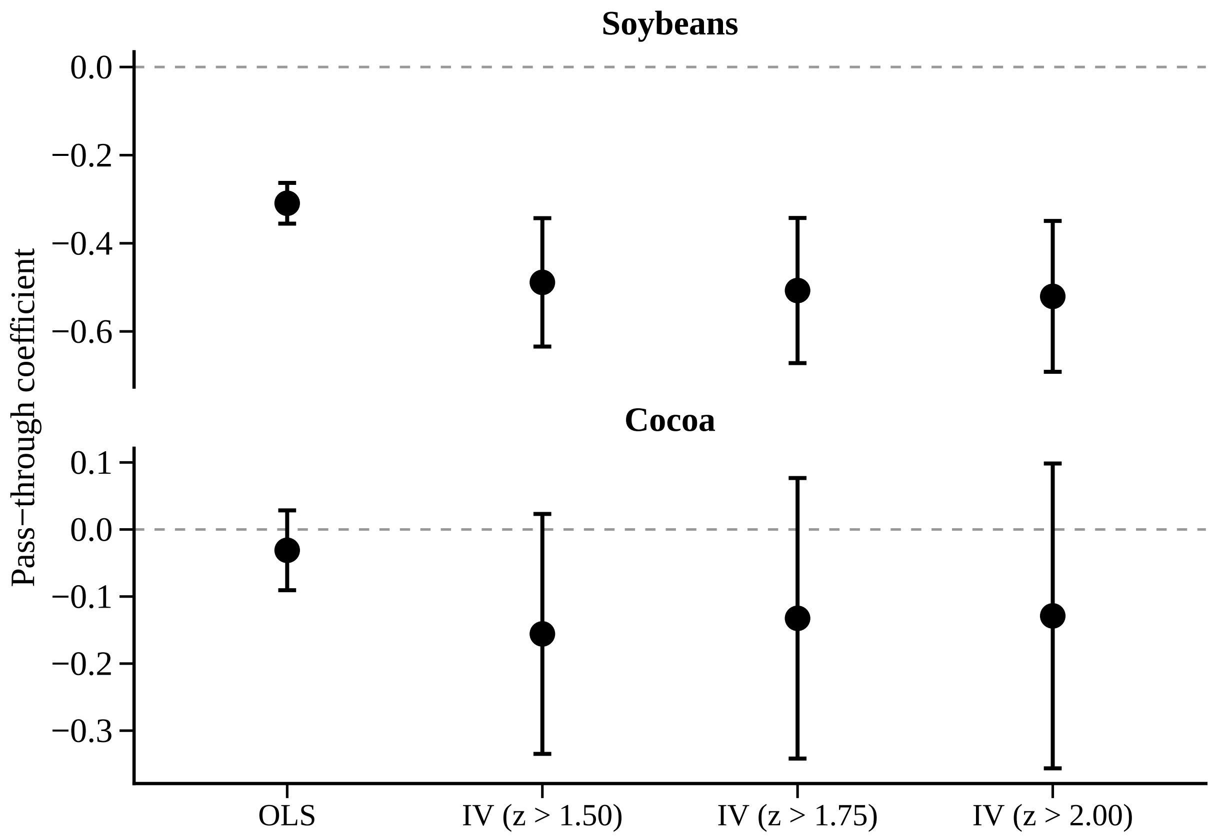
For cocoa, the estimated pass-through is statistically insignificant across both the OLS (-0.03) and IV (-0.13) specifications. This finding is in line with the developed conceptual framework. Because Brazil commands only a 5% share of global cocoa production and acts as a net importer of raw cocoa beans to feed its domestic processing infrastructure, its domestic currency shocks fail to transmit into international pricing trends (Castro, 2025). The large standard error (0.11) relative to the IV point estimate confirms the absence of a localized currency pass-through channel for this market, reinforcing the structural validity of the identification strategy.

Regarding the control variables under the IV specification, a 1% appreciation of the US dollar (Δx_{DXY}) decreases global soybean prices by 0.17% and global cocoa prices by 0.68%. These statistically significant, negative estimates demonstrate that the strengthening of the US dollar compresses international commodity prices by reducing non-US dollar purchasing power globally (Baffes and Haniotis, 2016). For Brent crude oil returns, a 1% increase in Brent prices expands soybean prices by 0.10% and cocoa prices by 0.07%, capturing the pass-through of global energy and fuel costs (Nazlioglu and Soytas, 2011). Finally, the VIX return coefficient (Δx_{VIX}) is negative and statistically significant for cocoa (-0.02) but lacks statistical significance for soybean, indicating that international cocoa pricing is more sensitive to periods of global market uncertainty, which is consistent with the established phenomenon of spillover effects of investor fear onto global commodity markets (see Bouri et al., 2021).

Robustness Check

To ensure the results are not driven by the selected instrument threshold, we test the sensitivity of the results to alternative instrument thresholds set at 1.5, 1.75, and 2.0 standard deviations above the mean weekly 5-year CDS return ($\Delta \ln \text{CDS}_t$). The main IV estimates remain robust across all alternative thresholds, as Figure 5 illustrates.

Figure 5: IV Estimates Under Alternative Instrument Thresholds



Note: The figure reports OLS and IV estimates of the Brazilian Real exchange rate (Δx_{BRL}) pass-through coefficient (β_1) on world commodity prices for soybean ($\Delta x_{\mathrm{Soybean}}$) and cocoa ($\Delta x_{\mathrm{Cocoa}}$). IV estimates correspond to instrument thresholds set at 1.5, 1.75, and 2.0 standard deviations above the mean weekly 5-year CDS return. Whiskers indicate 95% confidence intervals. Dashed horizontal lines denote zero.

The estimated effects of Brazilian Real exchange rate movements on the global benchmark price for soybean remain consistently negative and statistically significant. Similarly, the pass-through coefficient (β_1) remains statistically insignificant for cocoa across all specifications, aligning with the predictions of the conceptual framework underpinning this paper.

7 Conclusion

The conceptual framework developed in this paper explains how domestic political and fiscal shocks transmit to global markets, demonstrating that when an exporting nation holds a substantial global market share $s_{i,t}$, fluctuations in its currency exchange rate $r_{i,t}$ drive the global benchmark price $P_{g,t}$. Building on this foundation, this paper investigates the transmission of Brazil-specific shocks into the global soybean market to determine how exchange rate movements affect global prices. The empirical design adopts an instrumental variables (IV) strategy, utilizing an instrument Z_t constructed from extreme fluctuations in 5-year sovereign credit default swap (CDS) spreads. This econometric approach isolates variation in the Brazilian Real exchange rate $r_{i,t}$ that remains exogenous to global agricultural markets. Consequently, the instrument corrects for reverse causality by removing the endogenous movements of the Brazilian Real driven by global soybean price fluctuations, capturing only the variation generated by domestic political and fiscal events. Finally, it empirically estimates the extent to which these isolated domestic shocks transmit to the global benchmark price of soybean $P_{g,t}$, a market where Brazil commands a vast share of global production and exports.

The empirical results validate the conceptual framework developed by the paper. The estimations show that a 1% depreciation of the Brazilian Real against the US dollar, driven by internal sovereign risk, leads to a 0.51% decline in global soybean futures prices. Furthermore, the application of the Wu-Hausman test confirms that standard OLS estimation underestimates this transmission due to endogeneity bias. To ensure the validity of these findings, the empirical design incorporates a placebo commodity (cocoa). Because Brazil accounts for a minimal share of global production $s_{i,t}$ in cocoa and domestic supply remains highly inelastic, the conceptual framework predicts a zero pass-through relationship. The empirical estimates for cocoa prove statistically insignificant across all specifications, validating the underlying transmission mechanism and demonstrating that the results are robust to alternative instrument thresholds.

This study carries vital economic implications for global agricultural markets. Because Brazil is the dominant producer and exporter of soybean, its domestic currency movements transmit directly into the global benchmark price. As a result, producers from competing nations, particularly the United States, face price risks originating from Brazil's internal political and fiscal instability. Standard commodity market hedging instruments fail to mitigate this imported risk, suggesting that global market participants must actively monitor the sovereign risk of major producing nations to effectively manage their price exposures.

References

Amatov, A. and Dorfman, J. H. (2017). The effects on commodity prices of extraordinary monetary policy. *Journal of Agricultural and Applied Economics*, 49(1):83–96.

Avileis, F. G. and Mallory, M. L. (2022). The impact of brazil on global grain dynamics: A study on cross-market volatility spillovers. *Agricultural Economics*, 53(2):231–245.

Baffes, J. and Haniotis, T. (2016). What explains agricultural price movements? *Journal of Agricultural Economics*, 67(3):706–721.

Bahmani-Oskooee, M., Harvey, H., and Hegerty, S. W. (2013). The effects of exchange-rate volatility on commodity trade between the u.s. and brazil. *North American Journal of Economics and Finance*, 25:70–93.

Bai, J. and Ng, S. (2010). Instrumental variable estimation in a data rich environment. *Econometric Theory*, 26(6):1577–1606.

Banco Central do Brasil (2021). Foreign exchange rate volatility in brazil. Inflation report, Banco Central do Brasil. Box article in the March 2021 Inflation Report.

Bhar, R. (2015). Commodity export prices and exchange rate: An australian perspective. *International Journal of Economics and Finance*, 7(1):1–14.

Bonomo, M. and Terra, M. C. T. (2001). The dilemma of inflation vs. balance of payments: Crawling pegs in brazil, 1964–98. In Frieden, J. and Stein, E., editors, *The Currency Game: Exchange Rate Politics in Latin America*, chapter 4. Inter-American Development Bank, Washington, D.C.

Bouri, E., Lucey, B., Saeed, T., and Vo, X. V. (2021). The realized volatility of commodity futures: Interconnectedness and determinants. *International Review of Economics and Finance*, 73:139–151.

Bresser-Pereira, L. C. (2015). The macroeconomic tripod and the workers' party administration. In *The Brazilian Economy Today*, pages 121–134. Palgrave Macmillan.

Bukowski, M. and Swearingen, B. (2026). Oil crops outlook: May 2026. Technical Report OCS-26e, U.S. Department of Agriculture, Economic Research Service.

Castro, C. (2025). Brazil's role in the global cocoa landscape. Global Agricultural Information Network (GAIN) Report BR2025-0028, United States Department of Agriculture, Foreign Agricultural Service, Brasilia, Brazil.

Chan, K., Tse, Y., and Williams, M. (2011). The relationship between commodity prices and currency exchange rates: Evidence from the futures markets. In Ito, T. and Rose, A. K., editors, *Commodity Prices and Markets, East Asia Seminar on Economics, Volume 20*, pages 47–71. University of Chicago Press.

Chen, Y.-c. and Lee, D. (2018). Market power, inflation targeting, and commodity currencies. *Journal of International Money and Finance*, 88.

Chen, Y.-C., Rogoff, K. S., and Rossi, B. (2010). Can exchange rates forecast commodity prices? *The Quarterly Journal of Economics*, 125(3):1145–1194.

Clements, K. W. and Fry, R. (2008). Commodity currencies and currency commodities. *Resources Policy*, 33(2):55–73.

Colussi, J., Schnitkey, G., Janzen, J., and Paulson, N. (2024). The united states, brazil, and china soybean triangle: A 20-year analysis. *farmdoc daily*, 14(35).

Cootner, P. H. (1967). Speculation and hedging. *Food Research Institute Studies*, 7(Supplement):1–42.

Crespo Cuaresma, J., Hlouskova, J., and Obersteiner, M. (2021). Agricultural commodity price dynamics and their determinants: A comprehensive econometric approach. *Journal of Forecasting*, 40(7):1245–1273.

Daehler, T. B., Aizenman, J., and Jinjarak, Y. (2021). Emerging markets sovereign cds spreads during covid-19: Economics versus epidemiology news. *Economic Modelling*, 100:105504.

de Roon, F. A., Nijman, T. E., and Veld, C. (2000). Hedging pressure effects in futures markets. *The Journal of Finance*, 55(3):1437–1456.

Dutta, A., Uddin, G. S., Sheng, L. W., Park, D., and Zhu, X. (2024). Volatility dynamics of agricultural futures markets under uncertainties. *Energy Economics*, 136:107754.

Ferreira, A. and Tullio, G. (2002). The brazilian exchange rate crisis of january 1999. *Journal of Latin American Studies*, 34(1):143–164. Commentary.

French, K. R. and Roll, R. (1986). Stock return variances: The arrival of information and the reaction of traders. *Journal of Financial Economics*, 17(1):5–26.

Gibbons, M. R. and Hess, P. (1981). Day of the week effects and asset returns. *The Journal of Business*, 54(4):579–596.

Gopinath, G., Boz, E., Casas, C., Díez, F. J., Gourinchas, P.-O., and Plagborg-Møller, M. (2020). Dominant currency paradigm. *American Economic Review*, 110(3):677–719.

Hamilton, J. D. (1994). *Time Series Analysis*. Princeton University Press, Princeton, NJ.

Helms, B. P., Kaen, F. R., and Rosenman, R. E. (1984). Memory in commodity futures contracts. *Journal of Futures Markets*, 4(4):559–567.

Hirshleifer, D. (1990). Hedging pressure and futures price movements in a general equilibrium model. *Econometrica: Journal of the Econometric Society*, pages 411–428.

Kesse, K. (2017). Sovereign risk channels and exchange rates. *Quarterly Journal of Finance and Accounting*, 55(1/2):77–110.

Kohlscheen, E., Avalos, F., and Schrimpf, A. (2017). When the walk is not random: Commodity prices and exchange rates. *International Journal of Central Banking*, 13(2):121–158.

Nakamura, A. and Nakamura, M. (1981). On the relationships among several specification error tests presented by durbin, wu, and hausman. *Econometrica*, 49(6):1583–1588.

Nazlioglu, S. and Soytas, U. (2011). World oil prices and agricultural commodity prices: Evidence from an emerging market. *Energy Economics*, 33:488–496.

Newey, W. K. and West, K. D. (1987). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, 55(3):703–708.

Nigatu, G. and Adjemian, M. K. (2016). The u.s. role in the price determination of major agricultural commodities. In *Proceedings of the 2016 Annual Meeting of the Agricultural and Applied Economics Association*. Agricultural and Applied Economics Association. Also presented at the 2017 ASSA meeting as a preliminary AEA paper.

Ogawa, M. A., da Costa, N. J., and Moralles, H. F. (2018). Value-at-risk (VaR) Brazilian real and currencies of emerging and developing markets. *Gestão & Produc̆ão*, 25(3):485–499.

Saqib, O. F. (2002). An investigation into the 1999 collapse of the brazilian real. Discussion Paper 304, German Institute for Economic Research (DIW Berlin).

Sentelhas, P. C., Battisti, R., Câmara, G. M. S., Farias, J. R. B., Hampf, A. C., and Nendel, C. (2015). The soybean yield gap in brazil – magnitude, causes and possible solutions for sustainable production. *Journal of Agricultural Science*, 153:1394–1411.

Sharma, M., Gupta, S. K., and Mondal, A. K. (2012). Production and trade of major world oil crops. In Gupta, S. K., editor, *Technological Innovations in Major World Oil Crops, Volume 1: Breeding*, pages 1–15. Springer, New York, NY.

Shea, Z., Singer, W. M., and Zhang, B. (2020). Soybean production, versatility, and improvement. In Hasanuzzaman, M., editor, *Legume Crops: Prospects, Production and Uses*, chapter 3. IntechOpen.

Stock, J. H., Wright, J. H., and Yogo, M. (2002). A survey of weak instruments and weak identification in generalized method of moments. *Journal of Business and Economic Statistics*, 20(4):518–529.

Stock, J. H. and Yogo, M. (2005). Testing for weak instruments in linear IV regression. In Andrews, D. W. K. and Stock, J. H., editors, *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, chapter 5, pages 80–108. Cambridge University Press, Cambridge.

Thraen, C. S., Hwang, T.-C., and Larson, D. W. (1992). Linking of u.s. monetary policy and exchange rates to world soybean markets. *Agricultural Economics*, 6:365–384.

USDA (2025). World agricultural supply and demand estimates. Report, U.S. Department of Agriculture.

USDA, ERS (2025). Farm income and wealth statistics – cash receipts by state. Updated: September 03, 2025.

Valdes, C., Gillespie, J., and Dohlman, E. (2023). Soybean production, marketing costs, and export competitiveness in brazil and the united states. Technical report, Unknown.

Verduzco-Bustos, G. and Zanetti, F. (2026). The effects of geopolitical oil price shocks. Working paper.

Zerihun, M., Breitenbach, M., and Iyke, B. N. (2020). A comparative analysis of currency volatility among BRICS countries. *Journal of African Business*, 21(1):78–104.