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Do trade frictions distort the purchasing power parity (PPP) hypothesis? A closer look.

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Abstract

This paper explores whether trade frictions are the primary barrier preventing the Purchasing Power Parity (PPP) hypothesis from holding true between trading nations. It specifically examines the influence of exchange controls, a form of trade friction, on the relationship between an emerging economy, South Africa, and its primary trading partners, categorized based on whether they implement exchange control regulations or not. The methodology employed incorporates nonlinearity through quantile unit root tests and quantile cointegration, aiming to account for diverse economic conditions between trading nations. Empirical results suggest that the PPP hypothesis is more valid between countries with similar economic frameworks and synchronized business cycles. We propose that trade frictions might not necessarily inhibit the PPP hypothesis from being valid among nations with aligned economic structures that react similarly to global economic disturbances.

Keywords: PPP hypothesis, quantile cointegration, unit root test, exchange control.
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1. INTRODUCTION

Many studies have attempted to test the PPP hypothesis for bilateral and multilateral exchange rates (See Alba et Papell, 2007; Moatsos and Lazopoulos, 2021; Akay et al., 2021; Olaniran and Ismail, 2023). The PPP hypothesis stipulates that the exchange rate between two countries reflects their price differential or the difference in their consumer price index. It is assumed that when the purchasing power parity (PPP) hypothesis holds between two countries, a given basket of goods will be the same price in both countries after controlling for the exchange rate. The validity of the PPP hypothesis can act as a catalyst to assess the degree of bilateral or multilateral financial and economic integration between countries (see Tagushi, 2010; Yoon, 2020 ; Nagayasu, 2021).

Results from testing the PPP (Purchasing Power Parity) hypothesis have been contentious, with some studies supporting the hypothesis and others opposing it (see Robertson, 2014; Yoon, 2020; Moatsos & Lazopoulos, 2021; Nagayasu, 2021). This disparity in PPP test results is frequently ascribed to the deployment of inappropriate statistical and econometric methods. For instance, Taylor and Taylor (2004) emphasized that empirical studies relying on traditional unit root and cointegration tests often yield unreliable outcome.

There is an agreement among scholars that the test of the PPP hypothesis is carried out by using two general types of tests, one involving the stationarity of the real exchange rate and another

utilising the cointegration relationship of the nominal exchange rate and price difference (Chang et al.,2011; Bonga-Bonga, 2011; Moatsos and Lazopoulos, 2021). However, disagreement resides on the appropriate type of stationarity or cointegration technique to be used. Traditional stationarity and cointegration techniques developed by Granger (1984), Engle and Granger (1987) and Johansen and Juselius (1990) are usually associated with these tests. However, studies have challenged these techniques arguing that the mean-reverting process related to the PPP theory is nonlinear rather than linear (see Chang, 2002; Lyon and Olmo, 2017).

On a theoretical basis, the validity of the PPP is often attributed to the free flow of goods and services between trading partners. In that context, studies have shown that the hypothesis holds between trading partners or countries that belong to a regional grouping or integration (see Yildirim, 2017). However, Tiwari and Shahbaz (2014) show that the PPP hypothesis does not exist for all major trading partners in the case of India. The authors attribute this failure to the fact that intermediate goods face high barriers to trade between India and its trading partners. This finding may reveal that friction to trade may hamper the validity of the PPP theory.

It is worth mentioning that friction in trade may come up in different forms. It may occur in the form of quota or exchange rate controls. For example, Wei and Zhang (2007) show that exchange controls have adverse effects on trade as they may increase the cost of trade due to the intensification of inspections at the borders and other related control to avoid possible evasion. Other studies show that exchange control regulation impedes trade by distorting prices due to the limitation of forex transactions (see Tamru et al., 2021). Such price distortion may hinder the PPP theory from holding depending on the trade volume. For example, Alvarez and Braun (2006) show that price distortions are negatively related to the degree of openness and the speed at which trade volume, exports, and imports grow.

While exchange control regulations, seen as a form of trade friction, may obstruct the validity of the PPP hypothesis among trading partners, no study has yet tackled this theoretical dimension in their evaluation of the PPP hypothesis. This paper seeks to fill this void by examining whether exchange controls act as barriers for the PPP to hold among these partners. We will address this issue by adopting a nonlinear model, countering the statistical limitations of prior PPP-related studies. Hence, this paper harmonizes both statistical and theoretical facets in its test of the PPP hypothesis between trading entities. We achieve this by employing the quantile regression approach, pinpointing potential nonlinearities inherent in the PPP theory, and determining whether trade frictions, such as exchange control regulations, impact the validity of the PPP hypothesis. the paper focuses on South Africa and its trading partners, which are categorized based on their adherence to exchange control regulations.

Notably, South Africa introduced exchange control during the Apartheid era as a measure to curtail massive capital outflows, a consequence of the international economic and financial sanctions it faced at the time. Although this regulation has been gradually relaxed, it remains in place to some extent. Among South Africa's trading partners, Morocco, Sri Lanka, Egypt, Indonesia, and China still maintain exchange control regulations. Conversely, the Czech Republic, Botswana, the United States, Japan, and the United Kingdom do not enforce such controls.

In terms of methodology, this paper employs the quantile unit root test as proposed by Koenker & Xiao (2004) and the quantile cointegration regression method introduced by Xiao (2009). These methods are utilized to account for the asymmetric adjustment inherent in the PPP theory. Specifically, the weak-form PPP hypothesis, which examines the stationarity of the real exchange rate, is assessed using the quantile unit root approach. On the other hand, the strong form of PPP—that posits a one-to-one relationship between exchange rates and relative prices—is evaluated through the quantile cointegration method, as detailed in studies by Pedroni (2001) and Robertson et al. (2014).

The structure of the paper is outlined as follows: Section 2 delves into the methodology adopted for the study. Section 3 introduces the data utilized, while Section 4 presents the model estimations and provides a discussion of the results. The paper concludes with Section 5.

2. METHODOLOGY

The PPP hypothesis states that the nominal exchange rate between two countries should be equal to their relative prices. This implies:

$$S_t = \frac{P_t}{P_t^*} \tag{1}$$

with S_t being the nominal exchange rate (the domestic price of foreign currency), P_t the domestic price level and P_t^* the foreign price level. When the natural logarithm is taken, Equation 1 is transformed into:

$$s_t = p_t - p_t^* \tag{2}$$

The econometric model of Equation 2 is expressed as

$$s_t = \alpha(p_t - p_t^*) + \varepsilon_t \tag{3}$$

With ε_t being the error term. Th linear combination of equation 3 yields

$$\varepsilon_t = s_t - \alpha(p_t - p_t^*) \tag{4}$$

In Equation 4 , ε_t denotes the real exchange rate, r_t , especially when α is unity. It is in that context that the test of the weak form of PPP relies on the stationarity of ε_t, while the strong form goes further by testing the null hypothesis of $\alpha = 1$. It is worth noting that in a bivariate model as expressed in Equation 4, the stationarity of ε_t implies a cointegrating relationship between s_t and $p_t - p_t^*$.

To test for the weak-form of PPP within the quantile methodology, the quantile unit root test of Koenker and Xiao (2004) is considered. The conditional quantile autoregression model is given by

$$Q_{r_t}\left(\tau \middle| r_{t-1}, \dots, r_{t-q-1}\right) = \alpha_0(\tau) + \alpha_1(\tau) r_{t-1} + \sum_{j=1}^{q} \alpha_{j+1} \Delta r_{t-j} + \mu_t \tag{5}$$

with $Q_{r_t}(\tau|r_{t-1}, \dots, r_{t-q-1})$ being the conditional quantile of r_t for the defined quantile level $\tau \in (0,1)$ and μ_t the error term. The solution for $\hat{\alpha}_0, \hat{\alpha}_1, \dots, \hat{\alpha}_q$ is obtained using quantile regression. The null hypothesis of unit root conditional on the quantile level τ is then given by

$$H_0: \alpha_1(\tau) = 1 \; vs \; H_1: \alpha_1(\tau) \leq 1$$

with a t-ratio statistic defined by

$$t_n(\tau) = \frac{f\left(F^{-1}(\tau)\right)}{(\tau(1-\tau))^{\frac{1}{2}}} (\boldsymbol{R}`_{-1}\boldsymbol{P_X}\boldsymbol{R}_{-1})^{\frac{1}{2}}(\alpha_1(\tau) - 1) \tag{6}$$

where $f(\,)$ and $F(\,)$ are the probability and cumulative density functions of μ_t, $\boldsymbol{R}_{-1}$ is the vector of lagged real exchange rates used and $\boldsymbol{P_X}$ is the projection matrix onto the space orthogonal to $(1, \Delta r_{t-1}, \Delta r_{t-2}, \dots, \Delta r_{t-q})$. The t-ratio statistic is estimated, and its critical values are found using a bootstrap approach outlined in (Koenker & Xiao, 2004).

To test for the strong form of PPP within the quantile methodology, the quantile cointegration regression framework of (Xiao, 2009) is considered. The model takes the form:

$$Q_{s_t}(\tau|\mathrm{F_t}) = \beta_0(\tau) + \beta_1(\tau)(p_t - p_t^*) + \textstyle\sum_{j=-\mathrm{q}}^{q} \beta_{j+1}\Delta(p_{t-j} - p_{t-j}^*) + \varepsilon_t \tag{7}$$

where $(p_t - p_t^*)$ is the price difference and $\mathrm{F_t}$ refers to information known prior to time t. The parameters are solved using quantile regression and the null hypothesis conditional on the quantile level τ is of the form:

$$H_0: \beta_1(\tau) = 0 \; vs \; H_1: \beta_1(\tau) \neq 1$$

with test statistic

$$Y_T(\tau) = \max_{k=1,\dots,T} \frac{1}{\widehat{\omega}_\psi^* \sqrt{T}} \left| \textstyle\sum_{j=1}^{K} \psi_\tau(\varepsilon_{j\tau}) \right| \tag{8}$$

where $\psi_\tau(u) = \tau - \boldsymbol{I}(u < 0)$, $\varepsilon_{j\tau} = s_t - Q_{s_t}(\tau|F_t)$, and $\widehat{\omega}_\psi^*$ is the long-run variance of $\psi_\tau(\varepsilon_{j\tau})$. The critical values are obtained through a bootstrap method. These results will, however, be displayed visually with confidence intervals for $\beta_1(\tau)$. The strong form PPP hypothesis holds if the null hypothesis of no cointegration is rejected and $\beta_1(\tau) = 1$.

3. DATA

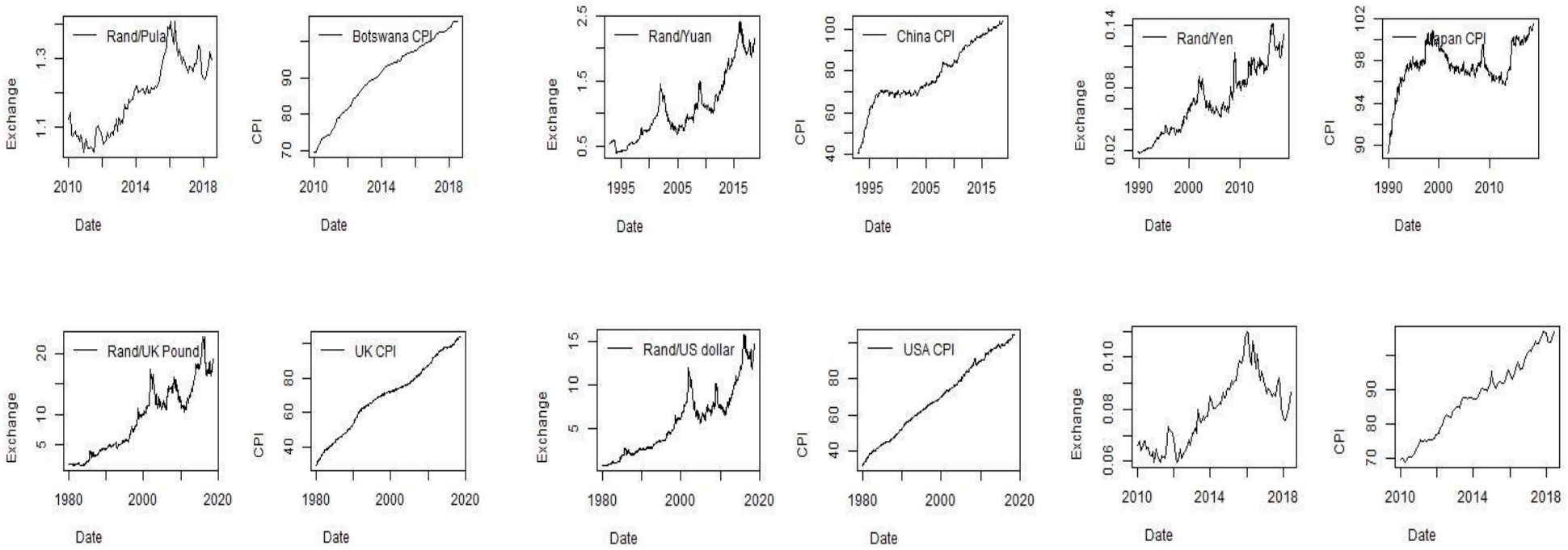
This paper utilizes monthly data spanning from January 1980 to July 2020. The selected sample encompasses significant epochs, capturing both tranquil and tumultuous periods in the global economy that can influence international trade. Nominal exchange rates concerning the South African currency, the Rand, as well as consumer price indices, were sourced from the South African Reserve Bank statistics and the International Financial Statistics of the International Monetary Fund.

Figure 1 illustrates the exchange rates and consumer price indices for South Africa's trading partners. A notable feature across the data is the pronounced volatility of exchange rates during pivotal financial and economic crises, specifically the dot.com crisis of 2000, the global financial crisis of 2008, and the COVID-19 pandemic. CPI data indicate a consistent upward trend, suggesting that inflationary episodes are a predominant characteristic in many countries' price structures.

The exchange rate trajectory between the South African rand and currencies of developed trading partners exhibits a marked similarity. These rates tend to spike during global financial crises and recede during more stable periods. Various factors may contribute to the parallel trends observed in exchange rates between South Africa and several developed economies. These factors encompass global economic cycles, investor sentiment, trade connections, and financial contagion.

In terms of the global economic cycle, it's crucial to highlight that a thriving global economy often sees investors gravitating towards higher yields in emerging markets, such as South Africa. In contrast, during global economic slumps or financial crises, capital flows reverse, moving away from emerging markets and gravitating towards the relative safety of developed economies. Such cyclical behaviors can lead to the South African rand (ZAR) mirroring movements against currencies of several developed nations (Frankel, 2010). A similar logic can be applied when discussing investor sentiment and financial contagion.

Figure 1. Exchange rates and CPI of selected countries



4. EMPIRICAL RESULTS AND DISCUSSION

To examine whether the PPP hypothesis holds in its weak form between South Africa and its primary trading partners, we employ the quantile unit root tests on their real exchange rate, as delineated in Equation 5. The real exchange rate is constructed as $re_t = \frac{eP_{ft}}{Pd_t}$, which is expressed in natural logarithm as $lre_t = le_t - (lPd_t - lPf_t)$, where le_t is the natural logarithm of nominal exchange rate between the South African Rand and the currency of its trading partners , Pd_t and Pf_t are consumer price indices in South Africa and its trading partners, respectively.

We advocate for the quantile unit root test based on concerns surrounding the traditional unit root tests for the real exchange rate. Specifically, the results of the test based on the Augmented Dickey Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS), reported in the appendix (Table A1), either yield inconclusive outcomes or fail to corroborate the stationarity of the real exchange rate. Additionally, the Jarque-Bera test results predominantly reject the null hypothesis of normality for the real exchange rates. Given these observations, we recommend the quantile unit root test as it better accounts for the asymmetrical behavior of the real exchange rate, a behavior underscored by the rejection of the standard normal distribution.

To account for possible asymmetry, the quantile unit root test is executed over the quantiles $\tau \in (0.1, 0.2, \ldots, 0.9)$. We calculate the critical statistics for the test and the corresponding p-values using a bootstrap methodology, following the approach outlined in Koenker & Xiao (2004). Tables 1 and 2 present the t-statistics and p-values for each quantile. These tables differentiate between South African trading partners based on whether they have exchange control regulations.

It's pivotal to underscore that, according to the tabulated results, the null hypothesis of a unit root (indicating the non-stationarity of the real exchange rate) is rejected at the 10%, 5%, and 1% significance levels if the corresponding p-values fall below 0.1, 0.05, and 0.01, respectively. Rejecting this null hypothesis points to the validity of the weak form of the PPP hypothesis for that particular quantile."

Table 1 Quantile unit root test of the real exchange rate: partners without exchange control regulation

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
BOTSWANA									
t-statistic	-0.1346	-0.052	-0.145	-0.0448	0.0275	0.0418	0.1309	0.2521	0.1918
(p-value)	(0.06)	(0.33)	(0.03)	(0.28)	(0.67)	(0.62)	(0.93)	(1)	(0.93)
JAPAN									
t-statistic	-0.1112	-0.0126	-0.0489	-0.0491	0.1705	0.0994	0.3619	0.2334	-0.1998
(p-value)	(0.34)	(0.46)	(0.40)	(0.34)	(0.66)	(0.52)	(0.83)	(0.52)	(0.1)
UNITEDKINGDOM									
t-statistic	-0.0759	-0.0877	-0.0306	-0.033	0.3871	0.4767	0.313	0.5767	0.7886
(p-value)	(0.43)	(0.35)	(0.49)	(0.44)	(0.8)	(0.92)	(0.71)	(0.89)	(0.95)
United States									
t-statistic	-0.588	0.2134	0.2528	0.219	0.2681	0.3804	0.8036	0.3993	0.2412
(p-value)	(0.15)	(0.73)	(0.72)	(0.79)	(0.76)	(0.82)	(0.91)	(0.79)	(0.52)
CZECHREPUBLIC									
t-statistic	-0.3269	-0.3959	-0.1759	-0.0996	-0.1774	-0.1917	-0.064	-0.0129	0.0475
(p-value)	(0.16)	(0.08)	(0.25)	(0.38)	(0.19)	(0.15)	(0.28)	(0.37)	(0.46)

Note: the null hypothesis of unit root is rejected at rejected at the 10%, 5%, and 1% significance levels if the corresponding p-values are less than 0.1, 0.05, and 0.01, respectively.

The findings presented in Table 1, concerning South Africa's trading partners that do not implement exchange control regulations, indicate that the null hypothesis of a unit root is largely upheld across all countries at every quantile level, with Botswana being the sole exception. Specifically, for Botswana, this hypothesis is rejected at lower quantiles, notably at the 10% and 30% quantiles. Crucially, it should be emphasized that the lower quantile of the South African real exchange rate is representative of its depreciation. A real depreciation in currency can enhance a country's trade competitiveness and furnish opportunities to ameliorate its terms of trade.

Table 2 Quantile unit root test of the real exchange rate: partners with exchange control regulation

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
CHINA									
t-statistic	0.6839	-0.242	-0.4596	-0.2904	-0.458	-0.3705	-0.3994	-0.3027	-0.1901
(p-value)	(0.99)	(0.25)	(0.05)	(0.14)	(0.03)	(0.07)	(0.06)	(0.13)	(0.15)
EGYPT									
t-statistic	-0.1669	-0.2808	-0.1428	0.1857	0.3043	0.3014	0.2394	0.236	0.5975
(p-value)	(0.23)	(0.16)	(0.33)	(0.8)	(0.82)	(0.79)	(0.67)	(0.66)	(0.82)
INDONESIA									
t-statistic	-1.6191	-1.7769	-1.2521	-0.9211	-0.4376	-0.2717	-0.6121	-0.3581	0.2689
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.11)	(0.19)	(0.04)	(0.09)	(0.61)
MOROCCO									
t-statistic	-0.1941	-0.1179	-0.0133	0.0553	0.0287	0.1727	0.2054	0.1801	0.4127
(p-value)	(0.15)	(0.28)	(0.54)	(0.75)	(0.52)	(0.84)	(0.89)	(0.82)	(0.94)
SRILANKA									
t-statistic	-0.2164	-0.1993	-0.0795	-0.0433	0.1153	0.1372	0.1505	0.3169	0.2164
(p-value)	(0.14)	(0.1)	(0.36)	(0.35)	(0.69)	(0.71)	(0.77)	(0.91)	(0.74)

Note: the null hypothesis of unit root is rejected at rejected at the 10%, 5%, and 1% significance levels if the corresponding p-values are less than 0.1, 0.05, and 0.01, respectively.

Table 2 displays the outcomes of the quantile unit root test of the real exchange rate between South Africa and its principal trading partners that impose exchange control regulations. The results reveal that the null hypothesis of a unit root is rejected for China at the 30%, 50%, 60%, and 70% quantiles. Furthermore, for Indonesia, the null hypothesis is rejected across all lower quantiles and the majority of the upper quantiles. However, there is no evidence to support the rejection of the null hypothesis of a unit root for the remaining countries that implement exchange control regulations

From the insights derived from Tables 1 and 2, several key observations emerge; first, predominantly, the weak form of the PPP hypothesis is evident at the extreme quantile of the real exchange rate, especially the lower quantile, which corresponds to when the South African real exchange rate depreciates. This phenomenon can be attributed to the idea that a real currency depreciation plays a pivotal role in rectifying potential disequilibria related to the PPP hypothesis(Bonga-Bonga, 2019). Essentially, beginning from a position of disequilibrium, if a real depreciation, subsequently leading to currency undervaluation, makes domestic goods more affordable for foreigners, it can drive up exports and taper off imports. This shift results in a trade surplus, exerting upward pressure on the currency, and can recalibrate the real exchange rate in alignment with PPP. Second, the validation of the PPP hypothesis does not appear to be influenced by whether a country enforces an exchange control regulation. As an illustration, the PPP hypothesis stands true for both Botswana and Indonesia, despite the contrasting exchange control regulations they have in place. Lastly, the findings hint at the PPP hypothesis predominantly holding ground between South Africa and certain emerging market nations. In contrast, there's

scant evidence to substantiate the validity of the PPP hypothesis between South Africa and the chosen developed economies for this paper.

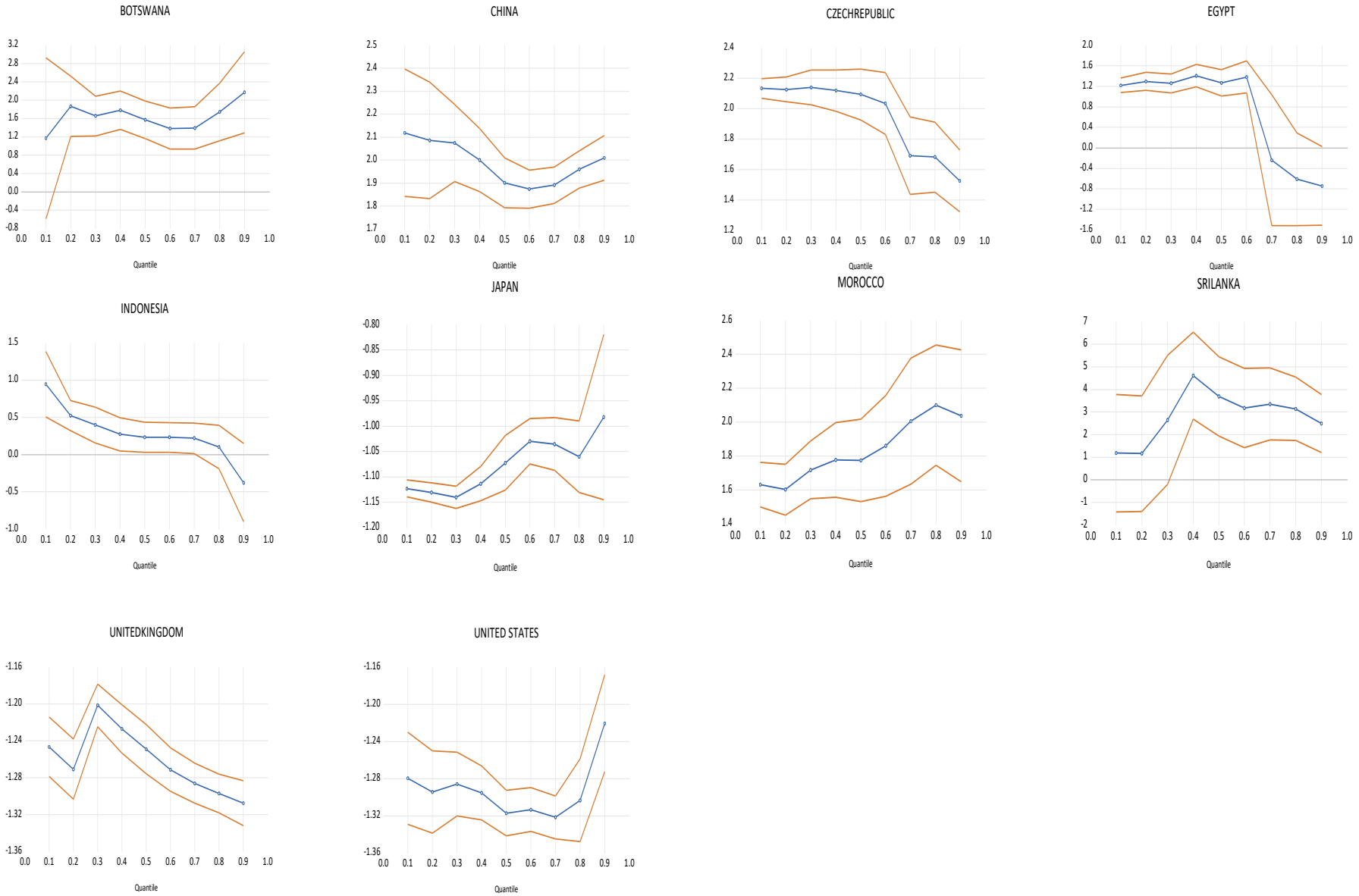
As for why the PPP hypothesis is more prevalent between emerging markets than between developed and emerging economies, this fact may be explained by a combination of factors related to the similarities of economic structures among emerging economies, the similarities between their responses to global shocks, and their dependence on natural resources. As for the similarity of economic structure being why PPP might hold between emerging economies, it is worth noting that emerging economies often have similar economic structures, face comparable challenges, and grow at comparable rates. As a result, different goods and services may have similar prices. Adding to this similarity of economic structure, the common responses of emerging economies to global shocks due to contagion synchronise their business cycle (see Teng et al., 2013; Bonga-Bonga, 2019); thus, most economic indicators display a common trend. On the dependence of most emerging economies on natural resources for their export revenues, the price dynamics of these resources can influence both economies similarly, affecting their exchange rates and prices.

Regarding the strong form of the PPP hypothesis, we estimate the dynamic cointegrating vector based on Equation 7 and then evaluate if $\beta_1(\tau) = 1$. In addition. We apply the test statistics as suggested in Equation 8 to confirm a coointegrating relationship at the qunatile where $\beta_1(\tau) = 1$. Figure 2 presents the dynamics of β_1 across the different quantiles. Its 99% confidence intervals are represented in red.

When interpreting the results shown in Figure 2, several key points stand out concerning the strong form of the PPP hypothesis. First, the confidence interval must encompass the value of unity. Second, even if this interval contains the value of unity, it shouldn't include the value of zero. Third, the null hypothesis of no cointegration should be rejected at the quantile that includes the value of unity. From Figure 2, we see that all three of these conditions are met for Indonesia at the 10% quantile, Botswana at 20%, Sri Lanka at 10%, and Egypt at 60%.

These findings indicate that the strong form of the PPP hypothesis holds between South Africa and these emerging economies, mirroring what we observed for the weak form of the PPP hypothesis. Such outcomes suggest that the PPP hypothesis is more likely to be valid between countries with a comparable economic structure and synchronized business cycles. We postulate that trade frictions may not necessarily deter the PPP from holding true among countries that have parallel economic structures and respond similarly to global economic shocks. A prime example of this is the relationship between Botswana and South Africa. Although Botswana has no foreign exchange control regulations and imposes no restrictions on capital outflows through its financial institutions, this paper demonstrates that the PPP hypothesis is valid between Botswana and South Africa. Both the weak and strong forms of the hypothesis hold at the lower quantile of the real exchange rate between the two countries' currencies.

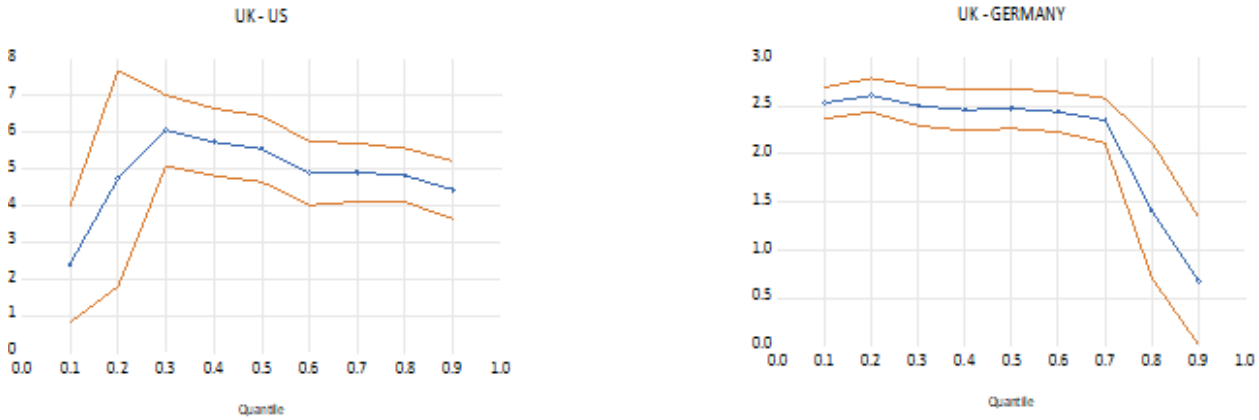
Figure 2. Dynamics of the cointegrating vectors across the different quantiles



To determine whether the validity of the PPP hypothesis is more closely linked to the synchronization of business cycles between countries rather than merely the absence of trade frictions, this paper examines its applicability among developed economies. Notably, evidence suggests that business cycles in developed economies tend to synchronize to a degree. Such synchronization is often credited to aspects like trade connections, financial integration, and parallel economic policies (Kose et al., 2008; Karadimitropoulou, 2018). However, it's essential to highlight that while synchronization exists, it's not absolute. There are occasions when the business cycles of two countries diverge. This very inconsistency underscores the paper's rationale for using a time-varying approach linked to the quantile model to test the PPP hypothesis.

Figure 3 presents the outcomes of the strong form of the PPP hypothesis using quantile cointegration between the UK and US, as well as the UK and Germany. The findings indicate that the hypothesis is valid at extreme quantiles, specifically when one currency either appreciates or depreciates in relation to another.

Figure 3 . Dynamics of the cointegrating vectors across the different quantiles in developed economies



It's essential to highlight that this paper's findings underscore the importance of synchronized business cycles and similar economic structures between countries for the PPP hypothesis to hold. However, because business cycle synchronization isn't perfect and doesn't persist indefinitely, quantile regression models serve as a valuable tool for determining when such synchronization takes place, and thus, when the PPP hypothesis is valid. The results of this paper support the PPP hypothesis at the extreme quantile distributions. They may suggest that countries' business cycles likely synchronize during these extreme quantiles, particularly when certain currencies appreciate or depreciate against others.

The rationale behind these findings may be linked to global imbalances and the resulting external adjustments. Global imbalances, such as sustained trade surpluses or deficits between countries, can lead to concerns about the sustainability of trade and financial flows and the synchronization of real business cycle among countries (Djigbenou-Kre and Park, 2016; Allegret et al., 2015).

Studies show that one of the ways to adjust these imbalances is through the real exchange rate channel (Omoshoro-Jones and Bonga-Bonga, 2020; Bonga-Bonga, 2019; Schnatz, 2011).

Regarding the adjustment of global imbalances through the real exchange rate channel, , Omoshoro-Jones and Bonga-Bonga (2020) demonstrated that in trade surplus countries, a rise in exports can lead to currency appreciation. As the currency appreciates, exports become costlier while imports become more affordable. Over time, this could diminish the trade surplus, with exports declining and imports increasing. Conversely, a trade deficit might exert downward pressure on a nation's currency, leading to its depreciation, thus, boosting exports. These adjustments underscore those severe fluctuations in both nominal and real exchange rates—manifested in changes in extreme quantiles—are necessary for the synchronization of the business cycle and price equality between countries.

It's important to highlight that the aforementioned mechanism for global imbalances adjustment can result in exchange rate shifts. Within the framework of the PPP theory, these shifts aid in re-establishing equilibrium concerning relative price levels between nations.

5. CONCLUSION

This paper aimed to investigate whether trade frictions, primarily in the form of exchange controls, serve as a central barrier to the Purchasing Power Parity (PPP) hypothesis among trading nations. The focus was on the relationship between an emerging economy, South Africa, and its major trading partners. These partners were categorized based on whether they implement exchange control regulations or not.

The methodology used incorporates nonlinearity, using quantile unit root tests and quantile cointegration, to accommodate varying economic conditions between trading countries. Empirical findings suggested that the PPP hypothesis is more applicable between nations with similar economic structures and synchronized business cycles. A case in point is the relationship between Botswana and South Africa. Notably, despite Botswana lacking foreign exchange control regulations and not imposing capital outflow restrictions through its financial institutions, the PPP hypothesis remains valid between these two nations. Both weak and strong versions of the hypothesis are consistent at the lower quantile of the real exchange rate between their currencies.

The paper posits that trade frictions might not necessarily impede the validity of the PPP hypothesis among nations with congruent economic structures responding similarly to global economic shocks. These insights have significant policy implications, particularly for investors and asset managers. The findings suggest that investment and portfolio allocation strategies should prioritize the alignment of economic structures rather than focusing solely on differences in trade and monetary policies, such as exchange controls.

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Appendix

Table 1A. Unit root test and normality tests

	ADF (t-statistics)	**KPSS (LM-statistics)**	**Jarque-Bera Statistics**
SA/Botwsana	-1.5856	0.9302***	2.62
SA/China	-1.6376	1.4012***	6.49***
SA/Czech	-2.2348	1.4716***	18.9***
SA/Egypt	-1.8262	0.2594	6.0057**
SA/Indonesia	-3.8152***	1.551***	182.17***
SA/Morocco	-1.685	0.7626***	2.822***
SA/Japan	3.047	0.2833	2.3
SA/Srilanka	-1.5742	0.9308***	4.9247*
SA/UK	-1.6591	2.522***	42.2***
SA/US	-2.235	2.485***	39.17***

Note: ***, ** and * denote rejection at 1%, 5% ad 10% levels, respectively. The null hypothesis of ADF is the presence of unit root while the null hypothesis of KPSS is that series are stationary.