
Asymmetry and transmission of international price shocks of cocoa and coffee in Togo

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Abstract

This study assesses the mechanism of the transmission of international price shocks to producer prices of coffee and cocoa in Togo. A threshold autoregressive (TAR) model was estimated using monthly series of international and producer prices of coffee and cocoa in Togo from 1994 to 2018. The results show that there is asymmetric transmission of international price shocks to producer prices. Domestic prices respond less quickly to international price increase than decreases. The asymmetric price transmission is similar in term of the speed of adjustment for the two commodities. In order to deal with this phenomenon, further investigations need to be done to detect the reasons for the asymmetry in price transmission between domestic and international coffee and cocoa markets.

Key words: shock transmission; asymmetry; international prices; coffee and cocoa

1. Introduction

During the 1980s and 1990s, most Sub-Saharan African countries engaged in structural adjustment policies and implemented major reforms. One objective of these reforms was to eliminate producer price stabilisation mechanisms (Tröster *et al.* 2019). While it is recognised, in general, that the reforms have had a significant and positive effect on agricultural supply and the well-being of producers, it must be noted that the abolition of stabilisation mechanisms has also had reverse effects. Indeed, it has led to an increase in the transmission of price fluctuations to the producer, and to the multiplication of commercial intermediaries, some of whom hold significant market power (Courtois & Subervie 2015). Thus, producers with weak shock-management capacity are more exposed to the international price instability.

The fluctuation in international prices of agricultural commodities is one of the main threats facing producers in developing countries. If the producer prices cannot be anticipated, production decisions cannot be made efficiently. Moreover, small-scale producers generally lack effective insurance instruments to cope with large drops in income, which contributes to their vulnerability (Yovo 2017). Under these conditions, analysing the extent to which international price fluctuations are transmitted to the prices paid to producers in developing countries is a central issue in agricultural economics. Such an analysis should make it possible to assess the level of integration of national markets with international markets. The lack of integration of the two types of markets means that international price signals are not completely transmitted to national markets. Moreover, the commercial intermediaries intervening in the export chains act on the transmission of world price variations (Subervie 2011). These actors' actions influence not only the elasticity of transmission, but also the dynamics of the price paid to the producer.

Some works, by authors such as Greb *et al.* (2016) and Bekkers *et al.* (2017), have generally assumed symmetric price transmission from international to domestic markets. For these authors, a price shock of a given magnitude in the international market would have the same response in domestic markets, regardless of whether the shock reflects a price decrease or increase. However, empirical evidence from the literature on price relationships shows that imperfect market characteristics, such as market concentration and intermediary intervention, may contribute to asymmetric price responses (Fiamohe & Frahan 2012; Lanie 2020).

The case of coffee and cocoa price transmission is of particular interest. In fact, coffee and cocoa are negotiated at global stock exchanges, whose prices provide a reference for the domestic market of coffee-producing countries. Any movement (increasing/decreasing) in coffee and cocoa prices in the world market affects the domestic prices in the physical markets around the world. Coffee prices in the domestic markets of coffee-producing countries have been shown to be unstable (Kamaruddin *et al.* 2021). This translates as a risk for growers' benefits. Price fluctuations are a cause of poverty for growers and this situation is difficult to mitigate. Growers constitute the part of the production chain that receives lower earnings in periods of increasing prices and are affected more rapidly by decreasing price periods (Jácome & Garrido 2017).

In the Togolese context, even though the coffee and cocoa sectors represent only 2% of Togolese GDP, they are very important from a social and economic point of view, supporting a large number of direct and indirect actors, including 32 000 producer households. The second and third largest export crops after cotton, coffee and cocoa respectively represent a source of income for rural households (Yovo 2021). The two commodities remain strategic crops for Togo due to the fact that they bring a substantial amount of foreign currency into the country, and also because they create a lot of jobs because of the large amount of labour required by the different value chains. In 2016, the two sectors generated 32 000 direct jobs and 93 000 indirect jobs. Forecasts for the year 2030 indicate 41 700 direct jobs and 125 000 indirect jobs (Yovo 2021).

Since the liberalisation that took place in 1996, smallholder coffee and cocoa producers have faced large fluctuations in prices, resulting in falls in income. Some actors in the rural sector even think that the stagnation of production observed over the past ten years is due to the response of producers to the volatility of coffee and cocoa prices (Yovo 2021). In fact, large numbers of growers exited the market, leading to a higher concentration of production. In the same time, many commercial intermediaries entered the market, with some of them having market power. The observation is that commercial intermediaries lower the prices paid to producers. In doing so, they earn huge profits that they appear to derive from their privileged position in the marketing chain (Tréku 2018). Moreover, the price intervention mechanisms of the Coffee and Cocoa Sectors Coordinating Committee (CCFCC), which is in charge of coffee and cocoa price dissemination, seems to weaken the

transmission of world price variations to producers. As pointed out by Yovo (2021), it is as if commercial intermediaries and the CCFCC are trying to disconnect international prices from domestic prices by introducing an asymmetry in price transmission that is unfavourable to producers. The concern relates to the mechanism of transmission of world coffee and cocoa prices to the domestic market. Specifically, this paper tries to respond to three research questions. Is there asymmetric transmission of international coffee and cocoa price shocks to producer prices? What is the nature of the asymmetric price transmission? What is the speed of the asymmetry of price transmission? These questions are not new to the literature of asymmetric transmission of agricultural commodity prices. They have been discussed extensively in the asymmetric price transmission (APT) literature over the last five years (Jacomini & Burnquist 2018; Meyer *et al.* 2018; Rudinskaya 2019; Abunyuwah 2020; Fitria *et al.* 2020; Lanie 2020; Gizaw *et al.* 2021; Hillen 2021; Ramsey *et al.* 2021; Antonioli & Santeramo 2022).

However, with regard to APT between the world and the domestic coffee and cocoa markets, very few works have dealt with the subject, even during the last ten years. Those that have include Subervie (2011), Mofya-Mukuka and Abdulai (2013), Khumaira *et al.* (2016), Jácome and Garrido (2017), Mai (2017), Rahmanta *et al.* (2020), Ghoshray and Mohan (2021) and Kamaruddin *et al.* (2021) on coffee, and Ajetomobi and Dlamini (2017) and Luckstead (2018) on cocoa.

Despite the relatively limited number of works on coffee and cocoa APT, there is no consensus about APT between international markets and local markets regarding coffee and cocoa in developing countries. Whereas Mofya-Mukuka and Abdulai (2013), Khumaira *et al.* (2016), Jácome and Garrido (2017), Rahmanta *et al.* (2020), Ghoshray and Mohan (2021) and Kamaruddin *et al.* (2021) find APT between international and local markets for coffee, Mai (2017) and Subervie (2011) find no APT. In the same vein, Luckstead (2018) found APT for cocoa in Côte d'Ivoire, Ghana and the Dominican Republic, which contradicts the findings of Ajetomobi and Dlamini (2017) for Nigeria. Moreover, not all of these authors investigated APT for the two commodities together. This issue is very important because the two commodities walk together. For example, in the Togolese context, 25% of producers produce both commodities, and commercial intermediaries and exporters rarely deal with only one of them. So it is necessary to study the two commodities together to gain a comparative perspective and for policy making.

Therefore, this study contributes to enrich the existing literature by providing empirical evidence of the existence, the nature and the speed of the asymmetry of international price transmission shocks for coffee and cocoa, two strategic commodities in West Africa in general. The results of the study further will help in making policy recommendations to improve the transmission of international coffee and cocoa prices to producers.

The remainder of the article is organised as follows: Section 2 reviews the theoretical literature on asymmetric price transmission. Section 3 models the asymmetric transmission of international price shocks and presents the nature and source of the data used. Section 4 presents and discusses the analytical results, while the conclusion and policy implications are provided in Section 5.

2. Theoretical literature review

Most analysis of the transmission of food prices between different markets uses the modified model of Houck (1977). This model consists of splitting the positive and negative price change variables. According to Meyer and Von Cramon-Taubadel (2004), all the variants of the Houck model are incompatible with the co-integration relationship between the price series because they do not take into account the possibility of a long-run equilibrium relationship between the price series examined. For example, Hassan and Simioni (2004) explain that retail and shipment prices may differ in the

short term due to seasonal factors. If such discrepancies persist over time, the mechanisms underlying the functioning of the market in question should constrain these prices to return to a long-term relationship, which the variants of the Houck model cannot explain. The standard co-integration and error correction models, according to Engle and Granger (1987), are also commonly used to examine prices transmission in agricultural markets. However, a number of authors (Enders & Granger 1998; Goodwin & Piggot 2001; Hansen & Seo 2002; Meyer 2004; Meyer & Von Cramon-Taubadel 2004) have criticised the forms of specification of these models because they do not enable the representation of the asymmetry of the co-integration relation due to the non-stationarity of the transaction costs. Enders and Granger (1998) show that the co-integration tests of Johansen (1995) and Engle and Granger (1987) perform poorly if the long-run relationship between the variables is not symmetric, i.e. positive and negative deviations from the long-run equilibrium are not corrected in an identical manner. Therefore, Enders and Siklos (2001) developed an alternative approach based on threshold autoregressive (TAR) and momentum-threshold autoregression (M-TAR). One limitation of the TAR and M-TAR models is that the mean of the residuals of co-integrating regression may not be an unbiased estimate of the threshold if the adjustment process is asymmetric (Enders & Siklos 2001). Hence, the threshold value is estimated in consistent TAR and M-TAR models.

Although threshold co-integration has seen more recent development, the model of Enders and Siklos (2001) was judged appropriate to examine the relationship between the world and domestic prices of coffee and cacao. Recently, a number of studies have used the TAR model to evaluate the direction and the speed of APT between international and domestic markets (Abunyuwah 2020; Fitria *et al.* 2020; Alam *et al.* 2021; Hillen 2021; Ramsey *et al.* 2021), and specifically for coffee and cocoa markets (Ajetomobi & Dlamini 2017; Luckstead 2018; Rahmanta *et al.* 2020; Ghoshray & Mohan 2021).

Regarding this study, the choice of the TAR model is justified by the simplified form of its specification, which uses the null value as a threshold delimiting two price variation regimes. According to Hansen (1996), thresholds delimiting adjustment regimes for unknown values cause inference problems due to the presence of nuisance parameters in threshold models. However, this author proposes a statistical test for the statistical significance of selected thresholds.

3. Modelling asymmetric price transmission and data presentation

3.1 Modelling asymmetric price transmission

To test the hypothesis of APT, we start with the long-run equilibrium relationship between the international price and the producer price of coffee and cocoa, specified as follows:

$$P_t^p = \beta_0 + \beta_1 P_t^m + \epsilon_t, \quad (1)$$

where P_t^p and P_t^m are the price paid to the producer and the international price of coffee and cocoa respectively, both expressed in USD and in logarithms, and ϵ_t is the random error term that captures the effect of variables that are difficult to observe, such as transaction costs (all costs related to transport, storage and trade margins).

The hypothesis that the interplay of market intermediaries is likely to keep the price paid to the producer below its equilibrium value can be tested using a *threshold autoregressive model* (TAR). Standard co-integration tests are based on the implicit assumption that price responses are linear and symmetric. However, economic variables such as prices may adjust asymmetrically. To take this

asymmetry into account, Enders and Granger (1998) propose an alternative approach based on a threshold autoregressive process (TAR), in which d is the adjustment time. The error correction term is described by:

$$\epsilon_t = \rho^{(i)}\epsilon_{t-1} + e_t^{(i)} \quad \text{if } \theta^{(i-1)} < \epsilon_{t-d} \leq \theta^{(i)}, \quad i = 1, \dots, K. \quad (2)$$

With $-\infty = \theta^{(0)} < \theta^{(1)} < \dots < \theta^{(k)} = +\infty$; $\theta^{(i)}$ denotes the i th threshold; and $e_t^{(i)}$ follows the normal distribution, $N(0, \sigma^2)$.

There are many variations of the TAR model. Some of the most widely used are presented in Balke and Fomby (1997). Threshold models consist of linear segmental relationships and are intended to model asymmetry. To the extent that market intermediaries are likely to keep the price paid to producers below its equilibrium value over time, the error correction term can be modelled by a single threshold model, such as:

$$\epsilon_t = \begin{cases} \rho_1\epsilon_{t-1} + e_t^{(1)} & \text{if } \epsilon_{t-d} \geq \theta \\ \rho_2\epsilon_{t-1} + e_t^{(2)} & \text{if } \epsilon_{t-d} < \theta \end{cases}, \quad (3)$$

where the terms ρ_1 and ρ_2 represent the positive and negative adjustment parameters of the delayed error term, ϵ_{t-1} , respectively.

The idea behind this model is that the speed of adjustment depends on the nature of the imbalance. When $\epsilon_{t-d} < \theta$, the producer price is below its equilibrium value plus the threshold ($P_{t-d}^p < \widehat{P}_{t-d}^p + \theta$), and when $\epsilon_{t-d} \geq \theta$, the output price is above its equilibrium value plus the threshold θ . If ρ_2 is less than ρ_1 , then the speed of convergence is lower when the output price is below its equilibrium value. In other words, the imbalances that lead the output price to below its equilibrium value are more persistent.

The hypothesis that the error correction term is described by a TAR process can be tested by an asymmetric co-integration test. Enders and Granger (1998) and Enders and Siklos (2001) modified the standard Dickey-Fuller co-integration test so that the hypothesis of a co-integrating relationship between prices can be tested without maintaining the assumption of symmetry in the long-run adjustment. Indeed, the standard Dickey-Fuller test based on the symmetrical adjustment hypothesis may tend to reject the hypothesis of co-integrated prices in the presence of asymmetry in the co-integrating relationship. As in the standard co-integration test, the asymmetrical co-integration test relies on the stationarity of the residual from the relationship in Equation (1).

To account for dynamic adjustment effects, Enders and Granger (1998) show that Equation (3) can be modified and rewritten as follows:

$$\Delta\epsilon_t = I_t\rho_1\epsilon_{t-1} + (1 - I_t)\rho_2\epsilon_{t-1} + \sum \psi_k \Delta\epsilon_{t-k} + \mu_t, \quad (4)$$

where μ_t is of zero mean and constant variance, independent of $\epsilon_j, j < t$, and I_t is an indicator function taking the value 1 if $\epsilon_{t-d} \geq \theta$, and zero otherwise.

Before estimating Equation (4), it will be necessary to ensure that the residuals are not autocorrelated and that the appropriate number of lags is chosen. The autocorrelation of the residuals is tested using the Ljung-Box tests, and the number of lags is determined using the Akaike information criterion (AIC) and the Schwartz Bayesian criterion (SBC).

The co-integration test in the TAR model is based on the coefficients ρ_1 and ρ_2 . If the hypothesis of price co-integration is verified, the coefficients ρ_1 and ρ_2 are necessarily negative. Enders and Siklos (2001) use two tests, a *t-max* (the larger of the two individual statistics) and a *t-min* (the smaller), to test the hypothesis that the coefficients are significantly negative, and an *F-test* to test the hypothesis that they are jointly different from zero. Critical values for these tests are given in Enders and Siklos (2001). The method of Chan (1993) was used to estimate the value of the threshold. The procedure consists of estimating Equation (1) and recovering the residuals. The estimated residuals are sorted in ascending order, after which 15% of the highest and lowest values are eliminated, and the remaining 70% of the values are considered as potential thresholds. Next, Equation (4) is estimated for each of the potential thresholds. The estimated threshold value comes from the minimisation of the sum of squares of the residuals. When the Enders and Siklos (2001) test detects the presence of an asymmetry in the co-integrating relationship between prices, it is then possible to estimate the asymmetric Enders and Granger (AECM) in which the speed of adjustment of the price paid to the producer depends on the nature of the imbalance:

$$\Delta P_t^p = I_t \phi_1 \epsilon_{t-1} + (1 - I_t) \phi_2 \epsilon_{t-1} + \sum_{k=0} \alpha_k \Delta P_{t-k}^m + \sum_{k=1} \beta_k \Delta P_{t-k}^p + \vartheta_t, \quad (5)$$

where the terms ϕ_1 and ϕ_2 represent the adjustment parameters for positive shocks (falling international price) and negative shocks (rising international price), and the term ϑ_t is white noise. The adjustment of variations in the variable P_t^p is symmetric when the parameters ϕ_1 and ϕ_2 are significant and equal. In this case, the Engle and Granger ECM becomes a special case of the AECM.

3.2 Data presentation

The data used are the monthly domestic and international prices of coffee and cocoa over the period from 1996 to 2018. The year 1996 corresponds to the beginning of the period of liberalisation of the coffee and cocoa sectors in Togo. These prices were extracted from the World Bank's African Development Indicator (ADI) and the FAO database (FAOSTAT). The domestic prices were converted into USD using exchange rates from the International Financial Statistics (IFS) of the International Monetary Fund. All prices were deflated by a consumer price index to account for inflation. For estimation, the natural logarithm of prices was used.

4. Results and discussion

4.1 Description of movements in domestic and international coffee and cocoa prices

The first step describes the visual movement in prices. This movement is represented in Figure 1 for coffee and in Figure 2 for cocoa. For the two commodities, the gap between the international price (PM) curves and the producer price (PD) is not constant. In general, price trends are characterised by high volatility in both international prices and producer prices. The fluctuation in international prices seems more pronounced than that in domestic coffee and cocoa prices.

For coffee, the analysis of the movement in prices shows that the gap was initially large at the beginning of liberalisation, then narrowed before increasing and narrowing again. For cocoa, it can be seen that the gap was large at the beginning of liberalisation and narrowed over the years.

These fluctuations in price differentials can be explained by the market power of intermediary traders, and also by transport costs and government intervention mechanisms.

Price movements suggest the existence of asymmetries in the price transmission between international and domestic prices. Price data seem to reveal that, between August 2004 and September

2005, an abnormal movement in world and domestic prices of cocoa was observed. An increase (decrease) in the world price was accompanied by a decrease (increase) in domestic price. For example, according to the data, the 0.13 point drop in the world cocoa price between March and April 2005 was accompanied by an increase of 0.10 point in the domestic price. With regard to coffee, the increase of 0.17 point in the world price between April and May 2012 was accompanied by a drop of 0.05 point in the domestic price.

This phenomenon is similar to what the literature calls asymmetric price transmission. In order to test the reality of this, in the next section we perform econometric tests for asymmetric price transmission.

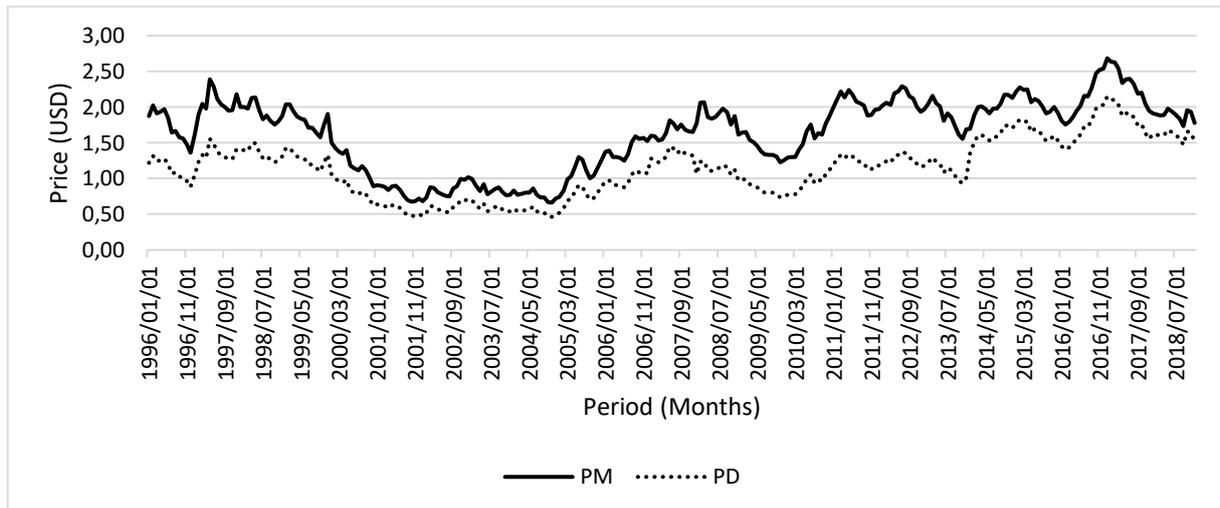


Figure 1: Evolution of the world and domestic coffee prices from 1996 to 2018

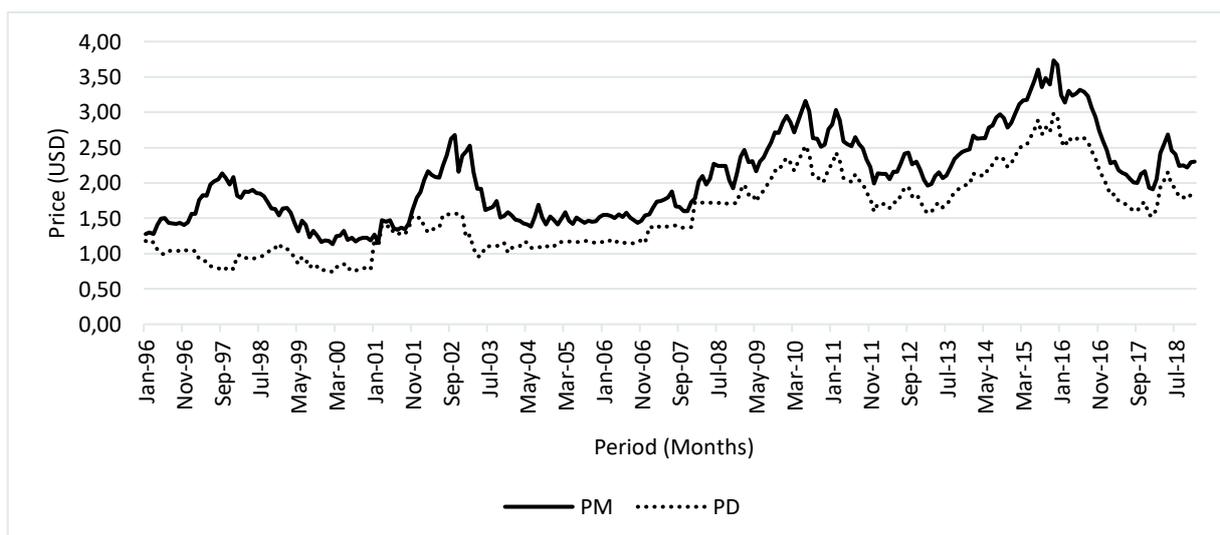


Figure 2: Evolution of the world and domestic cocoa prices from 1996 to 2018

4.2 Econometric results

4.2.1 Stationarity tests

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were used to test the hypothesis of stationarity of the price series. The tests presented in Table 1 below show that all the price series were non-stationary in level, but were integrated in first difference. On the other hand, the ADF and

Phillips-Perron tests performed on the price series in their first difference show that the t-statistics were different from zero at the 1% threshold. The price series therefore were stationary in their first difference, where they were integrated of order 1. This result suggests that there is a long-run relationship between the international price and the producer price.

Table 1: Results of unit root tests on coffee and cocoa prices

	ADF		PP	
	Level	Difference	Level	Difference
International coffee price	-1.37 (-0.03)	-11.60*** (-7.22)	-0.43 (-1.24)	-10.30*** (-7.20)
Coffee producer price	-0.38 (1.01)	-9.42*** (-5.63)	-0.68 (-1.21)	-6.43*** (-7.73)
International cocoa price	-1.48 (-0.10)	-12.31*** (-6.54)	-1.22 (-1.12)	-11.32*** (-5.76)
Cocoa producer price	-0.43 (-0.96)	-13.05*** (-8.07)	-0.45 (-0.71)	-11.05*** (-9.12)

Source: Authors' calculations based on ADI and FAO data

Notes: The values in brackets are the test statistics to be compared with the critical values, corresponding to -3.44 for the ADF test and -4.48 for the PP test at the 1% threshold level. *** indicates that the coefficient is significant at the 1% level.

4.2.2 Co-integration and asymmetric transmission tests

Table 2 shows the results of the tests for the asymmetric co-integration relationship between the price series according to Enders and Granger (1998). The Ljung-Box test was also performed to ensure that the residuals were uncorrelated. The Ljung-Box Q-statistics, also reported in Table 2, indicate that the residuals are not significantly correlated. The null ($\rho_1 = \rho_2 = 0$) hypothesis is rejected by comparing the computed Fisher statistics with the critical values of the Enders and Granger (1998) table. This result means that there is asymmetric co-integration between the producer price and the international price. We then tested the symmetric adjustment hypothesis. This hypothesis assumes the equality of the coefficients ρ_1 and ρ_2 , and is tested using the standard Wald test. The results of the test give values of 7.52 and 9.15 for coffee and cocoa prices respectively. The hypothesis of symmetrical adjustment of prices between the international and domestic markets for coffee and cocoa is therefore rejected considering a non-zero threshold. Moreover, there is no difference between the price adjustment speeds of the two commodities.

Table 2: TAR model estimation with endogenous threshold determination

	Coffee price	Cocoa price	Wald ($\rho_i^{coffee} = \rho_i^{cocoa}$)
θ	-0.23	-0.12	
ρ_1	-0.72** (-2.71)	-0.87** (-2.69)	NS
ρ_2	-0.47*** (-4.68)	-0.31*** (6.12)	NS
Observations	276	276	
t_{max}	-5.69	-4.54	
$F(\rho_1 = \rho_2 = 0)$	15.23***	16.44***	
Wald ($\rho_1 = \rho_2$)	7.52***	9.15***	
Q^d	0.31 (0.59)	0.67 (0.35)	

Source: Authors' estimate from ADI and FAO data.

Notes: The values in parentheses are Student's test statistics for ρ_1 and ρ_2 . F is the joint test statistic proposed by Enders and Siklos (2001). The Wald test is the test of equality of coefficients ($\rho_1 = \rho_2$). The number of lags in the TAR is determined by the Akaike information criterion. Q^d are the Ljung-Box statistics, for which the first orders (p) of autocorrelation of the residuals are jointly equal to zero. NS = not significant. *** and ** indicate that the coefficients are significant at a level of 1% and 5% respectively.

The estimated coefficients of ρ_1 and ρ_2 are -0.72 and -0.47 for the coffee market. The value of ρ_1 indicates that about 72% of the positive deviations from the long-run equilibrium are absorbed in a month. In contrast, the value of ρ_2 indicates that 47% of the negative deviations from equilibrium are absorbed within a month. For the cocoa market, the estimated coefficients are -0.87 for ρ_1 and -0.31 for ρ_2 . About 87% of the positive deviations (decrease in the international price) from equilibrium are absorbed within a month, and 31% of the negative deviations (increase in the international price) are absorbed within a month. These results imply that shocks causing positive deviations are better absorbed than those causing negative deviations. In other words, producer prices respond more quickly to shocks causing declines in the world price than those causing increases in the international price.

4.2.3 Test for asymmetric error correction model

Analysis of the short-run dynamics from the asymmetric error correction model (AECM) reported in Table 3 shows that a 1% increase in the international price leads to an increase of about 0.27% and 0.39% in the domestic price of coffee and cocoa respectively. On the other hand, domestic prices respond significantly to positive and negative deviations from equilibrium. Indeed, the estimated values of ϕ_1 and ϕ_2 indicate that adjusting the domestic price eliminates 52% of a negative deviation from the threshold and 77% of a positive deviation in coffee prices. In the case of cocoa, the results show that a domestic price adjustment eliminates 46% of a negative deviation and 64% of a positive deviation from the threshold. These results show that shocks that cause declines in international prices are better transmitted than those that cause price increases. Moreover, the speed of the adjustment mechanism is statistically identical for the two commodities.

Table 3: Asymmetric error correction model with endogenous threshold determination

	Coffee price	Cocoa price	Wald ($\phi_i^{coffee} = \phi_i^{cocoa}$)
ϕ_1	-0.77** (-2.71)	-0.64** (-2.69)	NS
ϕ_2	-0.52*** (-4.68)	-0.46*** (6.12)	NS
α_0	0.27**	0.39**	
α_1	-5.69	-4.54	
Observations	276	276	
F ($\phi_1 = \phi_2 = 0$)	36***	43***	
Wald ($\phi_1 = \phi_2$)	7.52***	9.15***	
Q ^d	0.31 (0.59)	0.67 (0.35)	

Source: Authors' estimate from ADI and FAO data.

Notes: Values in parentheses are Student's test statistics for ϕ_1 and ϕ_2 . F is the joint test statistic proposed by Enders and Siklos (2001). The Wald test is the test of equality of coefficients, $\phi_1 = \phi_2$. The number of lags in the TAR is determined by the Akaike information criterion. Q^d are the Ljung-Box statistics for which the first orders (p) of autocorrelation of the residuals are jointly equal to zero. NS = not significant. *** and ** indicate that the coefficients are significant at a level of 1% and 5% respectively.

These results are supported by those of other authors relating to the marketing efficiency of coffee and cocoa. These authors are Subervie (2011), Mofya-Mukuka and Abdulai (2013), Khumaira *et al.* (2016), Jácome and Garrido (2017), Mai (2017), Rahmanta *et al.* (2020), Ghoshray and Mohan (2021) and Kamaruddin *et al.* (2021) for coffee, and Ajetomobi and Dlamini (2017) and Luckstead (2018) for cocoa.

5. Conclusion and policy implications

There is no consensus on the existence or otherwise of asymmetric price transmission between international and domestic markets for coffee and cocoa. The objective of this paper was to examine the existence of asymmetry in the transmission of international price shocks to producer prices of coffee and cocoa in Togo. The basic hypothesis – that domestic coffee and cocoa prices respond less quickly to international price increases than to decreases – was confirmed. Producers' concerns about the rigidity in the transmission of international price increases to coffee and cocoa producer prices is correct. The asymmetric price transmission is similar in term of the speed of adjustment for the two commodities. In other words, there is asymmetric behaviour in the speed of adjustment of the domestic prices in response to the international prices of coffee and cocoa.

In order to reduce the asymmetry in price transmission, it is necessary to know the factors that cause the asymmetry of price transmission between international and domestic markets for coffee and cocoa. For this purpose, further investigations need to be done on detecting the reasons of asymmetry in price transmission between the international and domestic markets of the two commodities.

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