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DO FUTURES STABILIZE THE VOLATILITY OF THE AGRICULTURAL SPOT PRICES? EVIDENCE FROM THAILAND

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Abstract

This paper applies ARIMA-GARCH and ARIMA-TARCH with the dummy variable to explore whether futures in The Agricultural Futures Exchange of Thailand (AFET) can stabilize the spot prices volatility or not. Using the three spot prices of the futures' underlying products which are still trading in the market at the present; Ribbed Smoked Sheet no.3 (RSS3), Tapioca Chip (TC), and White Rice 5% (BWR5), to model the volatility series and make a comparison between the period of the presence and the absence of having the futures trading. The result is found that the AFET's futures have not affected the spot prices' volatility for Ribbed Smoked Sheet no.3 and White Rice 5%. While, Tapioca Chip price is more volatile after AFET started operating. This can be implied that AFET's futures cannot stabilize the agricultural spot prices.

Key words: *AFET, Futures Market, Variance Model*

***JEL Classification**:* C01, C51, G17

1. INTRODUCTION

Price volatility in agricultural spot market is a frequent occurrence. The reason is from fluctuation of demand and supply caused by natural disasters, more product corners or irrational market expectations. The price volatility generates difficulty in trading execution, pre-cost and profit calculation, and related decisions making for those who are involved in agricultural product businesses.

This research is started from the price fluctuation problem. Since, Thailand is based on agricultural production, it will be very advantageous that if there can be any tool to help stabilizing the spot prices. By the recent establishment of the first agricultural futures market in Thailand or AFET (The Agricultural Futures Exchange of Thailand), the question is formed here whether or not the futures can help lessen the price volatility?

Many researchers have been interested in this question. Netz (1995) explained through "storage" to answer why futures help stabilizing spot price. Storage is very valuable in the sense that the producers can store their unsold products when the time of oversupply. While, on the other hand when scarcity comes, storage is the solution lessening the products shortage since there are products have been stored and ready to distribute immediately. Implying that price shock by unexpected demand and supply could be lessened though storage, which later lead to lesser spot price volatility.

However the wrong storage amount is very risky to loss. Netz suggested that the farmers can better predict how much to store their products by hedging futures contract and storing physical product specified in the contract to be sure of how much to be delivered. Thus, futures seem to encourage the right storage level leading to spot price stabilization. Empirically, Netz showed that wheat price's volatility can be stabilized by futures.

Various futures' underlying products also have been studied, For example, the currency market of Mexican Peso, the Brazilian Real, and the Hungarian Forint futures contracts were researched in terms of the three respective spot markets. Jochum and Kodre (1998) used a SWARCH (Markov Switching Autogressive Conditional Heteroscedasticity) with the dummy model and find that Mexican Peso futures is the stabilizer, while the other two currency futures do not have any impact on the underlying products volatility.

The stock index futures is another study in which the difference of the results can be observed. Kumar and Mukhopadhyay (2007) have not found the volatility stabilization through the futures in the Indian NSE Nifty Index Futures. Arisoy's (2008) paper contradictory presents that having futures market does stabilize the underlying product volatility. The result is proved by using FTSE Xinhua China A50 as a case. However, the different outcomes may be caused by the different data. Both papers have used the GARCH model with the dummy as explained.

FTSE 100 stock index futures is the next market. Antoniou and Holmes (1995) used GARCH and the dummy. It is found that the dummy results in the volatility increase after the futures started trading. They moreover suggest that the volatility increase is due to the increased information in the market, not from speculating activity. Board, Sandmann, and Sutcliffe (2001) argue that having futures does not increase the volatility. Using EGARCH with futures trading volume, the hypothesis that "the increase in futures trading would increase more spot price volatility" is rejected by this paper.

Singh (2007) takes the Indian Hessian futures for the research. This is another one of the supporters showing that the agricultural futures is the stabilizer. Using the volatility and the dummy as the regressor, the research proved that cash price volatility is reduced after the introduction of its futures.

Different types of derivatives are also similar to futures. Chau, Tse, Yiu, and Wong, (2006) study the pre- and the post- presence of the forward market of Hong Kong Real Estate by using the normal GARCH(1,1) with the dummy period variable. The result found some interesting points; first, the spot price increases obviously after the introduction of the Real Estate Forward. However, they explained that the forward destabilization is caused by the regulatory control on the forward market which may leave the market non-freely operated. Later, the control becomes more relaxed making the spot prices more stabilized.

Among the previous studies, one cannot confidently conclude that the futures *is* or *is not* the spot price stabilizer since the results still vary. The Agricultural Futures Exchange of Thailand or AFET is another curiosity to be explored.

The main objective of this paper has been clarified in the title, this is to test whether the futures stabilize the spot price volatility or not, the framework in the empirical part can be accomplished by comparing the volatility between "*Before*" and "*After*" having the futures trading. To model the volatility for using in the comparison, widely used in economic and financial field, GARCH and TARCH are employed for portraying the volatility here. Moreover, the dummy variable is added to measure the significance of the effect between *before* and *after* period.

After the introduction in this section, section 2 provides the data information, while Section 3 is the methodologies used in the empirical part. The empirical result will be reported in section 4. Finally, the paper ends up with the conclusion in the fifth section.

2. DATA

The data that will be used empirically is limited to the three agricultural spot prices which AFET uses as the futures' underlying products and these products are still trading by the time of the research is in progress.

2.1 The Agricultural Futures Exchange of Thailand (AFET)

AFET is an independent juristic person established in 1999 under the provisions of the Act to run the exclusive agricultural futures exchange in Thailand regulated by Agricultural Futures Trading Commission. The Exchange is aimed to be the marketplace of trading agricultural futures with established rules and regulations offering fairness to all buyers and sellers. AFET is the first, and only, agricultural futures market operating at the present time.

Since the first trading day of AFET, nine products have been listed in this futures market. The details are shown in the following table:

Table-1: AFET products' summary (2004 - 2008)

	Underlying Products	Listed Name	Date of Listing	Status
1	Ribbed Smoked Sheet no.3	RSS3	May 28, 2004	Listed
2	White Rice 5% Brokens	WR5	August 26, 2004	De-Listed
3	Tapioca Starch Premium Grade	TS	March 25, 2005	De-Listed
4	White Rice 5% Brokens-Mini	WR5-M	August 8, 2005	De-Listed
5	Tapioca Chip	TC	August 18, 2006	Listed
6	Concentrated Latex	LATEX	March 31, 2006	De-Listed
7	Standard Thai Rubber 20	STR20	March 31, 2006	De-Listed
8	White Rice 5% (Specification Change)	WR5P	December 1, 2006	De-Listed
9	White Rice 5% (Re-Traded)	BWR5	April 2, 2007	Listed

There were six products which are temporarily suspended, which later were de-listed from the market. De-listing is executed because some have the burden of "unpopularity of the contracts" and some are needed for "contract specification modification". Both reasons are direct causes of illiquidity.

The current listed products are Ribbed Smoked Sheet no.3 (RSS3), Tapioca Chip (TC), and White Rice 5% (BWR5). An addition of futures product in AFET may be seen in the future depending on economic and market conditions, liquidity of the product and investors' interest.

So, the three spot prices which will be used are as followed;

- *Ribbed Smoked Sheet no.3:* October 1, 1999 to June 30, 2008 from CEIC Database.

- *White Rice 5%:* March 6, 2006 to June 30, 2008 from CEIC Database.

- *Tapioca Chip:* January 8, 2001 to May 30, 2008 from Office of Agricultural Economics (http://www.oae.go.th).

3. METHODOLOGY

To explore the curiosity whether having the futures market in the country affects the volatility in the spot market or not, GARCH and TARCH are employed here to model the spot price volatility. Additionally, the dummy variable is added to the model to measure the effect of the absence and the presence of having the futures trading on the spot prices' volatility.

3.1 ARCH and GARCH

Since the belief of time-varying volatility is more realistic than the constant one, GARCH becomes preferable for researchers to plot the volatility series. GARCH is more applicable than ARCH (Autoregressive Conditional Heteroscedasticity) developed by Engle (1982), which lets only the squared residuals to be the regressor in the model, and ARCH seems to cause an over-use of ARCH terms since it allows only the lags of ε2 in the model. The abundant ARCH terms may break the non-negative variance assumption which is a necessary requirement.

ARCH(p) is modeled as followed:

$$h_t = \beta_0 + \sum_{i=1}^{p} \beta_i \varepsilon^2_{t-i}$$

Bollerslev (1986) extends the study of ARCH (3.13) by introducing GARCH (Generalized Autoregressive Conditional Heteroscedasticity) for modeling the conditional variance or volatility similar to ARCH. However, GARCH is considered superior to ARCH. GARCH follows the ARMA process because the conditional variance depends on the past volatility (ε2t-i) or the ARCH term and the past variance (ht-i) or the GARCH term. This result in no over-use of only ε2t-I like in ARCH and the non-negative variance can remain.

GARCH (p,q) is modeled as followed:

$$h_t = \beta_0 + \sum_{i=1}^{p} \beta_i \varepsilon^2_{t-i} + \sum_{j=1}^{q} \alpha_j h_{t-j}$$

The requirement for GARCH, as mentioned, is the non-negative conditional variance. This requirement constrains β_0, β_i, and α_j to be greater than 0 or non-negative parameters. The term p and q shown in the model is the lag(s) order by giving $p \geq 0$ and $q \geq 0$.

To perform GARCH as the conditional variance modeler, the conditional mean needs to be made at an initial stage. For this thesis, ARIMA (autoregressive integrated moving average) is chosen as the mean equation upon the data stationarity level.

In some cases, normal GARCH cannot be fitted with the volatility series. The additional model from the family of GARCH needs to be proposed. TARCH and TGARCH are the widely known models from the family.

3.2 TARCH (Threshold ARCH) and TGARCH (Threshold GARCH)

The model of TARCH(p) and TGARCH(p,q) are as followed:

TARCH : $h_t = \beta_0 + \beta_1 \varepsilon^2_{t-1} + \lambda_1 \varepsilon^2_{t-1} d_{t-1}$

TGARCH: $h_t = \beta_0 + \beta_1 \varepsilon^2_{t-1} + \lambda_1 \varepsilon^2_{t-1} d_{t-1} + \alpha_1 h_{t-1}$

TARCH and TGARCH allow the impact of good news and bad news to be in the model. Zakoian (1990); Glosten, Jaganathan, and Runkle (1993) independently introduced and demonstrated that good news and bad news have different impacts on volatility (Tantisantiwong, 2001).

dt-1 is the news dummy term giving dt-1 = 1 if εt-i < 0 and dt-1 = 0 if εt-i ≥ 0. Good news produce εt-i ≥ 0 or positive value, while bad news give εt-i < 0 or negative value. If λ1 > 0, bad news will have larger effects on volatility than good news.

Enders (2004) explained that the volatility which tends to rise when a return declines (negative shock) and fall when a return rises (positive shock) is called "the leverage effect".

3.3 Dummy Variable

In the econometric model, the nominal or qualitative variables (e.g., sex, ages, and colors) can not be identified as the counting number. It is also for the presence and the absence of quantity as in this research; the volatility *before* and *after* having the futures trading.

Dummy is the solution to quantify these uncountable variables by generating artificial variables to be in the model. For the measurement of the volatility between two periods; *Before* and *After* having the futures trading. 0 indicates the Pre-period or the absence, while 1 indicates the Post-period or the presence.

4. EMPIRICAL RESULT

4.1 Stationarity Testing

Firstly, the stationarity of the data need to be confirmed. If the data are all stationary, the data at level can be appropriately used. The stationarity testing process is carried out by the Augmented Dickey Fuller test (ADF). The acceptation of the null hypothesis indicates the non-stationarity, while the rejection results in the stationarity.

Table-2: Unit Root Test

	Price at Level	**Price at First Difference**
Ribbed Smoked Sheet no.3	0.470350 [1] *(0.8161)*	-22.84748 [1] *(0.0000)*
Tapioca Chip	-2.063248 [0] *(0.5655)*	-42.55862 [0] *(0.0001)*
White Rice 5%	0.470350 [1] *(0.8161)*	-15.23615 [0] *(0.0000)*

The number without the parenthesis is the test statistic to be compared with MacKinnon one-sided p-values following the optimal lag(s) chosen by Schwarz criterion value or SC written on the same line. The value in the parenthesis on the second line is the probability. The result in the table shows that all the spot prices series are stationary at the first difference level as the null hypotheses have been rejected. This result allows ARIMA to be the mean equation for GARCH.

4.2 ARIMA Model Construction

Firstly, ARIMA needs to be created as the conditional mean equation to be able to move on with the building of the GARCH model. However, before the construction of GARCH, the mean equation should be checked for the correct specification by observing the serial correlation problem and ARCH effect.

If the serial correlation exists, the lags should be re-chosen for ARIMA until the problem is invisible. For the ARCH effect, if the ARCH is not present in ARIMA, GARCH should not be modeled and the volatility measurement has to be done in another method. Both tests are carried out by Serial Correlation LM test and ARCH LM test. The non-rejection of the null hypothesis of the Serial Correlation LM test indicates no serial correlation. For the existence of the ARCH effect, the null hypothesis of the ARCH LM test is to be rejected.

When creating the mean and variance equations, there may be more than one choice to be selected. Schwarz criterion value or SC is the final judgment.

The ARIMA models for the three spot prices with the specification checks are as followed:

I. Ribbed Smoked Sheet no.3: ARIMA(1,1,1)

$$S\_rss3_t = 0.040 + 0.648^{***}(R\_rss3_{t-1}) - 0.336^{***}(\varepsilon_{t-1}) \quad (1)$$

(0.041) (0.051)

Serial Correlation LM test: $X^2(2) = 0.190$

ARCH LM test: Obs*R-squared, $X^2(2) = 0.000^{***}$

II. Tapioca Chip: ARIMA(2,1,2)

$$S\_tc_t = 0.002 - 0.925^{***}(R\_tc_{t-2}) + 0.892^{***}(\varepsilon_{t-2}) \quad (2)$$

(0.044) (0.052)

Serial Correlation LM test: $X^2(2) = 0.093$

ARCH LM test: Obs*R-squared, $X^2(2) = 0.000^{***}$

III White Rice 5%: ARIMA(1,1,1)

$$S\_bwr5_t = 1.388 + 0.223^{**}(R\_bwr5_{t-1}) + 0.252^{***}(\varepsilon_{t-1}) \quad (3)$$

(0.090) (0.090)

Serial Correlation LM test: $X^2(2) = 0.975$

ARCH LM test: Obs*R-squared, $X^2(2) = 0.000^{***}$

Where:

- S_rss3_t is the first difference of the Ribbed Smoked Sheet no.3 spot price.
- S_tc_t is the first difference of the Tapioca Chip spot price.
- S_bwr5_t is the first difference of the Tapioca Chip spot price.
- The number in the parenthesis below the coefficient is the standard error.
- *** and ** denote the significance at 1% and 5% level respectively.
- The significance for both specification tests are reported in p-value (Chi-square distribution) for Obs*R-squared.

The ARIMA model (1), (2), and (3) are found significant for all the lag coefficients and the serial correlation are not present as the null hypothesis of each spot price's serial correlation test is not rejected. However, the three models exhibit ARCH effect confirming that the time varying volatility series for each price can be modeled by GARCH. The ARCH effect can be assured by each null hypothesis rejection in the three models' ARCH LM tests. So, the next stage is to construct ARIMA-GARCH model plus the dummy variable.

4.3 GARCH Construction with the Dummy Added

The estimated ARIMA(p,1,q)-GARCH(1,1) with the dummy (0: the presence and 1: the absence) of the three spot prices are on the followings:

I. Ribbed Smoked Sheet no.3: ARIMA(1,1,1)-GARCH(1,1) with the dummy

$$S\_rss3_t = 0.025 + \underset{(0.023)}{0.856^{***}}(S\_rss3_{t-1}) - \underset{(0.037)}{0.608^{***}}(\varepsilon_{t-1})$$

$$\sigma_t^2 = 0.003 + \underset{(0.009)}{0.140^{***}}(\varepsilon^2_{t-1}) + \underset{(0.008)}{0.860^{***}}(\sigma^2_{t-1}) + \underset{(0.001)}{0.0005}(\mathbf{DUMMY}) \qquad (4)$$

$Q(8) = 0.139$ $\quad Q(12) = 0.107$

$Q^2(8) = 0.910$ $\quad Q^2(12) = 0.797$

ARCH LM test: Obs*R-squared, $X^2(2) = 0.593$

II. Tapioca Chip: ARIMA(2,1,2)-GARCH(1,1) with the dummy

$$S\_tc_t = 0.002 - \underset{(0.064)}{0.919^{***}}(R\_tc_{t-2}) + \underset{(0.079)}{0.892^{***}}(\varepsilon_{t-2})$$

$$\sigma_t^2 = 0.001 + \underset{(0.007)}{0.087^{***}}(\varepsilon^2_{t-1}) + \underset{(0.037)}{0.358^{***}}(\sigma^2_{t-1}) + \underset{(5.84E\text{-}05)}{0.001^{***}}(\mathbf{DUMMY}) \qquad (5)$$

$Q(8) = 0.721$ $\quad Q(12) = 0.894$

$Q^2(8) = 0.870$ $\quad Q^2(12) = 0.928$

ARCH LM test: Obs*R-squared, $X^2(2) = 0.365$

Although the model (5) seems to have no problem, it is found in the Q^2 values after 15^{th} lag until 36^{th} lag, which is not shown here, that all of them are significant. This result indicates the presence of ARCH effect and the model is not in the right specification. For this case, ARCH effect is still left in the model. So, the variance equation needs to be reformed by adding more lags to GARCH model or constructing another type of volatility model from GARCH family.

After trying to solve the problem of significant Q^2 by adding more lags to ARCH and GARCH, it is still found that the Q^2 values still remain significant. Thus, the normal GARCH is not suitable for the data. The more correct specification and suitability is finally found in TARCH or Threshold ARCH shown in model (6).

ARIMA(2,1,2)-TARCH(2) with the dummy;

$$S\_tc_t = 0.002 + 0.830^{**}(R\_tc_{t-2}) - 0.842^{***}(\varepsilon_{t-2})$$
$$(0.298) \qquad (0.283)$$

$$\sigma_t^2 = 0.001 - 0.005^{***}(\varepsilon^2_{t-1}) + 0.040^{***}(\varepsilon^2_{t-2}) + 0.235^{***}(\varepsilon^2_{t-1}d_{t-1}) +$$
$$(0.000) \qquad (0.005) \qquad (0.029)$$

$$0.0004^{***}\mathbf{(DUMMY)} \qquad (6)$$
$$(1.59E\text{-}05)$$

Q(8) = 0.835 Q(12) = 0.877

$Q^2(8) = 0.983$ $Q^2(12) = 0.547$

ARCH LM test: Obs*R-squared, $X^2(2) = 0.741$

With the significance of $0.235^{***}(\varepsilon^2_{t-1}d_{t-1})$ term in the model (6), a brief explanation of TARCH can be discussed here. Since TARCH assumes that the news has impact on volatility as explained in the methodology part. For model (6), if the bad news or negative return occurs at time t-1, the d_{t-1} is equal to 1 affecting the volatility to be raised by about $0.235(\varepsilon^2_{t-1}) - 0.005(\varepsilon^2_{t-1})$. What if the good news happens at time t-1, the d_{t-1} term is equal to 0 making the news term becomes all 0 and leaving only the volatility from the left terms to be calculated.

III White Rice 5%: ARIMA(1,1,1)-GARCH(1,1) with the dummy

$$S\_bwr5_t = -0.011 + 0.547^{***}(S\_bwr5_{t-1}) - \mathit{0.217}(\varepsilon_{t-1})$$
$$(0.115) \qquad (0.145)$$

$$\sigma_t^2 = 1.022 + 0.177^{***}(\varepsilon^2_{t-1}) + 0.841^{***}(\sigma^2_{t-1}) + 0.202\mathbf{(DUMMY)} \qquad (7)$$
$$(0.015) \qquad (0.011) \qquad (0.141)$$

When the ARIMA(1,1,1) is combined with GARCH(1,1) here, the MA(1) or - *0.217*(ε_{t-1}) part becomes insignificant. Hence, the MA(1) is needed to be taken out of the model for the correctness.

The adjusted model for (6) is ARIMA(1,1,0)-GARCH(1,1) with the dummy, this one is the final model for White Rice 5%

$$S\_bwr5_t = -0.009 + 0.358^{***}(S\_bwr5_{t-1})$$
$$(0.049)$$

$$\sigma_t^2 = 1.04 + 0.178^{***}(\varepsilon^2_{t-1}) + 0.840^{***}(\sigma^2_{t-1}) + 0.209\textbf{(DUMMY)} \quad (8)$$
$$(0.015) \quad (0.010) \quad (0.143)$$

$Q(8) = 0.077$ $Q(12) = 0.146$

$Q^2(8) = 0.767$ $Q^2(12) = 0.728$

ARCH LM test: Obs*R-squared, $X^2(2) = 0.463$

Where:

- S_rss3_t, S_tc_t, and S_bwr5_t are the same denotation.
- The number in the parenthesis below the coefficient is the standard error.
- *** and ** denote the significance at 1% and 5% level respectively.
- Q and Q^2 are reported in p-value
- ARCH LM test is reported in p-value (Chi-square distribution) for Obs*R-squared.

After (4), (6), and (8) have been successfully made in ARIMA-GARCH and ARIMA-TARCH and all the coefficients are significant, the same specification check should be re-done to ensure that ARCH effect is invisible and the serial correlation problem is gone.

For model (4), (6), and (8) they result in the same outcome. Checked by Ljung-Box Q-statistic (Q), they are found no serial correlation in the error terms. For the ARCH effect, the Q^2 and the ARCH LM test simultaneously affirm that the ARCH effect is gone for (4), (6), and (8) since the null hypothesis for both measurements becomes not rejected.

When all the price series are well corrected and specified in GARCH and TARCH. The below is a summary for the three variance models:

I. Ribbed Smoked Sheet no.3

$$\sigma_t^2 = 0.003 + 0.140^{***}(\varepsilon^2_{t-1}) + 0.860^{***}(\sigma^2_{t-1}) + 0.0005\textbf{(DUMMY)} \quad (4)$$

II. Tapioca Chip

$$\sigma_t^2 = 0.001 - 0.005^{***}(\varepsilon^2_{t-1}) + 0.040^{***}(\varepsilon^2_{t-2}) + 0.235^{***}(\varepsilon^2_{t-1}d_{t-1}) + 0.0004^{***}\textbf{(DUMMY)} \quad (6)$$

III White Rice 5%

$$\sigma_t^2 = 1.04 + 0.178^{***}(\varepsilon^2_{t-1}) + 0.840^{***}(\sigma^2_{t-1}) + 0.209\textbf{(DUMMY)} \quad (8)$$

Since the title aims to determine the effect of AFET on the spot prices, the dummy needs to be checked here. The implication of the result can be analyzed with the following explanation; if the dummy has positive value, futures tends to increase the spot price volatility, while if the dummy is negative, AFET becomes the volatility reducer. However, the significance of the dummy needs to be confirmed for ensuring that the dummy variable really significantly different from zero which means that the presence of futures trading really affects the volatility change in the spot prices by one way or another. So, in this final stage, the attention will be more paid to the dummy.

The result of each agricultural spot price for dummy value is the same. All the three dummies have positive value. This indicates that after the futures have been started trading, the three underlying products' spot prices are more volatile. From White Rice 5% (+0.209 unit), the highest volatility, followed by Ribbed Smoked Sheet no.3 (+0.0005) and Tapioca Chip (+0.0004), respectively.

However, it can not rush to conclude that AFET is the cause of the spot prices fluctuation. The significance of dummy for each product's model needs to be observed. For Ribbed Smoked Sheet no.3 and White Rice 5%, the dummies are insignificant meaning that AFET is not that volatility increaser and AFET does not have any impact on the two spot prices' fluctuation.

In contrast with Tapioca Chip, the dummy becomes significant. This implies that when after AFET started trading, the spot price becomes more volatile at +0.0004 units, still, the unit of increased volatility is very tiny tending to zero.

Summarily, AFET has no involvement in increasing or decreasing the volatility for Ribbed Smoked Sheet no.3 and White Rice 5% spot price. While, Tapioca Chip has more volatility after the establishment of AFET, however, the increased volatility is not a big matter since the number is approximately equal to zero. In conclusion, the Thai agricultural futures market seems not to stabilize the volatility in the Thai agricultural spot prices.

5. CONCLUSION

Do AFET's Futures Stabilize the Spot Prices Volatility? This question is formed after many studies have focused on the other futures markets in various products and countries. Since, the conclusion cannot be made upon the mix of results; some have found the stabilization outcome, while some end up with the destabilization. This paper uses AFET (The Agricultural Futures Exchange of Thailand) as a case to be empirically tested.

To prove this question, the methodology is made to measure the volatility in the spot market between the pre- and the post- presence of AFET, this paper apply ARIMA(p,d,q)-GARCH(p,q) and ARIMA(p,d,q)-TARCH(p) to model the volatility. Additionally, the dummy is added to the model to be the indicator of the volatility effect between the presence; as equal to 1, and the absence; as equal to 0, of the futures trading.

ARIMA(1,1,1)-GARCH(1,1) with the dummy is applied to Ribbed Smoked Sheet no.3 spot prices. While Tapioca Chip and White Rice 5% are compatible with ARIMA(2,1,2)-TARCH(2) with the dummy and ARIMA(1,1,0)-GARCH(1,1) with the dummy respectively. The result of the research more focuses on the significance of the dummy variable to see whether the volatility effect is higher or lesser after the period of futures have been started trading.

The volatility of the three products similarly increases after the presence of the futures. Nevertheless, the result of each dummy variable is contradictory. Ribbed Smoked Sheet no.3 and White Rice 5% have not been affected by the futures trading since the dummy is not even statistically significant, meaning that the causes of more or less volatility in the two spot prices have not conveyed from the Thai futures market. However, the presence of futures seems to raise more spot price fluctuation of Tapioca Chip. The result is found that the dummy is positive significance. Though, it sounds unfavorable, the unit of increased volatility is very tiny tending to zero.

Finally, one can conclude that the first and only agricultural futures market of Thailand or AFET has not involved the price volatility in spot market. Even worse for the case of Tapioca Chip price, AFET seems to increase the volatility, but in a litter matter. Concluding all here, AFET's futures cannot stabilize the agricultural spot prices.

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