International Journal of Social and Administrative Sciences
ISSN(e): 2521-0556
DOI: 10.18488/journal.136.2019.42.155.177
Vol. 4, No. 2, 155-177

URL: www.aessweb.com

EXPLORING THE EFFECT OF PHYSICAL DELIVERY V/S CASH SETTLED FUTURES CONTRACTS WITH THE PROSPECTIVE OF OBLIGATORY DELIVERY IN ISLAMIC CONTRACT OF SALES

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Article History
Received: 18 February 2019
Revised: 26 March 2019
Accepted: 30 April 2019
Published: 14 June 2019

Keywords
Futures contract
Cash settlement
Physical delivery
GARCH model
Volatility
Spot price
Futures price.

ABSTRACT

This study emphasizes that either physical delivery or cash settlement method for futures contract is better for precious metal such as gold and the storable commodities like rice, wheat, sugar, as well as check the effect of both settlement method on the volatility of futures and spot price. To examine the issue we use bivariate GARCH model to discover the interaction between the spot price return and futures price return. The result shows basis variability of spot price and futures prices returns was substantially reduced in the case of physical delivery as compare to the cash settlement of same commodities, which means the physical delivery is more reliable for the rice, wheat, sugar, and gold futures contracts. In addition, physical delivery settlement method is better than the cash settlement because it covers the gap of demand and supply in the market which effect on price and the physical delivery method is more reliable, as it restricts the liquidation of futures contact which declines the price and provide the social benefit as well.

Contribution/ Originality: This study contributes to the existing literature of settlement method of futures contracts effects on the spot and futures prices.

1. INTRODUCTION

1.1. Background of the Study

For the price volatility of commodities or securities, buyers and sellers have a great concern in this current globalized economy, especially for the goods which may be traded internationally. The risk of price volatility primarily associated with agriculture, energy, metal, equity and interbank offer rate. The buyers and seller of the commodities use the futures contract to hedge this critical risk, each futures contract must be settled either physical delivery or cash settlement method on its expiry.

To hedge the risk of sudden or significant change in price of buyer and seller of a commodity a financial mechanism was developed called the futures contract which is a written agreement between buyer (long) and seller (short) including the specification that is price, size (quantity), grade (quality) and terms of delivering the goods at a specified date in the future. The first recognized exchange was established in 1710 in Japan namely Dojima Rice exchange for the mainly trading of rice futures.[1] In the mid of 1800s, Chicago was recognized as a commercial

[1] https://www.investopedia.com/ask/answers/031015/what-history-futures.asp.

center with railroad and telegraph connecting the agricultural market place with east. The fist setup of American exchange was established in 1848 called Chicago Board of Trade (CBOT), this introduce the efficient and standardized method of trade (exchange of goods and payment) by the futures contracts[2].

In the United State two contract which are switched from traditional settlement method of physical delivery to cash settlement. The feeder cattle futures contract which were traded in Chicago Mercantile Exchange (CME) change the settlement method from physical delivery to cash in September 1986 and the second one lean hog futures contract were replaced live hog futures contract and switched into physical delivery which were formerly cash settled. And the ten individual share futures (ISF) contract switched from cash settlement to physical delivery in March 2000, traded at Sydney Futures Exchange (SFE). The Exchange claim that these changes would be beneficial.

The commodities futures contract is usually settled by actual physical delivery of product. In which the seller with short position must liquidated the position at the settlement date by making delivery, likewise the buyer with long position is bounded to take physical delivery in exchange at determined price by the regulator.

When delivery takes place, a warrant or bearer receipt that represents a certain quantity and quality of a commodity in a specific location changes hands from the seller to the buyer upon which time full value payment occurs. The buyer has the right to remove the commodity from the warehouse at their option. Often, a purchaser will leave the raw material product at the storage location and pay a periodic storage fee. Exchanges also set fees for many aspects of the delivery process.

The ability to deliver or take delivery provides the critical link between the derivative instrument and the commodity. Therefore, as a futures contract approaches the delivery date, the price of the futures month will gravitate towards the price of the actual physical or cash market price.

However, the vast majority of market participants in futures markets pay no attention to delivery and for a good reason. Think of speculators who purchase a live cattle contract because they believe that the price will appreciate. Few, if any, have the ability or desire to take delivery of 40,000 pounds of cattle. Even if the cattle do not arrive on their doorsteps, owning cattle at a location requires a different set of skills than trading the animal and depends on having the contacts to market the beef to an ultimate buyer. After all, the buyers of the futures contract only made the purchase because they believed the price would move higher.

The main purpose of physical delivery on a futures contract is to formulate the cause during the delivery period the convergence of cash price and futures price. In contrast under cash settlement method, contract is settled on the final settlement date by marking to the market according determined price by the exchange.

The price volatility is the great challenge in the current globalized economy that concerning with buyers and seller of commodity or security, mainly for the goods which may be traded internationally. The risk of price volatility primarily associated with the agriculture, energy, metal, equity and interbank offer rate.

The volatility is basically associated with the commodities price, it is fluctuations in price day to day, the prices may be toward either direction upward or downward, the price volatility is arisen due to some major factors such as change in weather conditions, incline or decline of production, storage level, delivery constraints and market information etc. the increase in price volatility is the major problem with the both long and short positions because it make their profits or losses bigger, it means a trader with long position earn profit if volatility increase while the counter part with the short position will suffer loss and on the other hand the situation would be vice versa, for example if a trader buy a cotton futures contract for at agreed future price will make a profit if price move away from agreed price at the expiry, while he lose money if price goes down with passing time.

To cater this critical issue futures contract is used as a risk hedging tool. The futures contract must be settled through either physical delivery or cash settlement, according to the predetermine mode of settlement by the

[2] https://www.universalclass.com/articles/business/investments/understanding-the-history-of-commodities-markets-and-futures-market.htm.

exchange. However if the sellers with open short position intending to deliver requires to inform to exchange prior to the trading day as described by the exchange, and the buyers with open long position matched randomly by the exchange on the date of expiration of contract will be bounded to settle by taking physical delivery. In absence of any notification received by the exchange, all open positions at the expiration of the contract to be cash settled at the final settlement price as determine by the Exchange.

1.2. Problem Statement

Whether physical settlement is superior to cash settlement or otherwise would be based on which method results in a creditable and fair price on expiry of the contract and one which is likely to serve investors' and hedgers' interests best. This would happen only if there is a proper convergence between the futures and the spot markets. Cash settlement offers savings in delivery-related cost, has lower settlement risk and reduces time and effort for participants. However, Cash-settling option contracts is fraught with danger and has on many occasions led to large speculative practices.

However, the extent of these benefits depends upon the reliability of cash settlement mechanism having a spot-price assessment process which is robust and cannot be easily manipulated. Room for manipulation is higher where spot markets are outside the purview of the derivative market regulator and are not organised and transparent. This makes accurate assessment of cash or spot price difficult as is the case in physical commodities — market is fragmented, opaque and inefficient. Equity, bonds and currencies markets in contrast are large, transparent with institutional participants and most importantly regulated.

Physical delivery of futures contracts leads to convergence of prices between the futures market and the spot market. Studies show that volatility of future prices decline after cash settlement was replaced by physical settlement. In physical settlement, manipulators realize that if they artificially increase or decrease the price, there is the threat of delivery hanging over them. In cash settlement, manipulators on taking large, long or short positions attempt to either jack up or depress the price in the spot market. Most transactions in the futures market are not affected by settlement method as they are squared off before contract expiry. The decision to settle in cash or in physicals is dependent on the nature of underlying cash market. Though the futures contact is supposed as the tool to hedge the risk of price volatility for the either party with short and long position, this study has investigated which method of futures contract settlement is better for the commodities like agriculture goods, because the price is a function of demand and supply and the volatility is a result of movement of underlying supply and demand. This study suggest that the physical delivery of underlying is better method of settlement.

1.3. Gap Analysis

Many studies have examine the effect of cash settlement versus physical delivery but their study only focus on specific futures contract and limited to a particular area, Rich and Leuthold (1993) observe the small improvement in basis variability after cash settlement and the conversion bring the improvement in contract performance also for the some hedger but not for all (Chan and Lien, 2002) study the feeder cattle futures contract, and found that the cash settlement changed the structural relationship between cans and futures prices (Lien and Tse, 2002) study the feeder cattle futures and finds that the volatility of future price of feeder cattle declined after conversion the method to cash settlement, Chan and Lien (2001) consider the feeder cattle and lean hog futures and finds that after convergence spot and futures markets become more segmented and futures market was less effective in price discovery (Kenyon *et al.*, 1991). Investigate the basis of individual lots of feeder cattle and found that no basis variability was reduced and hedger ability had not improved significantly after conversion the settlement method to cash settlement.

The above studies only covered limited area that is examine the effect conversion of settlement method from traditional mode of settlement, physical delivery to cash settlement, these studies only cover specific period, after

and before conversion of settlement method, in the all above studies only futures price were considered to evaluate the effect of cash settlement.

In our study we consider spot and futures price to evaluate the effect of the two different settlement method of settlement on price volatility. While in general the above studies find the convergence effect of cash settlement from physical delivery that lead improvement in market performance, but their results are not reliable because they ignore the major economic factors of demand and supply which are totally impact on price volatility.

In the result of switching the settlement method of feeder cattle futures contract in September 1986 by the Chicago mercantile exchange from physical delivery to cash settlement, with the expectation of this change will reduce the volatility and improve the prediction of hedgers for basis. Till date many researches have been done on the subject to investigate the effect of the settlement method on futures market performance and volatility. However, all the previous studies only evaluate the futures price during different period which is after and before switching of settlement method their study also ignore the main economic factor of demand and supply which are directly impact on price. Although the previous studies suggest that the cash settlement is better, but we suggest to prefer the physical delivery because is more easier to pass on underlying if necessary for example if a cotton dealer hedge with futures, at the expiry of contract he decide to make delivery because the actual cotton still not sold, if delivery is possible it is easy to make the tender and get cotton paid for and out of his system.

1.4. Research Objectives

This study has tried to explore the effect of physical delivery versus cash settled futures contract on spot and futures price volatility. This study check the volatility in spot price as well as the futures price due to method of futures contract settlement i.e. physical delivery or cash settlement. For this, we examined the existing futures contract settled through physical delivery as well cash settlement for the same period January 2016 to January 2019 and consider the same commodities i.e. rice, wheat, sugar and gold traded in two different futures markets PMEX (Pakistan Mercantile Exchange) CME (Chicago Mercantile Exchange).

Moreover, this study also focus on Islamic perspective of futures contract, and try to argue that the physical delivery of futures contracts are beneficial for the commodities such as rice, wheat, sugar and gold.

1.5. Significance

Though the sometime physical delivery might be difficulty and the delivery cost is also associated with the physical delivery, but ideally more delivery satisfy the more need of society and improve the net social welfare, generally price is associated with the demand and supply, the physical delivery restrict the liquidation of contract which resulting the decline in price.

This study is comprehensively observed the both prices spot and futures, and consider the futures contracts which are settled through the physical delivery and cash settlement method during the same period. Our analysis explore that the physical delivery settlement method is better than the cash settlement because it cover the gap of demand and supply in the market which effect on price and the physical delivery method is more reliable, as it restrict the liquidation of futures contact which decline the price and provide the social benefit as well. The physical delivery settlement method also beneficial for the industries particularly for the foods sector, due to its storage suitability, (grade) quality of commodity.

In the early development of Islamic mode of sale, Shariah compliant futures contract restrict the existence of the underlying at the time of buying and selling the physical delivery method also provide the option for the Shariah compliant futures contract. This study will be helpful to the development of Islamic futures contract, which is under consideration of PMEX based on Islamic mode of transaction "Murabaha".

1.6. Outline of the Study

The study is divided in several sections, the first section discuss the previous studies on the futures contract, the second section describe the data and methodology, the third section states the empirical result and the last section is conclusion.

2. LITERATURE REVIEW

While various studies have examined and explore the effect of cash versus physical delivery, Chan and Lien (2001) Consider the effect of cash settlement on the futures market ability to foresee spot prices, considering the feeder cattle and live hog futures contract with the help of Geweke feedback measure they find that by adopting cash settlement in 1986 feeder cattle futures enhance its price discovery and also both futures and spot markets turn into more integrated, however the condition was much different in case of live hog after adopting the cash settlement in 1996, the futures market was lose its price discovery, in addition spot and futures market became more segmented.

Lien and Tse (2002) investigate the effect of changing settlement mode of feeder cattle contract on the behavior of cash and futures price of feeder cattle spot and future prices, by using a bivariate GARCH model, the result observed declining volatility in futures price but not the spot prices by changing the settlement mode. With the evidence cash settlement is suggested beneficial to feeder cattle futures market.

Chan and Lien (2002) Examine the feeder cattle futures after replacement of settlement method with cash settlement by Chicago Mercantile Exchange, to discuss that cash settlement will improve convergence between cash and futures prices and cut off the basis variability, using the stochastic volatility models they found the basis variability was reduced and a change was persuaded in the structural relationship between spot and futures prices, also futures market has improved its efficiency.

Garbade and Silber (2000) discussed the issues related to the settlement method such as explores the specific elements that make the cash settlement more or less necessary and whether it should be optional or obligatory, they also examine how should the cash settlement index to be constructed and deals with the unique cash settlement of futures contract on heterogeneous grades of the similar commodity. Their results suggest that the cash settlement can expand the contribution of futures contracts to economic benefit in some way, promote closer convergence of cash and futures price, improve risk transfer function and hedging of futures contract, delivery cost saving, and whether multiple product varieties are significant cash settlement is permitting a market-basket contract by adding flexibility to contract design.

Pirrong (2001) States that it is always possible to design a delivery settled futures contract that is less susceptible to concerning by a large long than any cash settled contract. Such contract is more susceptible to manipulation by large short. So that cash settlement does not uniformly dominate delivery settlement as a mean of reducing the frequency of market power manipulations in derivatives markets. The efficient choice of settlement mechanism depends on whether supply and demand conditions favor long manipulation tend to disfavor short manipulation and vice versa.

Chaherli and Hauser (1994) Investigates the impact of settlement terms on the hedging effectiveness of Chicago Board of Trade corn and soybean futures contract, focusing the impact of changes in delivery location and delivery differential on price risk reduction for the hedgers at non-delivery market. the result of their study suggest that an index could provide a good measure of value and be difficult to manipulate, moreover when hedging effectiveness was measured individually at non delivery locations, responds to changes in delivery differential as well as delivery location, while as result were aggregated over space, the changes in settlement specifications tend to likely effect hedging performance, the result also suggest that cash settlement provides slightly higher level of hedging effectiveness then any type of multiple delivery.

Chan and Lien (2003) Considering the feeder cattle futures contract after replacement of physical delivery system with cash settlement method, by adopting the Stochastic Volatility models which allows for time varying volatility. Obtaining the mixture of high, low, open and close prices it is found that after replacement of settlement method from physical delivery to cash settlement volatility of the feeder cattle futures price decreased, hence this change improves prices discovery and risk management functions of the futures market.

Schroeder and Mintert (1988) Investigate the hedge ratio associated with feeder cattle with cash settlement and compare the level of hedging risk under cash settled contract with physical delivery. Their study cover the Feeder steer and heifer price data from January 1977 to December 1987, and using the ordinary least square to estimate the hedge ration and estimate the equation by using generalized first-order autocorrelation adjusted least squares. The hedging risk compared for several weight of feeder steers and heifers analyzed across four markets, their result suggest that the hedging risk not always lower with cash settlement than under the physical delivery contract specification.

Kenyon *et al.* (1991) analyze two different data sets first data set consist of weekly average cash and futures prices for the period September 1986 to April 1989, second data set consist of individual lots prices for feeder cattle from 1983 through 1988. For the first data set used the standard deviation to estimate feeder steer basis, and the second set of data used to estimate basis equations and basis forecasts before and after cash settlement, the basis forecast error in general did not decline under cash settlement compared to physical delivery. The overall result suggest that cash settlement has not significantly changed the basis risk in hedging feeder cattle.

3. CONCEPTUAL FRAMEWORK

Typically Sellers with short positions and buyers with long position always face significant problem of fluctuation in price, the futures contract is used as a tool to hedge this risk, and must contain proper settlement specification and such specification is main aspect which determine the success of the contract. And exchange is the regulatory which customize the specification time to time according to the business situations. The basic objective of physical delivery on a futures contract is to formulate the cause during the delivery period the convergence of cash price and futures price. In contrast under cash settlement method, contract is settled on the final settlement date by marking to the market according determined price by the exchange.

The both settlement mechanisms either it is actual physical delivery or cash settlement are the method of settling the futures contract, in the cash settlement mechanism the both positions of futures contract either short or long during life of contract position are "marked to the market" on a daily basis. Hence each day during the life of contract value is transferred by settlement variation either long to short or short to long position in accordance of futures price variation, thus the amount of any gains or losses incurred on a day must be paid by the positions with losses to the positions with gains prior to initiation of next trading day. On the other hand in actual delivery method of futures contract settlement based on actual physical delivery, that is short make the delivery, and long pay an amount of money determined by a futures settlement price.

The volatility is described by the fluctuation in price of any asset (underlying) it is actually the risk or uncertainty related to the size of changes in underlying value. The high volatility means the price move either direction by the greater value over short span of time.[3] In this study we have analyze the spot (cash) price of commodity in ready market as well as futures contract price at its respective exchange.

All the futures contract must be settled on it expiry according to it specification defined by the exchange, under the specification of futures the exchange define the mode of settlement either physical delivery or cash settled.

Under the physical delivery method commodities futures contract is must be settled by actual physical delivery of product. In which the seller with short position must liquidated the position at the settlement date by making

[3] https://www.investopedia.com/terms/v/volatility.asp.

delivery, likewise the buyer with long position is bounded to take physical delivery in exchange at determined price by the exchange. In contrast under cash settlement method, contract is settled on the final settlement date by marking to the market according determined price by the exchange.

4. MEHODOLOGY

4.1. Data

Last three years futures contract data from January 2016 to January 2019 has been examined, the data of (nearby) futures contract prices such as rice, wheat, sugar and gold, have been taken from PMEX (Pakistan Mercantile Exchange) and CME (Chicago Mercantile Exchange) for both local and international commodities on the daily basis, and spot price data have been taken from agricultures marketing information system and different internet source. For the each commodity (rice, sugar, wheat and gold) the total observation we have 1,590, for the physical delivery 795 and for the cash settlement 795 also. Figures 1 to 12 display the full series of spot & futures price, return and basis, which clearly represent the change in behavior of the price, return and basis for physical delivery settlement and cash settlement futures. Figure 1 to 4 present the spot and futures price, whereas Figure 5 to 8 present the returns and Figure 9 to 12 shows the volatility of the spot and futures of rice, sugar, wheat and gold respectively.

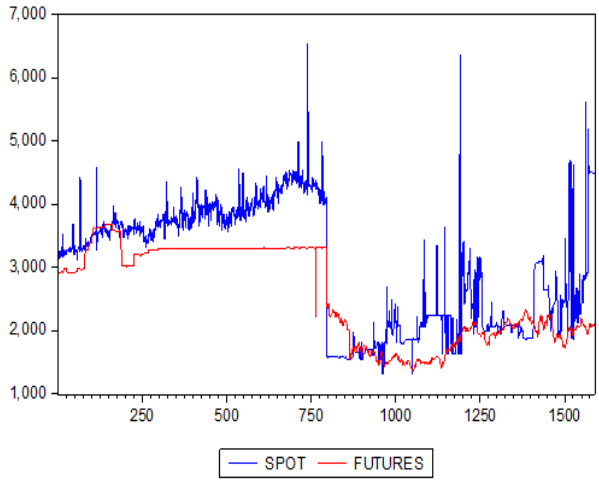

Figure-1. Spot & Futures Price of Rice.

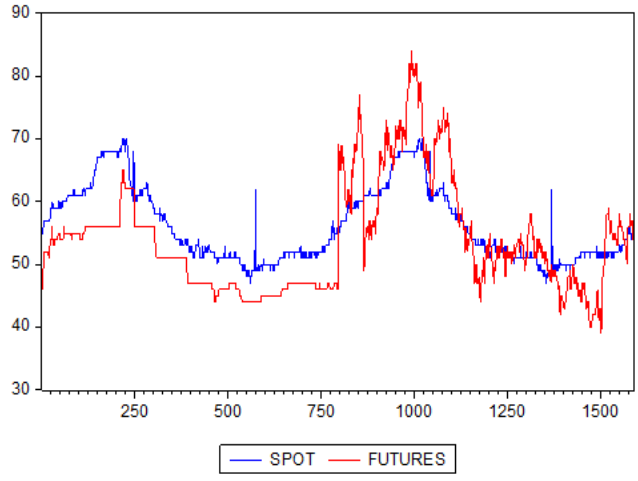

Figure-2. Spot & Futures Price of Sugar.

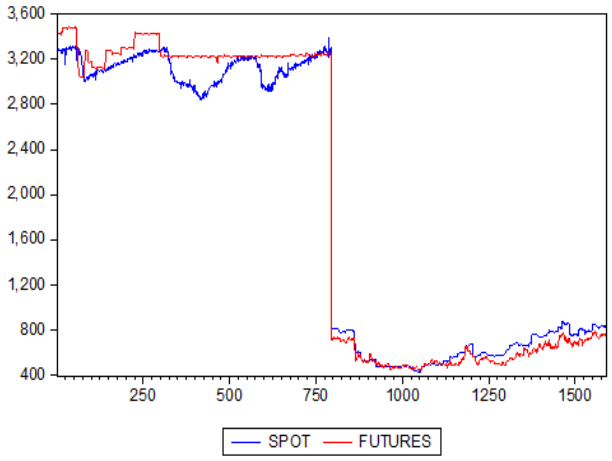

Figure-3. Spot & Futures Price of Wheat.

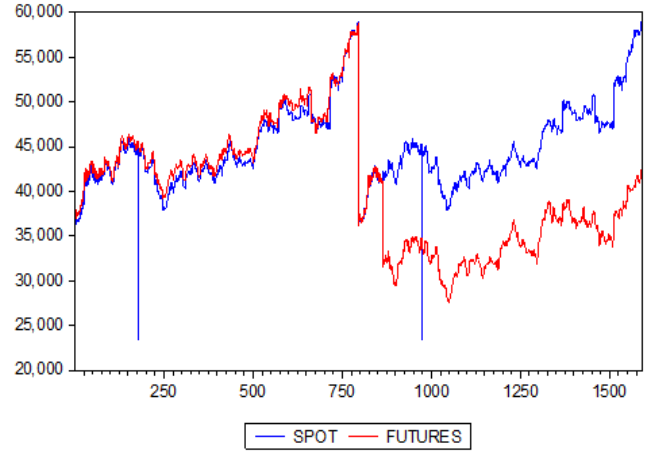

Figure-4. Spot & Futures Price of Gold.

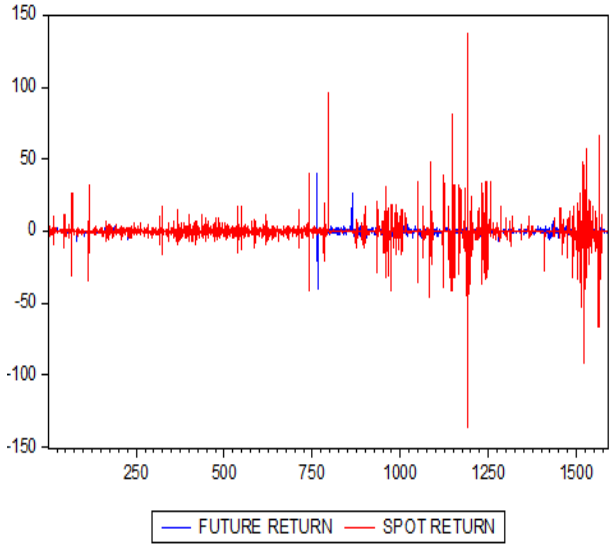

Figure-5. Spot & Futures Return of Rice.

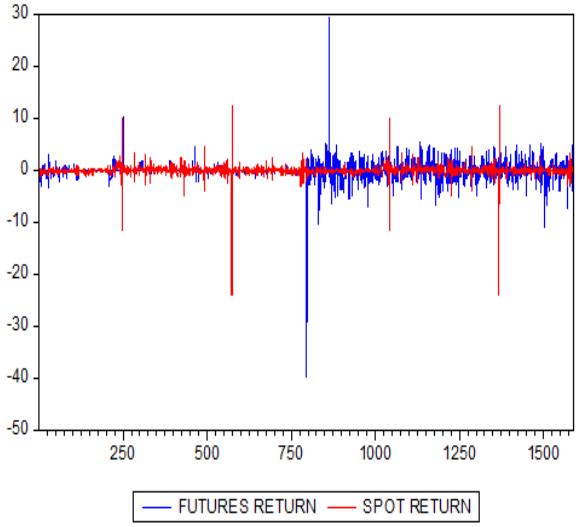

Figure-6. Spot & Futures Return of Sugar.

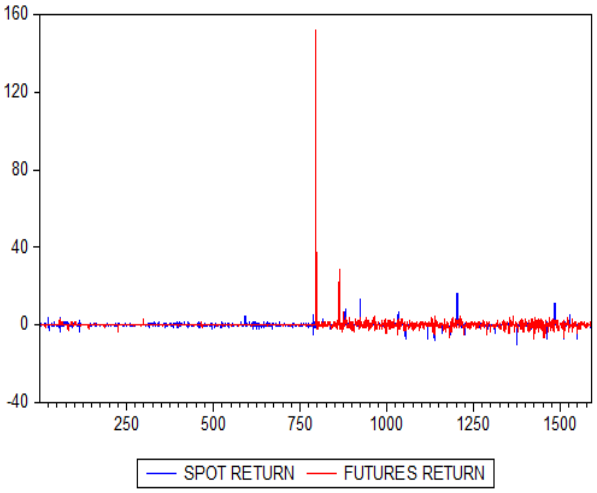

Figure-7. Spot & Futures Return of Wheat.

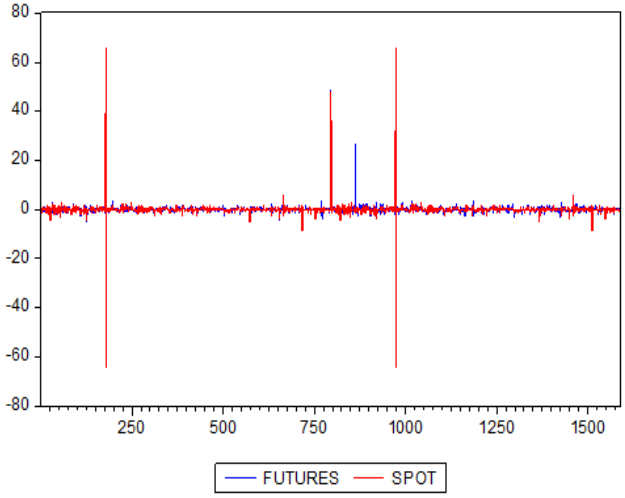

Figure-8. Spot & Futures Return of Gold.

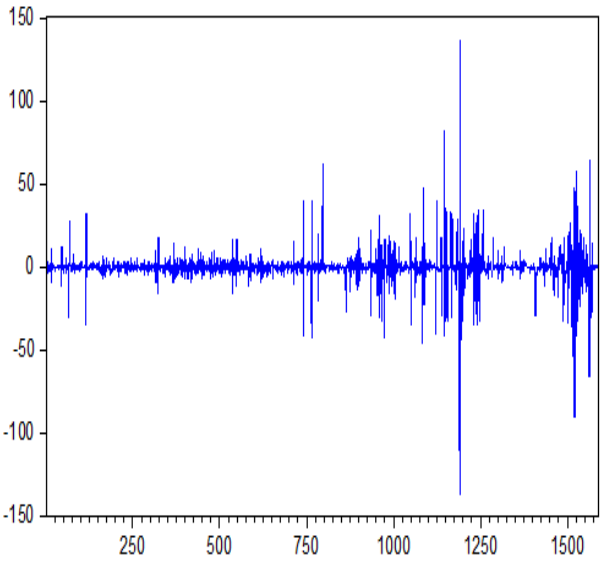

Figure-9. The Basis of Rice.

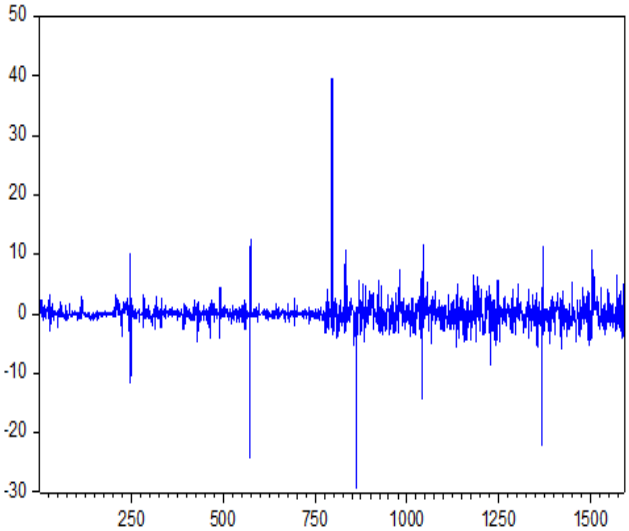

Figure-10. The Basis of Sugar.

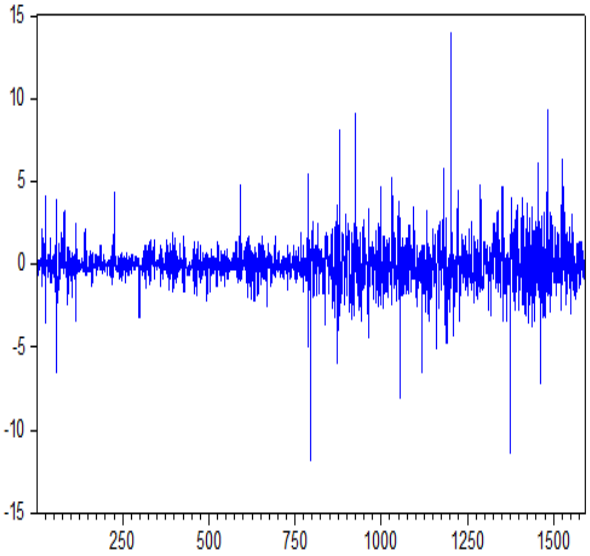

Figure-11. The Basis of Wheat.

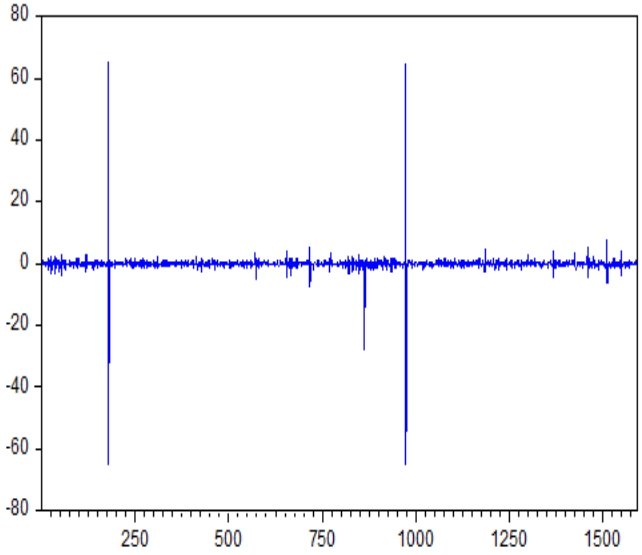

Figure-12. The Basis of Gold.

Table-1. Summary of Statistics Under Physical Delivery Method.

Statistics	Rice			Sugar			Wheat			Gold		
	Spot Return	Futures Return	Basis	Spot Return	Futures Return	Basis	Spot Return	Futures Return	Basis	Spot Return	Futures Return	Basis
Mean	-0.029332	-0.016083	-0.013388	0.000441	-0.000113	0.000290	-0.001071	0.006322	-0.007985	-0.060705	-0.059408	-0.001322
Median	-0.100000	0.020000	-0.030000	0.000000	0.020000	0.010000	-0.020000	0.020000	-0.020000	-0.010000	-0.050000	0.020000
Maximum	40.220000	40.120000	40.190000	12.500000	10.340000	12.450000	5.490000	3.100000	5.420000	65.810000	3.910000	65.27000
Minimum	-41.34000	-40.86000	-42.410000	-24.12000	-3.390000	-24.13000	-4.950000	-3.680000	-6.580000	-64.25000	-5.480000	-65.03000
Std. Dev.	4.680819	2.089102	5.126102	1.404033	0.653280	1.534495	0.780622	0.386374	0.900360	3.401758	0.867200	3.395798
Skewness	-0.047698	-0.528777	-0.167293	-5.105821	5.122931	-4.326120	0.388214	0.205213	-0.024876	0.653579	-0.692596	0.083758
Kurtosis	28.053170	356.726300	29.884620	133.064500	89.151390	96.239360	12.341050	43.361030	12.315330	337.68550	8.476133	342.2115
Jarque-Bera	20765.42	4139500.00	23915.77	563113.10	249019.60	290089.20	2906.64	53898.76	2870.90	3705866	1055.58	3806715

Source: Author's Test Run Statistics.

Table-2. Summary of Statistics Under Cash Settlement Method.

Statistics	Rice			Sugar			Wheat			Gold		
	Spot Return	Futures Return	Basis	Spot Return	Futures Return	Basis	Spot Return	Futures Return	Basis	Spot Return	Futures Return	Basis
Mean	-0.132446	0.017062	-0.149559	-0.002333	0.029445	-0.031828	-0.003102	-0.007301	0.004124	-0.060479	-0.019445	-0.041034
Median	0.000000	0.080000	-0.090000	0.000000	0.020000	0.060000	-0.020000	-0.010000	-0.050000	-0.010000	-0.030000	0.000000
Maximum	136.69000	26.90000	136.66000	12.50000	29.28000	11.69000	27.98000	29.28000	14.03000	65.810000	26.480000	64.83000
Minimum	-136.69000	-7.48000	-136.820000	-24.12000	-11.000000	-29.27000	-10.720000	-7.500000	-11.410000	-64.25000	-7.980000	-65.39000
Std. Dev.	13.816190	1.911656	13.939820	1.402740	2.317420	2.690953	1.752056	2.086450	1.915113	3.403899	1.395084	3.567738
Skewness	-0.111711	3.232901	-0.099835	-5.125350	2.163723	-2.089715	6.245383	3.206777	0.570927	0.652972	8.298790	-0.778606
Kurtosis	33.306320	52.131630	32.158870	133.67620	35.330410	27.586310	105.04110	51.420650	9.982474	337.26240	167.3010	285.4451
Jarque-Bera	30349.53	81141.19	28094.66	567700.00	35155.75	20550.41	349197.70	78827.27	1654.03	3691847	901055.60	2635987

Source: Author's Test Run Statistics.

Table 1 and Table 2 provide the some summary statistics for the cash and futures return as well as basis. The Table 1 is presenting the Mean, Median, Maximum, Minimum Standard Deviation, Skewness, Kurtosis and Jarque Bera of the physical delivery contract and Table 2 is showing statistics of Cash settled contract, In the physical delivery the mean of the spot return increased from the cash settled regime, for the rice, sugar, and wheat from 0.1031 (-0.132446 to -0.029332), 0.0028 (-0.002333 to 0.000441), and 0.0020 (-0.003102 to -0.001071) respectively while for the gold minimal declined by 0.0002 from -0.060479 to -0.060705. likewise the futures return mean of rice, sugar and gold declined in physical delivery from cash settlement regime 0.0331 (0.017062 to -0.016083), 0.0296 (0.029445 to -0.000113), and 0.0400 (-0.019445 to -0.059408) respectively, though mean of futures returns of wheat inclined 0.0136 from -0.007301 to 0.006322.

The mean of basis reduced for the contract with settlement system of physical delivery by 0.0121 of wheat, while increased by 0.1362 of rice, by 0.0321 of sugar and by 0.0397 of gold respectively.

Under unconditional volatility which estimate by the standard deviation of the basis declined by 8.8137 (13.939820 to 5.126102) of rice, 1.1565 (2.690953 to 1.534495) of sugar, 1.0148 (1.915113 to 0.900360) of wheat, and 0.1719 (3.567738 to 3.395798) of gold in physical delivery based futures contract. Which is suggest that the basis become more stable and the physical delivery futures contacts are more effective for hedging.

For the spot and futures returns (standard deviation) unconditional variance for spot and futures returns substantially declined in the physical delivery based futures contract. In the Rice spot return the reduction was 66%, but for futures return were minimal inclined by 9%, In the Sugar spot and futures return the reduction was 0.1% and 72% in wheat 55% and 81%, and for Gold 0.06% and 38% respectively.

The above result shows that the physical delivery based futures contracts are more effective for hedging price volatility, and the basis (standard deviation) variability was substantially reduced in the case of physical delivery as compare to the cash settlement of similar commodities, which means the physical delivery is more reliable for the rice, wheat, sugar, and gold futures contracts. However the skewness in the physical delivery settlement method of rice spot return, futures return and basis was -0.0476 (left tail approximately symmetric), -0.5287 (left tail moderately skewed), and -0.1672 (left tail approximately symmetric). The skewness of sugar was -5.105821 (left tail highly skewed), 5.122931 (right tail highly skewed), and -4.326120 (left tail highly skewed). The skewness of wheat spot and futures return was 0.3882 (right tail approximately symmetric), 0.2052 (right tail approximately symmetric) while of the basis was -0.024876 (left tail approximately symmetric). And the gold skewness was 0.6535 (right tail moderately skewed), -0.6925 (Left tail moderately skewed) and 0.0837 (right tail approximately symmetric) of spot return, futures return and the basis respectively.

On the other hand the kurtosis in the physical delivery regime of all commodities spot, futures return and the basis is more than 3 which represent the all variables have a longer tail and fatter and central peak is higher and sharper than a normal distribution. Also in term of Jarque Bera reject the null hypothesis at 5% significance level i.e. H_0: data is normal, which mean the return and basis of all variables of rice, sugar, wheat and gold is not normally distributed.

4.2. Inferential Analysis

In this study we use the bivariate GARCH model to discover the interaction between the spot price return and futures price return. Let $\mathbf{S}_t$ and $\mathbf{F}_t$ represent logarithm spot and futures prices respectively, at time $\mathbf{t}$. the nominal returns of the cash and futures are estimated as $\mathbf{r}_{St} = \mathbf{S}_t - \mathbf{S}_{t-1}$ and $\mathbf{r}_{Ft} = \mathbf{F}_t - \mathbf{F}_{t-1}$ respectively. The $\mathbf{b}_t = \mathbf{S}_t - \mathbf{F}_t$ is defined as basis i.e. the difference between the logarithm cash and futures prices. According to the unit root and co-integration characteristics of $\mathbf{S}_t$ and $\mathbf{F}_t$, we investigate an error correction model where b_{t-1} is error correction term (*ect*) and γ is the coefficient of *ect* in Equation 3 and 4. To discuss the effect of settlement mode i.e. cash settlement

and physical delivery on futures and spot returns. The Equation 1 and 2 are conditional mean equations as described below.

$$r_{St} = \alpha_{S0} + \sum_{i=1}^{m} \alpha_{Si}\, r_{S,t-i} + \sum_{j=1}^{n} \beta_{Sj} r_{F,t-j} + \delta_S D_t + \varepsilon_{St} \quad (1)$$

$$r_{Ft} = \alpha_{F0} + \sum_{i=1}^{m} \alpha_{Fi}\, r_{F,t-i} + \sum_{j=1}^{n} \beta_{Fj} r_{F,t-j} + \delta_F D_t + \varepsilon_{Ft} \quad (2)$$

In the above equation D_t denoted as the dummy variable where it is equal to zero (0) when the nearby futures contract is settled through physical delivery and otherwise one (1). The coefficient of dummy variable δ explains the effect of physical delivery on the return of spot and futures price. The positive coefficient of dummy variable states that the return of spot or futures is more volatile in the physical delivery regime, while the negative coefficient implies that the volatility reduces respectively.

In order to observe the time varying variance of the residual $\varepsilon_t = (\varepsilon_{st}, \varepsilon_{ft})'$, we select a bivariate GARCH model. Let σ_t^2 denote the variance of the residual ε_t. We have the following equation.

$$\sigma^2_{St} = \alpha_{S0} + \alpha_{S1}\, \sigma^2_{S,t-1} + \beta_{S1}\varepsilon_{St-1} + \delta_S D_t \quad (3)$$

$$\sigma^2_{Ft} = \alpha_{F0} + \alpha_{F1}\, \sigma^2_{F,t-1} + \beta_{F1}\varepsilon_{F,t-1} + \delta_F D_t \quad (4)$$

4.3. Results

A physical delivery for a futures contract of rice, sugar, wheat and gold may supposed to decrease the basis variability. To investigate such claim empirically we estimate a univariate GARCH model for b_t and add the dummy variable to perceive the effect of physical delivery on the basis risk.

Rice:

$$b_t = -0.108250 - 0.039700_{b,t-1} + \varepsilon_t$$
$$\sigma^2_{bt} = 11.14902 + 0.383770\sigma^2_{b,t-1} + 0.090916\varepsilon_{b,t-1} + 81.26564D_t$$

Sugar:

$$b_t = -0.337913 - 1.004635_{b,t-1} + \varepsilon_t$$
$$\sigma^2_{bt} = 0.516497 + 1.510805\sigma^2_{b,t-1} + 0.018226\varepsilon_{b,t-1} + 5.849131D_t$$

Wheat:

$$b_t = -0.020284 - 0.168159_{b,t-1} + \varepsilon_t$$
$$\sigma^2_{bt} = 0.670529 + 0.201576\sigma^2_{b,t-1} + 0.124869\varepsilon_{b,t-1} + 3.333124D_t$$

Gold:

$$b_t = 0.092026 - 0.120576_{b,t-1} + \varepsilon_t$$
$$\sigma^2_{bt} = 7.236200 + 0.179359\sigma^2_{b,t-1} + 0.082080\varepsilon_{b,t-1} + 0.995183D_t$$

Where ε_t and σ^2 are the residual of the b_0 the coefficient of D_t is significant at 5% level which indicate that in the physical delivery settlement the conditional variance of basis has declined see Table 6b.

Table-3 Augmented Dickey-Fuller (ADF) Unit Root Test.

Variable	Statistics			
	Rice	Sugar	Wheat	Gold
Spot Price	-2.0377	-1.5072	-1.8589	-3.3044
Spot Return	-28.344	-27.712	-40.692	-27.15
Futures Price	-1.8503	-2.7186	-1.7679	-2.6078
Future Return	-49.245	-38.804	-39.804	-39.023
Basis	-22.801		-43.507	-26.833

*MacKinnon (1996) one-sided p-values. Critical value -3.412651 at 5% significance level
All variables are tested with a trend, an intercept and Lag Length (Automatic - based on SIC, maxlag=23).

We have observe the non-stationarity of price data by applying augmented Dickey-Fuller (ADF) test to $\mathbf{S}_t$ and $\mathbf{F}_t$ with a trend and an intercept the critical value -3.412651 at 5% significance level, the Table 3 represent the ADF test statistics for the cash and futures price (-2.037710, -1.850333) of rice, (-1.507242, -2.718619) of sugar, (-1.858886, -1.767901) of wheat and (-3.304430, -2.607799) of gold respectively. Thus the unit root hypotheses are not rejected. However for spot return, futures return and basis the statistics of ADF was (-28.34430, -49.24487, -22.80110) of rice, (-27.71189, -2.718619, -31.68375) of sugar, (-40.69234, -39.80424, -43.50683) of wheat and (-27.14951, -39.02320, -26.83316) respectively, which suggesting that the series of spot return, futures return and basis are stationary but the spot and futures price are integrated.

Table-4. Johansen Co-integration Test.

(A) Rice

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.019000	30.40404	19.38704	0.0009
At most 1	0.001663	2.637471	12.51798	0.9166
Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
** MacKinnon *et al.* (1999) p-values				
1 Co-integrating Equation(s):		Log likelihood	-19685.10	
Normalized co-integrating coefficients (standard error in parentheses)				
RICE_FC	**RICE_SP**	**@TREND(2)**		
1.000000	-0.664739	0.573447		
	(0.07040)	(0.14368)		

All variables are tested with a trend, an intercept and Lag Length 1 to 4.

(B) Sugar

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.019080	30.53446	19.38704	0.0008
At most 1	0.001247	1.977918	12.51798	0.9700
Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon *et al.* (1999) p-values				
1 Co-integrating Equation(s):		Log likelihood	-4367.896	
Normalized co-integrating coefficients (standard error in parentheses)				
SUGAR_FC	**SUGAR_SP**	**@TREND(2)**		
1.000000	-1.452727	-0.007652		
	(0.15473)	(0.00200)		

All variables are tested with a trend, an intercept and Lag Length 1 to 4.

(C) Wheat

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.013927	22.22900	19.38704	0.0188
At most 1	0.002244	3.560961	12.51798	0.8043
Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon *et al.* (1999) p-values				
1 Co-integrating Equation(s):		Log likelihood	-15909.09	
Normalized co-integrating coefficients (standard error in parentheses)				
WHEAT_FC	**WHEAT_SP**	**@TREND(2)**		
1.000000	-1.031414	0.126281		
	(0.02705)	(0.07397)		

All variables are tested with a trend, an intercept and Lag Length 1 to 4.

(D) Gold

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.013533	21.60970	19.38704	0.0234
At most 1	0.003671	5.833591	12.51798	0.4817
Max-eigenvalue test indicates 1 co-integrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon *et al.* (1999) p-values				
1 Co-integrating Equation(s):		Log likelihood	-25856.70	
Normalized co-integrating coefficients (standard error in parentheses)				
GOLD_FC	**GOLD_SP**	**@TREND(2)**		
1.000000	-1.609018	14.88589		
	(0.16001)	(1.55791)		

All variables are tested with a trend, an intercept and Lag Length 1 to 3.

So to estimate the co-integrating relationship between the spot and futures prices we applied the Johansen Co-integration test with trend and intercept at 5% significance level. Table 4 represent the Johansen co-integration p values of each variable are more than 5% which are 0.9166 of rice, 0.9700 of sugar, 0.8043 of wheat and 0.4817 of gold, thus we cannot reject the null hypothesis at 5% level of significance, and the negative coefficient respectively -0.664739, -1.452727, -1.031414 and -1.609018 of rice, sugar, wheat and gold suggest that fallen in the spot price is associated with the rise in futures price and vice versa, which is consistent with the recent empirical evidence that suggested the persistence in the inverse relationship between spot price and futures price, so it is concluded the Johansen co-integration test has confirmed there is long run equilibrium relationship between spot and futures price.

Table-5. Vector Error Correction Model (VECM).

i) Vector Error Correction Model (VECM)									
Co-integrating Equation									
Dependent Variable Commodity Spot Price					**Dependent Variable Commodity Future Price**				
	Rice	**Sugar**	**Wheat**	**Gold**		**Rice**	**Sugar**	**Wheat**	**Gold**
Spot (-1)	1.000000	1	1	1	Future(-1)	1	1	1	1
Future(-1)	-1.0762	-0.7821	-0.9317	0.1091	Spot(-1)	-0.9292	-1.2787	-1.0734	9.16569
Standard errors	(0.09681)	-0.1113	-0.0153	-0.2416	Standard errors	-0.071	-0.2109	-0.0175	-3.2859
t-statistics	[-11.1165]	[-7.02579]	[-60.9619]	[0.45155]	t-statistics	[-13.0836]	[-6.06341]	[-61.1781]	[2.78942]
C	-251.62	-13.996	-94.454	-49373	C	233.802	17.8964	101.382	-452539
Error Correction:	D(RICE_SP)	D(SUGAR_SP)	D(WHEAT_SP)	D(GOLD_SP)	Error Correction:	D(RICE_FC)	D(SUGAR_FC)	D(WHEAT_FC)	D(GOLD_FC)
CointEq1	-0.0916	-0.0078	-0.0535	-0.0164	CointEq1	-0.0064	-0.0213	0.02957	-0.001
Prob.	0	0.0885	0.0055	0.0051	Prob.	0.0241	0	0.0996	0.0201
Standard errors	(0.01503)	-0.0046	-0.0192	-0.0059	Standard errors	-0.0028	-0.0051	-0.0179	-0.0004
t-statistics	[-6.09553]	[-1.70465]	[-2.78101]	[-2.80295]	t-statistics	[-2.25807]	[-4.14432]	[1.64824]	[-2.35855]
D(Spot(-1))	-0.402	-0.3636	-0.4453	-0.577	D(Future(-1))	-0.2709	-0.0122	0.20085	-0.0005
Prob.	0	0	0	0	Prob.	0	0.6303	0.0106	0.9768
Standard errors	(0.02626)	-0.0245	-0.0784	-0.0279	Standard errors	-0.0252	-0.0251	-0.0785	-0.0284
t-statistics	[-15.3081]	[-14.8457]	[-5.68091]	[-20.6796]	t-statistics	[-10.7601]	[-0.48474]	[2.55803]	[-0.01907]
D(Spot(-2))	-0.1945	-0.2514	0.02486	-0.2616	D(Future(-2))	-0.0581	0.04002	-0.0325	-0.0284
Prob.	0	0	0.7502	0	Prob.	0.0212	0.1099	0.6779	0.3174
Standard errors	(0.02500)	-0.0244	-0.0781	-0.0277	Standard errors	-0.0252	-0.0251	-0.0787	-0.0286
t-statistics	[-7.78137]	[-10.3028]	[0.31839]	[-9.45074]	t-statistics	[-2.30811]	[1.59582]	[-0.41371]	[-0.99360]
D(Future(-1))	0.128782	0.00971	0.42511	0.50955	D(Spot(-1))	-0.0032	-0.0214	-0.2073	0.01239
Prob.	0.3688	0.5765	0	0	Prob.	0.489	0.5454	0.0084	0.488
Standard errors	(0.14326)	-0.0174	-0.0784	-0.0446	Standard errors	-0.0046	-0.0354	-0.0785	-0.0178
t-statistics	[0.89894]	[0.55860]	[5.42470]	[11.4284]	t-statistics	[-0.69225]	[-0.60443]	[-2.63940]	[0.69658]
D(Future(-2))	0.148024	0.00082	-0.0278	0.21442	D(Spot(-2))	0.00319	0.05139	0.03691	0.00079
Prob.	0.3015	0.9624	0.7238	0	Prob.	0.4687	0.1454	0.6358	0.9618
Standard errors	(0.14323)	-0.0174	-0.0785	-0.0449	Standard errors	-0.0044	-0.0353	-0.0782	-0.0176
t-statistics	[1.03349]	[0.04716]	[-0.35345]	[4.77732]	t-statistics	[0.72502]	[1.45763]	[0.47194]	[0.04459]
C	1.427633	0.00018	-1.5151	23.5429	C	-0.6931	0.00423	-1.6616	3.3037
Prob.	0.8457	0.9928	0.3509	0.4099	Prob.	0.5908	0.8825	0.3087	0.8687
Standard errors	(7.33322)	-0.0202	-1.6238	-28.56	Standard errors	-1.289	-0.0292	-1.6269	-18.206
t-statistics	[0.19468]	[0.00897]	[-0.93305]	[0.82433]	t-statistics	[-0.53773]	[0.14485]	[-1.02127]	[0.18147]

Source: Author's Test Run Result.

Given this outcome we are proceed the vector error correction model (VECM) and consider the Equation (5) and (6) conventional error correction model for co-integration series and Equation (7) and (8) error correction term, to examine the how deviation from the long run are corrected.

$$r_{St} = \alpha_{S0} + \sum_{i=1}^{m} \alpha_{Si}\, r_{S,t-i} + \sum_{j=1}^{n} \beta_{Sj} r_{f,t-j} + \gamma_S b_{t-1} + \varepsilon_{St} \quad (5)$$

$$r_{Ft} = \alpha_{F0} + \sum_{i=1}^{m} \alpha_{Fi}\, r_{F,t-i} + \sum_{j=1}^{n} \beta_{Fj} r_{F,t-j} + \gamma_F b_{t-1} + \varepsilon_{Ft} \quad (6)$$

$$b_{t-1} = r_{S,t-1} - \alpha_{S0} - \alpha_{S1}\, r_{F,t-1} \quad (7)$$

$$b_{t-1} = r_{F,t-1} - \alpha_{F0} - \alpha_{F1}\, r_{S,t-1} \quad (8)$$

Rice

$$r_{St} = -0.091631 b_{t-1} - 0.401976\, r_{S,t-1} - 0.194517\, r_{S,t-2} + 0.128782\, r_{F,t-1} + 0.148024\, r_{F,t-2} + 1.427633$$

$$b_{t-1} = 1.000000\, r_{S,t-1} - 1.076214\, r_{F,t-1} - 251.6209$$

$$r_{Ft} = -0.006421 b_{t-1} - 0.270944\, r_{F,t-1} - 0.058106\, r_{F,t-2} - 0.003195\, r_{S,t-1} + 0.003186\, r_{S,t-2} - 0.693103$$

$$b_{t-1} = 1.000000\, r_{F,t-1} - 0.929183\, r_{S,t-1} + 233.8019$$

Sugar

$$r_{St} = -0.007755 b_{t-1} - 0.363632\, r_{S,t-1} - 0.251434 r_{S,t-2} + 0.009708\, r_{F,t-1} + 0.000819\, r_{F,t-2} + 0.000181$$

$$b_{t-1} = 1.000000\, r_{S,t-1} - 0.782073\, r_{F,t-1} - 13.99628$$

$$r_{Ft} = -0.021301 b_{t-1} - 0.012170 r_{F,t-1} + 0.040022\, r_{F,t-2} - 0.021387\, r_{S,t-1} + 0.051386\, r_{S,t-2} + 0.004226$$

$$b_{t-1} = 1.000000\, r_{F,t-1} - 1.278653\, r_{S,t-1} + 17.89638$$

Wheat

$$r_{St} = -0.053455 b_{t-1} - 0.445256\, r_{S,t-1} + 0.024855 r_{S,t-2} + 0.425112\, r_{F,t-1} - 0.027755\, r_{F,t-2} - 1.515106$$

$$b_{t-1} = 1.000000\, r_{S,t-1} - 0.931659 r_{F,t-1} - 94.45368$$

$$r_{Ft} = 0.029573b_{t-1} + 0.200849r_{F,t-1} - 0.032549\, r_{F,t-2} - 0.207269\, r_{S,t-1} + 0.036913r_{S,t-2} - 1.661556$$

$$b_{t-1} = 1.000000\, r_{F,t-1} - 1.073355\, r_{S,t-1} + 101.3823$$

Gold

$$r_{St} = -0.016434b_{t-1} - 0.576981\, r_{S,t-1} - 0.261567r_{S,t-2} + 0.509554\, r_{F,t-1} + 0.214423\, r_{F,t-2} + 23.54292$$

$$b_{t-1} = 1.000000\, r_{S,t-1} + 0.109103r_{F,t-1} - 49373.09$$

$$r_{Ft} = -0.000962b_{t-1} - 0.000542r_{F,t-1} - 0.028428\, r_{F,t-2} + 0.012389\, r_{S,t-1} + 0.000787r_{S,t-2} + 3.303695$$

$$b_{t-1} = 1.000000\, r_{F,t-1} + 9.165692\, r_{S,t-1} - 452538.6$$

The estimated results are reported in Table 5, in the above equations b_{t-1} is denoted as error correction term (ECT) which is a speed of adjustment theoretically the coefficient of ECT must be negative and significant, the outcome of the VECM models indicate here the coefficient of error correction term for the all variables that is rice, sugar, wheat and gold spot price as well futures price are negative and significant at level 5%. Being negative it suggests us that if there is a departure in one direction the correction would be pulled back to the other direction so that to ensure the equilibrium is retained. In Table 5 we have estimate the both spot and futures prices of all variables as dependent and independent variable and vice versa, the negative ECT coefficient of each variables tells us the speed of adjustment that departure from long run equilibrium is corrected each period and also the speed of adjustment is statistically significant its means that the independent variable which is the explanatory variable in this specification grandeur causes dependent variable.

Table-6(a). GARCH (1,1).

Dependent Variable		Rice		Sugar		Wheat		Gold	
		Rice Futures Return	Rice Spot Return	Sugar Futures Return	Sugar Spot Return	Wheat Futures Return	Wheat Spot Return	Gold Future Return	Gold Spot Return
C	Coefficient	0.008119	-0.0368	0.07816	-0.0263	0.01492	-0.0158	-0.0099	0.10199
	z-Statistic	0.038108	-0.40723	0.20381	-0.7604	0.96241	-0.8495	-0.1959	0.66834
	Prob.	0.9696	0.6838	0.8385	0.447	0.3358	0.3956	0.8447	0.5039
FC_RET	Coefficient		0.055873		0.01119		0.87017		0.70439
	z-Statistic		1.28177		0.96679		315.923		61.9856
	Prob.		0.1999		0.3336		0		0
FC_RET(-1)	Coefficient	-0.18535		-0.7452		0.05547		0.39059	
	z-Statistic	-1.71249		-5.5897		1.58534		4.82037	
	Prob.	0.0868		0		0.1129		0	
SP_RET	Coefficient	0.005023		0.02219		0.94943		0.25356	
	z-Statistic	1.273357		1.06292		241.627		118.114	
	Prob.	0.2029		0.2878		0		0	
SP_RET(-1)	Coefficient		0.131181		0.61028		0.00573		0.02579
	z-Statistic		0.066865		1.37171		0.25688		0.21628
	Prob.		0.9467		0.1702		0.7973		0.8288
DUMMY	Coefficient	-0.05483	-0.04841	-0.4154	-0.0019	-0.0393	0.05469	0.01369	-0.0912
	z-Statistic	-0.24242	-0.25033	-1.0003	-0.1493	-0.9741	1.36623	0.229	-0.4612
	Prob.	0.8085	0.8023	0.3172	0.8813	0.33	0.1719	0.8189	0.6447
AR(1)	Coefficient	0.167969	0.141236	0.00918	-0.4155	-0.2091			-0.329
	z-Statistic	1.550093	0.071219	0.16174	-2.4792	-5.7649			-0.0741
	Prob.	0.1211	0.9432	0.8715	0.0132	0			0.9409
AR(2)	Coefficient				-0.0968	-0.1583			
	z-Statistic				-0.738	-4.7325			
	Prob.				0.4605	0			
MA(1)	Coefficient		-0.6965	0.82439	-0.5193		-0.2601	-0.4807	-0.121
	z-Statistic		-18.607	7.96323	-0.876		-10.387	-5.6196	-0.0272
	Prob.		0	0	0.3811		0	0	0.9783
MA(2)	Coefficient								-0.1229
	z-Statistic								-0.0629
	Prob.								0.9498
Variance Equation									
C	Coefficient	0.069488	8.067025	0.60054	1.0885	0.02308	0.01545	2.3348	6.20853
	z-Statistic	25.3193	19.70064	3.78496	13.2192	11.2049	9.60649	6.01244	3.44894
	Prob.	0	0	0.0002	0	0	0	0	0.0006
RESID(-1)^2	Coefficient	0.013945	0.560473	0.07533	0.29899	0.15023	0.08647	0.05316	0.16915
	z-Statistic	18.28067	11.32341	3.29764	5.02628	12.2654	12.037	2.20614	1.09591
	Prob.	0	0	0.001	0	0	0	0.0274	0.2731
GARCH(-1)	Coefficient	0.975813	0.050262	0.7995	0.12522	0.86939	0.91663	0.0099	0.14087
	z-Statistic	1007.296	1.828018	15.2301	1.94034	103.337	158.137	0.06063	0.57368
	Prob.	0	0.0675	0	0.0523	0	0	0.9517	0.5662
DUMMY	Coefficient	-0.04478	86.78984						
	z-Statistic	-14.7967	33.47115						
	Prob.	0	0						

Dummy Variable: Settlement..
Method: ML - ARCH (Marquardt) - Normal distribution.

Table-6(b). GARCH (1,1).

Dependent Variable		Rice Basis	Sugar Basis	Wheat Basis	Gold Basis
C	Coefficient	-0.1083	-0.3379	-0.0203	0.09203
	z-Statistic	-1.9724	-8.1955	-0.8275	0.79251
	Prob.	0.0486	0	0.4079	0.4281
BASIS(-1)	Coefficient	-0.0397	-1.0046	-0.1682	-0.1206
	z-Statistic	-0.2984	-133.78	-0.684	-0.5221
	Prob.	0.7654	0	0.494	0.6016
AR(1)	Coefficient	0.28457		0.06487	
	z-Statistic	1.49931		0.03412	
	Prob.	0.1338		0.9728	
MA(1)	Coefficient	-0.6745	0.94677	-0.0989	-0.2445
	z-Statistic	-10.204	91.9023	-0.0594	-0.976
	Prob.	0	0	0.9526	0.3291
Variance Equation					
C	Coefficient	11.149	-0.3379	0.67053	0.17936
	z-Statistic	23.7322	-8.1955	27.9512	0.98873
	Prob.	0	0	0	0.3228
RESID(-1)^2	Coefficient	0.38377	1.51081	0.20158	0.08208
	z-Statistic	9.54043	24.6293	7.9623	0.27714
	Prob.	0	0	0	0.7817
GARCH(-1)	Coefficient	0.09092	0.01823	0.12487	0.99518
	z-Statistic	2.9662	4.06487	7.64597	2.32406
	Prob.	0.003	0	0	0.0201
DUMMY	Coefficient	81.2656	5.84913	3.33312	0.09203
	z-Statistic	28.0283	55.7866	25.7873	0.79251
	Prob.	0	0	0	0.4281

In the Table 3 ADF unit root test reject the null hypothesis which suggesting that the series of spot return, futures return and basis are stationary, the ADF result allowing us to apply the (Generalized Autoregressive Conditional Heteroskedasticity) model introduced by Bollerslev (1986) and Taylor (1986). The GARCH model allows that to investigate the volatility changes over time. Table 6(a) represent result of GARCH model for the spot and futures return of all variables, the negative coefficient of the dummy variable indicates that the volatility of futures returns reduced under physical delivery of rice sugar and wheat but not of the gold due to less demand as compare to the other variables. However the combined coefficient of the ARCH term (RESID(-1)^2) and GARCH term (GARCH(-1)) is less than 1 for both spot and futures returns of all variables, which conclude the result as there is a less persistence of volatility in the physical delivery settlement mechanism.

5. DISCUSSIONS

Chan and Lien (2003) Used the Stochastic Volatility models which allows for time varying volatility, found that after replacement of settlement method from physical delivery to cash settlement volatility of the feeder cattle futures price decreased, hence this change improves prices discovery and risk management functions of the futures market (Chan and Lien, 2001) Consider the effect of cash settlement on the futures market ability to foresee spot prices, with the help of Geweke feedback measure. find that by adopting cash settlement in 1986 feeder cattle futures enhance its price discovery and also both futures and spot markets turn into more integrated, however the condition was much different in case of live hog after adopting the cash settlement in 1996, the futures market was lose its price discovery, in addition spot and futures market became more segmented. Lien and Tse (2002) investigate the effect of changing settlement mode of feeder cattle contract on the behavior of cash and futures price of feeder cattle spot and future prices, by using a bivariate GARCH model, and observed declining volatility in futures price but not the spot prices by changing the settlement mode (Chan and Lien, 2002) Using the stochastic volatility models to discuss that cash settlement will improve convergence between cash and futures prices and cut off the basis variability.

Regardless of the above results, their findings were for the limited area and only cover futures price volatility, though the delivery cost is high in case of feeder cattle, therefore after cash settlement feeder cattle futures become stable.

However our results suggest that the physical delivery is more beneficial than the cash settlement as in the above section Table 6(a) represent result of GARCH model for the spot and futures return of all variables, the negative coefficient of the dummy variable indicates that the volatility of futures returns reduced under physical delivery of rice sugar and wheat but not of the gold due to less demand as compare to the other variables. However the combined coefficient of the ARCH term (RESID(-1)^2) and GARCH term (GARCH(-1)) is less than 1 for both spot and futures returns of all variables, which conclude the result as there is a less persistence of volatility in the physical delivery settlement mechanism.

5.1. Analysis with the Prospective of Obligatory Delivery in Islamic Contract of Sales

Islamic jurisprudence has laid down enormous rules governing the contract of sale, the following rules are taken from Usmani (2004).

"Rule 1. The subject of sale must be existing at the time of sale. Thus, a thing which has not yet come into existence cannot be sold. If a non-existent thing has been sold, though by mutual consent, the sale is void according to Shari'ah. Example: A sells the unborn calf of his cow to B. The sale is void.

Rule 2. The subject of sale must be in the ownership of the seller at the time of sale. Thus, what is not owned by the seller cannot be sold. If he sells something before acquiring its ownership, the sale is void. Example: A sells to B a car which is presently owned by C, but A is hopeful that he will buy it from C and shall deliver it to B subsequently. The sale is void, because the car was not owned by A at the time of sale.

Rule 3. The subject of sale must be in the physical or constructive possession of the seller when he sells it to another person. Examples: (i)A has purchased a car from B. B has not yet delivered it to A or to his agent. A cannot sell the car to C. If he sells it before taking its delivery from B, the sale is void."

The gist of the rules mentioned in paragraphs 1 to 3 is that a person cannot sell a commodity unless: (a) It has come into existence. (b)It is owned by the seller. (c)It is in the physical or constructive possession of the seller. There is a big difference between an actual sale and a mere promise to sell. The actual sale cannot be effected unless the above three conditions are fulfilled. The actual sale will have to be effected after the commodity comes into the possession of the seller.

As per the above rules, the obligation of delivery flows naturally from the formation of the contract. The Hanafis define delivery and receipt of the goods as: the removal of all obstacles by the seller between the buyer and the object of sale, allowing the buyer to use the object (Al-Zuhayli, 1997). Delivery only occurs if the object is present or if the buyer is able goes to the item and is able to receive it (as a counter example, an item kept in trust of the buyer may be easily receivable, like an item locked in a safe). Closely related to the timing of delivery is the issue of the transfer of risk. Risk connotes the bearing of loss in the event that the good are damaged without there necessarily being fault on the part of either party (Ewan, 2000). The general rule is that risk follows delivery rather than transfer of title.

In the forward sale, the primary obligation of the seller is the delivery the good at some future date. This understanding is based on the verse:

"When you deal with each other in transactions involving future obligations in a fixed period of time" (Baqarah, 2:282)

Morever, in the forward contract, the payment of the price must be made at the time of the formation of the contract. Spot payment is a condition of the contract, rather than an obligation, and a delay in the payment will render the contract void ab initio. This position follows the hadith of the Prophet (saw) that:

"Pay the forward price for a known volume" (Al-Zayla)

Hence, The Prophet (saw) prohibited the trading of one deferred item for another. The reason is that the forward contract already contains an element of uncertainty (gharar) by its nature, as the object of the forward sale may fail to come into exist. Gharar is prohibited in Islam, however, if the price were to be deferred as well, this would add another level of uncertainty to the transaction (Nafay, 2011).

5.2. Economic and Social Implications of Obligatory Delivery in Islamic Contract of Sales

The argument of efficiency in free market predispose that social benefit of a product is equal to its private benefits, under equilibrium condition of demand and supply. Social benefit is the total benefit to society from producing or consuming a good/service, it includes all the private benefits plus any external benefits of production/consumption. If a good has significant external benefits, then the social benefit will be greater than the private benefit. In this way the product that have higher societal benefit would be demanded more, as a result price of that product increases. This will increase the payoff of the suppliers. Suppliers would respond by increasing their production as their profit maximization level of output goes up. Moreover, because of ease of entry, other firms join in by divert their resources into producing this product. Overall this would lead to higher production of socially benefit product moving the economy to optimal dynamic equilibrium.

As per the Islamic jurisprudence discussed above, it's obligatory to take delivery for any sales transition in order for it to become valid under Islamic context. This could have far reaching effects on production, liquidity of the product. I absence of the above mentioned rules, a product can be sold without coming into existence. Hence, any price appreciation in response of increased demand would not increase the private benefits of the producers and this would not lead to increase in output of the physical product. If goods have a social benefit much greater than private benefit, they are likely to be under-consumed in a free market. People don't take into account the full social benefit – only their private benefit. This leads to market failure.

In terms of the effect to the society, producers and growers of the commodity would not increase their production in response from higher prices in cash settled market. As dynamic stability mechanism of increased production failed, the prices would become more unstable and subject to manipulation from speculators.

Moreover, Under cash settled system, speculators can affect the prices without taking full exposure of capital, hence can place bets on disproportionate larger volumes thereby increasing volatility and risk. Whereas under delivery system, the bets are high enough to deter speculative behavior due to full exposure, moreover, fluctuation in market would be promptly responded by increased production, thereby increasing the stability as well as moving the economy towards socially optimal equilibria.

Empirical evidence of the impact of Obligatory delivery clearly showed that delivery based contract are less volatile than cash settled, hence making physical delivery more reliably.

6. CONCLUSION

The price volatility is the great challenge in the current globalized economy that concerning with buyers and seller of commodity or security, mainly for the goods which may be traded internationally. The risk of price volatility primarily associated with the agriculture, energy, metal, equity and interbank offer rate. To cater this critical issue futures contract is used as a risk hedging tool. The buyers and seller of the commodities use the futures contract to hedge this critical risk, each futures contract must be settled either physical delivery or cash settlement method on its expiry. This study emphasizes for precious metal such as gold and the storable commodities like rice, wheat, sugar, which mode of settlement is better, to examine this issue we use bivariate GARCH model to discover the interaction between the spot price return and futures price return, we consider the last three years futures contract data from January 2016 to January 2019 has been examined, the data of (nearby) futures contract prices such as rice, wheat, sugar and gold, have been taken from PMEX (Pakistan Mercantile Exchange) and CME (Chicago Mercantile Exchange) for both local and international commodities on the daily basis, and spot price data have been taken from agricultures marketing information system and different internet source. The result shows basis variability of spot price and futures prices returns was substantially reduced in the case of physical delivery as compare to the cash settlement of same commodities, which means the physical delivery is more reliable for the rice, wheat, sugar, and gold futures contracts.

Moreover according to Islamic jurisprudence, it's obligatory to take delivery for any sales transition in order for it to become valid under Islamic context. This could have far reaching effects on production, liquidity of the product. I absence of the above mentioned rules, a product can be sold without coming into existence. Hence, any price appreciation in response of increased demand would not increase the private benefits of the producers and this would not lead to increase in output of the physical product. If goods have a social benefit much greater than private benefit, they are likely to be under-consumed in a free market. People don't take into account the full social benefit – only their private benefit. This leads to market failure.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Contributors/Acknowledgement: Both authors contributed equally to the conception and design of the study.

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