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Review article

Risk Management of Agriculture Commodity at Indonesia Futures Market: A Literature Study

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Abstract *- According to a literature study, this article attempts to answer how farmers and agribusinesses should face the risk of agriculture commodity price volatility. In the current economy, farmers and agribusiness companies face high risks due to the emergence of specific new factors, such as increased volatility in input and output prices, climate change, restrictions on international trade, US-China trade war, higher food safety standards, and public awareness about the environment and halal guarantee. Markets of commodity futures play an essential role in price formation, which helps farmers/producers prepare their production, processing, storage, and marketing planning of commodities. The agricultural sector's current critical problem is price risk, which often creates losses among producers (farmers). It is not uncommon for farmers to bear losses and debt burdens due to high commodity price volatility and falling prices during the harvest. An important question that has become a topic of debate in agriculture is whether commodity price volatility stems from speculation in the futures market or whether this volatility reflects the underlying economic fundamentals. In this context, there is a growing concern that commodity derivative investments based on replicating futures index have become an independent source of price behavior and lead to current price volatility patterns in this market.*

Keywords *- Agriculture commodity, Price volatility, Risk, Hedging, Speculation, Futures markets*

I. INTRODUCTION

In the current economy, farmers and agribusiness companies face high risks due to the emergence of specific new factors, such as increased volatility in input and output prices, climate change, restrictions on international trade, US-China trade war, new and more stringent food safety standards, and public awareness about the environment and halal guarantees. This development is relevant to significant changes in agricultural market fundamentals (UNCTAD, 2011). A critical problem in agricultural commodity prices is the adjustment of risks from supply and demand mechanisms. Economic risk is crucial for forming commodity futures market prices, especially in developing countries like Indonesia. In developed countries, farmers as commodity producers have access to commodity futures markets so that they can hedge their price volatility more effectively (Broll et al., 2013).

It is well known that commodities are the essential economic foundation for developing countries by providing food, creating income opportunities, and export activities for those directly involved in the agricultural sector. Like everything else, the Indian commodity sector has experienced a tremendous surge in more sophisticated and structured markets over the last few decades (Mukhrejee, 2011). Therefore, unlike in other countries where the agricultural sector in GDP is still marginal (except in some Asian countries such as Pakistan, Bangladesh, Sri Lanka, Indonesia, China, Thailand, Malaysia, and others). The growth of the agricultural sector has an essential role in Indonesia's economic growth and other emerging countries. In most economies driven by agriculture, it is well known that the government's agricultural policies tend to protect and promote the agricultural sector through various procurement and regulated pricing mechanisms (Mukhrejee, 2011).

Broll et al. (2013) state that farmers and agribusiness companies face a high level of risk in the current economy due to certain new factors, such as higher price volatility for inputs and outputs, climate change, and restrictions on international trade, and new food safety standards and tighter. This development coincided with a significant shift in the foundations of the agricultural market. The farm sector's current critical problem is price risk, which often creates losses among producers (farmers). It is not uncommon for farmers to incur losses and debt burdens due to high commodity price volatility, especially falling prices during the harvest season (Elumalai, 2009).

The agricultural sector in Indonesia is one sector that has a strategic role in the Indonesian economy. This sector contributed to the second largest GDP after the processing

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industry, which amounted to 13.26% (BPS 2017). The employment provided by this sector is also quite large, at around 35% of the total workforce (BPS 2017). Besides, the agricultural industry also plays a role as a food and industrial raw materials provider through several leading commodities such as CPO, coffee, cocoa, olein, and rubber.

The debate about policy in agriculture in Indonesia is related to the fundamental question of whether commodity price volatility stems from speculative activities on the futures market or whether the price volatility reflects underlying economic fundamentals. If volatility is caused by hypothetical action, then an efficient price is not formed efficiently. If the commodity market's price is under the underlying economic factors, the price is more efficient (Broll et al., 2013; Fitriani et al., 2019). According to Nakajima (2012), asymmetric information conditions can interfere with the formation of efficient prices due to an overreaction in price movements that drive additional risk.

In this context, there are concerns that investment in agricultural commodity derivatives based on the replication of the futures index is a source of independent price behavior and is the cause of patterns of price volatility in this futures market (Gilbert, 2010). He added that agricultural commodities, in general, have characteristics and properties that have risk values such as the perishable, fluctuating quantity of harvests, and are challenging to control, especially those caused by natural change factors. This factor causes problems that often face agricultural commodities trade, and the price is constantly fluctuating, so the risks faced by farmers and producers are very high.

One alternative to solving this problem is to carry out risk management through futures contract trading. Today, futures contracts have a very strategic role as a means of determining prices and implementing hedges. Futures contracts help commodity prices on the market become more stable and reduce the probability of high volatile prices (Dewi et al., 2011). Futures trading can provide economic benefits in the form of the transfer of unwanted risk through hedging activities. Hedging can be done through various derivative instruments, namely forward, option, future, and swap (Hull, 2015).

This paper aims to analyze aspects of risk management in agricultural commodities through the futures trading system (derivatives) through a review of the financial literature to provide a more integrative and comprehensive solution to various post-harvest problems in the Indonesian agricultural sector. Therefore, this article focuses on discussing derivative instruments in the form of options and futures in the context of risk management of agricultural commodities.

II. LITERATURE REVIEW

A. Derivative Instruments

A derivative involves two parties (bilateral) or an "exchange" agreement whose value is derived from a commodity or instrument used as a primary reference or basis. A derivative instrument is an instrument whose value is derived from an underlying asset or the underlying asset or derivative product (Hull, 2015). Derivatives are grouped based on the nature of the underlying assets, such as stocks, bonds, commodities, and indices (Brigham & Houston, 2016).

Instruments to buy or sell an asset at a particular time and price differentiates commodities trading. Forward contracts and swap contracts use specific instruments primarily in currencies, and futures contracts focus on commodity goods. Simultaneously, options can cover almost all commodities, including stocks, bonds, currencies, and futures contracts (Hull, 2015).

In practice, derivatives are commonly used as a tool to manage risk, primarily due to price fluctuations that tend to be difficult to predict. Asset prices are often risk-controlled, including agricultural commodities (CPO, olein, cocoa, tobacco, coffee, and others), mining commodities (gold, coal, nickel, tin, oil, and gas), stocks, bonds to foreign currencies (Dewi et al., 2011). Uncertainty in these assets' price movements often creates investment risk and high business risk that can potentially harm investors or commodity producers (Bodie et al., 2014). Investment managers, hedge funds, speculators, and commodity producers often use derivatives as a risk control tool.

The increasing volatility of the international market is driving the use of derivative instruments in controlling financial risk. Risk management is the main focus of activities in the derivatives market, which can be used by actors (participants) to reduce various kinds of risks. Different derivative instruments have emerged, such as futures contracts for agricultural production factors, such as fertilizer and environmental damage prevention (Mukherjee, 2011; Gilbert, 2010).

B. Futures and Options

A futures contract is an agreement that requires both parties to make a transaction, namely to buy (long position) or sell (short position) a particular underlying asset. The whose delivery is carried out with product specifications and the price set when the contract was made (Hull, 2015; Brown & Reilly, 2012). One of the main benefits that futures contracts can provide is to protect the value of assets (hedging) that are the basis of the risk of uncertainty in future price changes (Brigham & Houston, 2016).

Furthermore, options contracts are divided into two types, namely calls as buying rights and puts as selling rights. The buyer or owner of the call has the right to purchase certain assets at a specific price on a certain date in the future. Instead, the buyer or owner of the put has the right to sell certain assets at a particular price at a specific date in the future. The contract price is called the strike price or exercise price, and the date on the contract is called the expiration date or maturity date. This option has two styles, namely the European style and the American style. European options can be exercised only strictly at the due date.

In contrast, American options can be exercised during the option's life or as long as the option is not expected or precisely at the due date (Hull, 2015; Brealey et al., 2011).

In the futures market, the commodities traded already have certificates that provide certainty and guarantee specifications related to quality and quantity. However, these specifications may differ between markets because each market has specific standards for commodities traded. The commodity market's general functions include the source and place of commodity information, trading mechanisms, commodity sellers' and buyers' information, and speculative activity intensity (Hull, 2015).

The commodity market's main benefits include fulfilling commodities needed by buyers with guaranteed specifications, encouraging commodity productivity and marketing, creating jobs, and becoming a foreign exchange source for the country. The other most important thing is as an instrument of risk management, especially the risk of commodity price volatility. Thus, commodity futures markets can reduce the producers' price risk and business risk because they can provide information for planning production, processing, storage, marketing, product certification, and trading on the stock exchange (Gobewole, 2020; Elumalai, 2010).

C. Derivatives and Risk Price

One of the most important economic functions of derivative instruments is the transfer of market risk. The transfer of risk due to drastic changes in asset prices by the parties. Such as who wants to avoid it (hedgers) and wants to control it better (speculators). In every trading activity, rational business actors always expect a profit but face the risk of loss, which is still inherent in their business activities (Hull, 2015). Agribusiness risks generally stem from commodity price volatility, currency exchange rates, benchmark interest rates, inflation rates, government regulations, and technological developments. Through this derivative market, risks arising from prices on diverse commodities' physical demands, such as agricultural, plantation, and mining products, can be hedged. Hedging is carried out on unmanageable risks originating from external factors (Hull, 2015; Dewi, 2011).

Derivatives improve economic efficiency by allowing users to be familiar with, isolate, and manage underlying price risks always present in individual financial problems. For that reason, risk transfer using a futures contract contains an understanding that both parties, both buyers and sellers, impose risks that arise from fluctuations in commodity prices in the future (Gilbert, 2010). If there is a risk to the buyer, the seller must bear the risk, and vice versa. Therefore, futures contracts are made with specifications that enable the party's transaction to liquidate their position at any time and at any price without involving the commodity's physical handover. Thus, the buyer who initially wanted to get the goods and the seller who originally wanted to sell the goods were finally exposed to a situation of uncertainty about the price and the physical handover process of commodities (Nakajima, 2012; Hull, 2015).

D. Futures Exchange in Indonesia

Commodity futures trading is formed to establish the reference price of primary commodities in Indonesia and hedging for commodity trading market players. The basis for implementing Commodity Futures Trading in Indonesia is UU No. 32/1997, as amended by UU No. 10/2011 concerning Commodity Futures Trading. Futures trading is another form of insurance activity created based on market mechanisms, namely by forming derivative markets or derivatives from physical commodity markets, by conducting transactions in both markets simultaneously in opposite positions (selling or buying) for the same amount of commodity. These two markets will cover each other's losses suffered in one market.

A futures exchange is a place for buying and selling futures contracts for several commodities or financial instruments at a specific price based on the applicable rules and regulations. In this case, the futures market is beneficial for producer farmers and those who need prices to reference their business interests. In Indonesia, two exchanges serve commodity transactions: the Jakarta Futures Exchange or the Jakarta Futures Exchange (BBJ/JFX) and the Indonesia Commodity and Derivatives Exchange (ICDX). The commodities traded as futures contracts between the two exchanges are almost identical, namely estate, mining, and financial commodities. For each commodity whose contract is traded on an exchange, the specifications are clearly defined, concerning the quantity, quality, and time of delivery, so that Exchange users can efficiently conduct transactions.

III. DISCUSSION

A. Indonesian Agricultural Commodity Futures Trading

Currently, the demand for commodity futures hedging is increasing significantly. Jakarta Futures Exchange (JFX) achieved multilateral transactions of 1.09 million lots during 2017. The number of these transactions rose 23.57 percent from the achievement in 2016. Throughout 2017, coffee commodity futures dominated 44% or rose 4 percent compared to 2016. The second position is gold futures trading at 39%. While olein is 16% (up 3% from 2016), the cocoa trade contract accounted for 5%, up 1% from the previous period. The futures trade in Indonesia's agricultural commodities has a positive trend from these data and is increasing significantly (JFX, 2018).

Commodities in exchanges have different characteristics from other financial assets because commodities are continually produced and consumed continuously. So the classification of attractive assets for commodities (in the scope of production and consumption) does not have to "match" one another in the same period because commodities

can be stored as inventory (Gobewole, 2020; Jarvinen 2004). The definition of a commodity is emphasized, including all goods, services, rights, and other interests and any derivatives of tradable commodities and subject to futures contracts, sharia derivative contracts, and other derivative contracts (Dewi et al., 2011).

In futures trading, agricultural commodities are one of the world's preferred futures contracts, including Indonesia. Agricultural commodity instruments are considered to play an essential role because of their role in various primary and secondary sectors throughout the world, besides the commodity is also traded continuously on commodity exchanges around the world (Purnomo et al. 2013). Agricultural commodity prices often fluctuate due to some problematic factors, such as weather and season anomalies, natural disasters, and others. By hedging using futures contracts, commodity owners, investors, or speculators can minimize sales risk due to price fluctuation (Mukhrejee, 2011; Prihatini, 2015).

Aside from being a means to achieve high profits, investing in derivative instruments is carried out by investors to protect the value (hedging) of their assets from the increase or decrease in the price of these assets. For example, palm oil entrepreneurs hedge by buying and selling CPO futures contracts on the futures exchange. Thus, the entrepreneur can minimize losses on CPO price changes that occur. Another illustration is that a farmer can sell futures contracts for his crops to speculators before the harvest is carried out. Farmers hedge the risk of rising or falling crop prices, and speculators accept this risk transfer in the hope of an enormous reward. The farmer knows for sure the sale value of the harvest he will obtain later, and the speculator will benefit if the selling price has increased, but if the selling price has decreased, he will suffer a loss (Ismiyanti & Sasmita, 2011; Prihatini, 2015).

Commodity futures trading transactions, especially agriculture, can be an attractive investment choice because offering high returns. Futures trading is often referred to as a risky, complex, and highly volatile activity, requiring high business skills. However, according to Purnomo et al. (2013), investment in the commodity market has a higher profit potential than savings or deposits; it can even exceed the profits from stocks or bonds. This return is because, in futures trading, there are two ways of opportunity, both in the Buy-Sell position and the Sell-Buy position, so that both parties have the same chance to make a profit. Another plus is that customers can invest directly (direct investment) and now monitor the risks faced. However, investment in commodity markets, especially futures trading, must be done because it has a higher risk and does not guarantee the Deposit Insurance Corporation (LPS).

B. Empirical Research

Many empirical studies of futures trading through agricultural commodity derivative instruments have been carried out with several perspectives. Wisantyo (2006) conducted a study of investment analysis on gold and olein commodity futures contracts in terms of risk and returned using the Capital Asset Pricing Model (CAPM) method. The results of the study indicate that gold commodities are more sensitive to the market. Hence, gold commodities' investments tend to be riskier than olein (CPO) commodities, but gold has a high return than olein commodities. By comparing the same item, Ismiyanti & Sasmita (2011) used the OLS model to see the effectiveness of hedging between olein and gold. The result is that the value of the olein hedging ratio is higher than the golden hedging ratio. This condition shows that the futures contracts needed to reduce losses on the spot olein market are more numerous than gold commodities.

Prakash & Gilbert (2011) found evidence that companies' hedging policies are value-enhancing activities or activities to increase company value, proving that the market provides more value to companies implementing hedging programs. Bhargava (2007) examined the optimal ratio of ratios to the futures contracts of the cotton and soybean commodity markets. This study identified that the modified regression method and the error-correction model demonstrated the effectiveness of hedging using futures contracts from cotton and soybean commodities. Broll et al. (2012) state that the volatility of agricultural prices on global markets is not only caused by economic fundamentals. However, there are also concerns that this could also be caused by investor speculation in the futures trading market (Santosa, 2021).

In India, there are three commodity exchanges in which agriculture exists as a commodity, namely the Multi Commodity Exchange (MCX), the National Commodity and Derivatives Exchange (NCDX), and the National Multi Commodity Exchange (NMCE). Based on Dhankhar's (2009) research results, India's agricultural futures market has a definite and significant impact on the production and prices of various agricultural commodities.

Some studies also analyze the relationship between futures on agricultural commodities with other variables. A survey conducted by Prihatini (2015) proves the effect of prices and other variables, namely production, exchange rates, interest rates, and world oil prices on exports, were analyzed using VECM analysis. The results show that futures prices, export prices, production, exchange rates, interest rates, and world oil prices significantly affect exports in the long run. Research conducted by Dewi et al. (2011) with the title analysis Olein futures contract on the Jakarta Futures Exchange shows that the Olein futures contract return equation is influenced jointly by SBI, exchange rate returns, and CPO returns by 66%. Other factors influence the rest.

At present, the agricultural commodity futures market is currently far from perfect. In developed countries, farmers' access to commodity futures markets is already good, protecting them from the risk of price fluctuations. However, in some developing countries, this is still not well accessible. Farmers still depend on commodity futures contracts to protect the risk of agricultural commodity prices (Allen & Lueck, 2003).

An important question that is the main topic of debate in agriculture is whether commodity prices' volatility stems from speculation in the futures market or whether this volatility only reflects the underlying economic fundamentals. In this context, there is a growing concern that financial investments into commodity derivatives based on replicating index futures have become an independent source of price behavior and have led to recent price volatility patterns in these markets (Broll et al., 2013). They further noted that reviewing optimal risk management decisions from a farmer who was reluctant to take risks faced various commodity price uncertainty sources. Farmers sell commodities to two markets, but only one of them has a futures market. Broll et al. (2013) show that farmers' optimal position is over-hedge, full-hedge, or under-hedge strategy, depending on whether two random commodity prices are positively correlated, uncorrelated, or negatively correlated.

Elumalai et al. (2009) found a model that revealed direct short-term causality. The previous futures price (lag) coefficient in the spot price model is positive and indicates a significant flow of information from futures to the spot market. The study results are widely revealed that this agricultural futures commodity affects the spot price, which shows better hedging efficiency for producers to protect their price risk on the futures exchange.

The impact of futures trading on spot price volatility is proven empirically and shows that futures and spot prices are stable long-term equilibrium relationships. External macro-risk shocks that are changing can be adjusted back to the spot price. However, futures prices (lagged) positively affect changes in spot prices in the short-term dynamics. It shows a unidirectional causal relationship from futures to spot prices. However, in the price discovery process, futures contracts get their value from the spot market. In that case, there is also an alleged causal relationship between spot prices to futures. This group feels that a more in-depth analysis needs to be done to study the relationship between futures prices and spot prices and ascertain the impact of the introduction of futures on spot price volatility. Next, the factors influencing price formation in futures trading must be analyzed, considering the global demand and supply situation (Elumalai, 2010).

Price signals from the futures market mean as a piece of content information for farmers. With this information, farmers may make better decisions about what and how to produce and sell. This circumstance has implications for changes in cropping patterns, cropping intensity, and crop diversification to be delivered. Elumalai (2010) states that almost no empirical studies have been conducted to assess futures trade impact on agricultural production in emerging countries, including Indonesia. In this context, the bid response model that combines can analyze futures prices (Santoa, 2011).

IV. CONCLUSION

Considering that Indonesia is an agricultural country, it is better for commodity futures trading through derivative instruments such as options and futures to develop and strengthen the national agricultural system. Trading agricultural commodities through derivative instruments can reduce various risks caused by the typical characteristics of farm products. With derivative instruments on commodity exchanges, asset price formation is expected to be more efficient. The risk of price volatility can be mitigated to reduce business risk significantly.

Futures trading has a potential role in minimizing the price risks faced by farmers. This fact is supported by an efficient and transparent price mechanism in the futures market to help farmers make decisions about production, processing, storage, and marketing activities. In addition to risk transfer, the futures market provides an important economic function of price discovery. It is hoped that in Indonesia, early-stage futures trading and a well-developed futures exchange will play an essential role in risk transfer, promoting technology and investment in agriculture.

At present, based on some empirical studies, commodity trading issues short-term contracts (60-90 days), and most transaction cases do not cover the complete harvest cycle. The group feels that the contract's duration should be longer to facilitate farmers' hedging price risk more effectively. Furthermore, accredited storage facilities that can provide quality certification products to farmers must be developed and extended to major commodity-producing centers. An assessment of available storage facilities by commodity exchange must be carried out wherever the physical shipment/delivery of commodities occurs.

The process and mechanism of commodity trading in the futures exchange will be faster, easier, and more transparent by utilizing the latest information technology (IT). Buyers and buyers can make transactions through online trading facilities. Registered commodities and their specific specifications can easily be searched by potential buyers (sellers) warehouses by potential buyers and are quickly traded on the market with brokers and minimum transaction costs. With more available access to information, market efficiency in the formation of commodity prices is getting better. With commodity futures markets, producers can control their business risks through better business planning, starting from production, processing, storage, certification, marketing, and trading on the stock exchange.

A conclusion section is not compulsory, but we recommend it. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. Try to emphasize your scientific contribution and the differences from previous works in the literature. The conclusion is a text-only section - do not use equations, graphs, or cite references in this section. Make sure that the whole text of your paper observes the textual arrangement on this page.

RECOMMENDATION

The government and other related parties are advised to build better facilities and infrastructure to improve services, access to farmers, and warehousing that meet international standards. This collaboration is vital to easily transact their commodities on the futures exchange to hedge from price volatility. The items offered to the futures exchange should be expanded to nine essential commodities to make inflation control easier for BI and the government. Besides, it is necessary to do the quality certification and commodity specifications that are easier and available in each agricultural center. The quality and quantity of commodities offered by farmers are guaranteed.

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