

# ADB Sustainable Development Working Paper Series



## Prefeasibility Study of an ASEAN Rice Futures Market

Andrew McKenzie No. 19 | March 2012

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Asian Development Bank

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## Abbreviations

Asian Development Bank
Archer Daniels Midland
Agricultural Futures Exchange of Thailand
ASEAN Food Security Reserve Board
agriculture price risk management
Association of Southeast Asian Nations
Padiberas Nasional Berhad (Malaysia)
Badan Urusan Logistik (Bureau of Logistics, Indonesia)
Chicago Board of Trade
Chicago Mercantile Exchange
hundredweight or centum weight
deferred payment
freight on board
Indonesia Commodity and Derivatives Exchange
Intercontinental Exchange
International Finance Corporation
Minneapolis Grain Exchange
National Food Authority (Philippines)
National Multi-Commodity Exchange of India Ltd.
over-the-counter
People's Republic of China
Public Warehouse Organization
Singapore Exchange
Singapore Mercantile Exchange
state trading enterprises
United States of America
United States Department of Agriculture
Viet Nam Food Corporation
Zhengzhou Commodity Exchange

### **Executive Summary**

This report presents a prefeasibility study of a rice futures market in the Association of Southeast Asian Nations (ASEAN) region. Following are the main points of the study:<sup>1</sup>

**Economic benefits.** The general consensus among potential exchanges (Singapore Mercantile Exchange and Singapore Exchange), existing exchanges (Agricultural Futures Exchange of Thailand and Zhengzhou Commodity Exchange), Thai Rice Exporters Association members, and international trading houses is that an ASEAN-based rice futures contract would provide two important economic benefits to the market: price discovery and price risk management. ASEAN rice markets are currently opaque and a futures contract could help increase market price transparency to aid all market participants in marketing and production decisions. Representatives of the international trading houses who were interviewed confirmed the hedging need for a liquid rice futures contract.

**Limitations of futures markets.** Futures markets have a limited role in stabilizing prices across multiple years or seasons. In effect, they reflect current and expected future supply and demand conditions, and if those conditions result in higher or more volatile cash prices, futures prices will also be higher and more volatile. In this sense, futures markets are not a panacea for removing all market price volatility.

**Necessary cash market characteristics.** Past studies have identified several important cash market characteristics needed to promote the success of a futures contract:

- (i) Adequate cash price volatility. The regional/international ASEAN rice market is characterized by high levels of price volatility. Prices must be volatile to create hedging needs and attract speculators. On the other hand, government intervention policies, across many countries in the ASEAN region, have been specifically designed to stabilize domestic price levels. Such policies are direct substitutes for a futures contract and, if successful, negate the need for a futures contract. Thus, under this criterion, a regional contract serving the highly volatile international market would have the greatest chance of success.
- (ii) A large competitive and well-defined underlying cash market that lends itself to standardization. Neither domestic nor regional/international ASEAN rice markets meet these criteria. The regional and international markets are thinly traded by a few private traders and a significant amount of trade occurs directly between governments. Both exchange and international trading house representatives interviewed expressed concern that the potential hedging pool (users of the contract) was not large enough to create enough liquidity in a contract.

In addition, the market is highly segmented between different rice varieties and there is a lack of international grading standards to measure and standardize variety and quality differences. Both exchange and international trading house representatives

<sup>&</sup>lt;sup>1</sup> This prefeasibility study was prepared by Andrew McKenzie for the Asian Development Bank (ADB) under TA-REG 7495: Support for the Association of Southeast Asian Nations Plus Three Integrated Food Security Framework, which is financed by the Japan Fund for Poverty Reduction. The author is a professor at the Department of Agricultural Economics and Agribusiness at the University of Arkansas, USA. The main points of the Executive Summary were presented at the Technical Workshop on Rice Price Volatility cum Trade and Coordination Meeting between the ASEAN Food Security Reserve Board, the ASEAN Secretariat, and ADB, which was held in Bangkok on 26–27 January 2012.

emphasized that this lack of standardization on quality and product variety is a major obstacle to the development of futures contracts.

However, the results from a hedging effectiveness analysis conducted for this report show that a hypothetical futures contract (assumed to exactly track the Thai 5% white freight on board [FOB] price) would provide a successful hedge against volatility in Viet Nam 5% white FOB price, Thai Hom Mali FOB price, and to a lesser extent, Cambodia 5% white FOB price. Preliminary results indicated that the hypothetical futures contract would be an ineffective hedge for other rice varieties across the region, although these results should be qualified as only a few other varieties were considered and the data were limited to only a few observations.

- (iii) Minimal government intervention in the underlying cash market. The general consensus among exchanges and traders is that government intervention across the region, in the form of export bans and direct price intervention, has undermined the development of a successful domestic or regional futures contract. In particular, exchange representatives cited export bans as most damaging as they remove supply sources needed to physically deliver on futures contracts.
- (iv) Free flow of public information. Exchange representatives agreed on the need for an independent institution to document, publish, and disseminate rice market information on price and production data—akin to the role assumed by the United States Department of Agriculture in US grain markets. The ASEAN Food Security Reserve Board (AFSRB) could assume this responsibility. Such information is necessary to attract speculative interest to a contract and to aid in price discovery.

**Current feasibility of developing a rice futures contract.** I would argue that current cash market characteristics are not conducive to the development of a successful rice futures contract at either the domestic or regional level. Exchange and international trading house representatives confirmed this opinion, highlighting government intervention, lack of quality and grading standardization, and the limited size of private trade as major obstacles to contract development.

**Policy conditions needed.** To create a successful rice futures market, the following are necessary:

- (i) Create an economic environment in which the private sector can play a more active role in both the domestic and regional/international rice marketing systems.
- (ii) Increase regional cooperation on rice trade policies.
- (iii) Improve the harmonization of rice quality and grading standards. Warehouse receipts and grading standards should replace the system of visual inspections.
- (iv) Improve basic transportation infrastructure and pursue policies to increase investment in private storage facilities and facilitate better access to credit.
- (v) Create an independent institution to document, publish, and disseminate rice market information on price and production data. The AFSRB could assume this responsibility.
- (vi) Ensure an adequate regulatory framework exists to police futures exchanges.
- (vii) Provide adequate sources of credit and financing to potential hedgers.
- (viii) Provide educational support for potential hedgers and government trade and commerce officials.
- (ix) Survey potential industry users to determine optimal contract specifications.

- (x) With respect to the development of domestic rice futures contracts and exchanges, develop the marketing role of cooperatives. Specifically, polices should target improving marketing education and providing access to affordable credit.
- (xi) Create a regional forum in which private traders, exchange members, and government trade and commerce officials across the region can discuss policies needed to promote a trading environment conducive to the development of futures contracts. This forum could also consider alternative risk management tools such as swaps, and conduct and fund further research with respect to potential hedging effectiveness. Again, the AFSRB could assume the responsibility for such a forum.
- (xii) Increase price transparency in existing cash markets and develop a cash price index for the ASEAN region. This would be a good first step to a futures market.

### Introduction

This report is broken down into three sections. Section 1 focuses on describing the general benefits of futures markets and the basic principles of how they are used. In particular, the report highlights the benefits of price discovery and price risk management. Section 2 outlines rice market participants (market agents) in the Association of Southeast Asian Nations (ASEAN) who might benefit from an Asian rice futures contract. The final section analyzes the likely success of an Asian rice futures contract. Specifically, the various criteria needed to bring about a successful contract are examined with respect to the ASEAN region, including optimal exchange location and contract specifications. The topics covered in the three sections are intrinsically linked. Hedging or risk management is the most important function of a futures contract while the likely success of a futures contract is based largely on its potential need or demand as a hedging tool.

### 1. What are Futures Markets and How are They Used?

This section provides a brief overview of the principles of futures markets. The general definition of a futures contract is explained and other fundamental concepts are described, including how contracts are traded, who trades contracts, and why contracts are traded. The overview provides context as to how United States (US) rice and other grain and oilseed markets use futures markets to manage price risk, enhance marketing margins, and discover price. In addition to introducing the underlying principles of futures markets, common misconceptions regarding their use in US grain and rice markets are dispelled. Chicago futures markets have played a central role in the US grain markets for over 100 years, and have been a major factor in driving economic growth and developing the most efficient marketing system in the world. Throughout this section, pertinent issues related to the development of an Asian rice futures contract are highlighted. Subsequent sections of the report investigate the extent to which the successful story of US rice and grain futures markets can be played out in the ASEAN region. Without a thorough understanding of the more predictable basis risk, it would be impossible to clearly see the potential economic benefits afforded by futures markets and contracts.

#### 1.1. What is a Futures Contract?

A commodity futures contract is a standardized agreement to buy or sell a commodity at a date in the future. The fixing of a future price makes futures contracts similar to forward contracts, which are simply agreements negotiated between two parties to trade a commodity at a fixed price sometime in the future. The most important difference between a futures contract and a forward price contract is that futures contract performance is guaranteed by futures exchanges—and unlike forwards do not contain counterparty risk. Although forward contracts bear more risk than futures, they also play an important role in the US rice and grain marketing system, providing a price link between farmers and merchandisers. The term merchandiser will be used throughout the report to describe all agribusiness firms involved in the procurement, handling, drying, storage, redistribution, processing, milling, and export of rice and other grains. Futures and forward markets are intrinsically linked in US markets and work together to make the US rice and grain marketing system the most efficient in the world. Importantly, futures markets offset the inherent risk associated with forwards and provide a benchmark against which all forward contracts are priced.

#### 1.2. What are Futures Markets and Exchanges?

Futures markets provide open and competitive trading in commodities at an organized exchange. Trading can take place by open outcry auction in a physical trading area, known as a trading pit, or electronically. The largest exchange in the world is the Chicago Mercantile Exchange (CME), but there are numerous futures exchanges across the world, including several in Asia. Currently, rice futures contracts are traded at the Chicago Board of Trade (CBOT), which is part of the CME Group; the Agricultural Futures Exchange of Thailand (AFET); and the Zhengzhou Commodity Exchange (ZCE) in the People's Republic of China (PRC). The majority of trading in the CBOT rice futures contract takes place electronically on the CME Group's Globex trading platform.

#### **1.3.** Futures Contract Specifications

Each futures contract specifies the quantity of the commodity, the quality of the commodity, and the delivery terms. For example, following are the US CBOT rough rice futures contract specifications:

- Contract size: 2,000 cwt or hundredweight (about 91 metric tons)
- Deliverable grade: US No. 2 or better long-grain rough rice with a total milling yield of not less than 65%, including head rice of not less than 48%
- Delivery locations: Designated elevators in Eastern Arkansas
- Delivery dates: Contracts mature in January, March, May, July, September, and November. Each contract month represents a separate futures contract.

The choices of contract specifications are of vital importance in determining the ultimate success or failure of a futures contract. The literature on futures contract innovation clearly identifies the need for contract specifications to satisfy the hedging requirements of industry participants. For example, contract size should be specified to meet the physical cash needs of hedgers. The size of US grains futures contracts match typical modes of transportation (e.g., barges and rail cargos). Also, delivery locations of futures contracts are selected in terms of where physical cash market trade is most active. The success of the futures contract is measured in terms of how actively a contract is traded. The terms of volume (the number of contracts traded on a daily basis) and open interest (the number of contracts that have yet to be offset) are used in the futures industry to gauge trading activity. US futures exchanges devote vast financial resources to the process of futures contract innovation. Industry experts, firms, traders, academics, and government officials involved in industry oversight and grading standards are all consulted and surveyed prior to a futures contract launch. With this in mind, any prospective Asian futures exchange interested in launching a rice futures contract would need to allocate similar resources to the contract development process.

All US grain and oilseed contracts specify physical delivery, but feeder cattle and lean hogs contracts are cash settled contracts. It should be emphasized that less than 2% of US grain futures contracts result in physical delivery. The vast majority of contracts are instead settled by offsetting in the futures market. These futures contracts were never intended to be the primary way of obtaining physical cash crop for buyers. In an efficient, well functioning futures market, cash sales and purchases are handled by buyers and sellers in separate, conveniently located local cash markets, with low transportation and storage costs.

Under cash settlement, futures contracts are settled in cash terms against a price index. For example, when the price index at contract maturity is greater than the initial price of the futures contract at purchase time, the buyer of the futures contract receives the price difference. Theoretically, under physical delivery, arbitrage forces futures and cash prices at delivery locations to converge to the same level. However, it should be noted that US rice and wheat futures contracts have experienced some convergence problems over the last several years. Lack of convergence reduces hedging effectiveness and price discovery—the two primary benefits of futures markets. Although cash settlement ensures convergence, it also has potential problems. To create a credible price index and prevent potential price manipulation, which in turn has negative implications for risk management and price discovery, prices used in the construction of the index must be taken from relevant, transparent, and liquid cash markets.

Ultimately, the choice of contract settlement is best determined by analyzing the specific characteristics of the underlying cash market. This is critical in determining the success of a new futures contract. Therefore, considerable resources should be devoted to analyzing the best form of settlement for a new Asian rice futures contract. This issue is addressed in more detail in section 3.

#### 1.4. How are Futures Contracts Traded?

Futures traders are categorized into two groups: *hedgers* and *speculators*. Hedgers buy and sell commodities in the physical cash market and trade futures to offset cash price risk. This risk management service is typically considered the most important economic function of futures markets. Speculators, on the other hand, have no interest in the physical cash commodity, but seek to profit from movements in futures prices. Although speculation has historically been criticized as a morally reprehensible act, speculators play a vital role in providing the two main economic benefits of futures markets: price discovery and risk management. The larger the speculative trading volume, the greater the market liquidity (the number of competitive bids and offers made on an exchange). By providing liquidity to a futures market, speculators (i) make it easy for hedgers to enter and exit the market at competitive prices, and (ii) help markets to adjust quickly to supply and demand information and to provide important pricing signals to industry. Although speculators have been widely accused by the media and governments of contributing to the 2008 commodity price spikes, in academic circles this remains a controversial issue. While increased speculative activity in 2008 was undoubtedly correlated with price rises, evidence of causality is not conclusive.

Futures trades are transacted at prices determined by matching bids and offers on either the pit floor or the electronic platform of an exchange. It is important to understand that exchanges do *not* set trading prices but merely provide the opportunity for prices to be determined in an auction-type setting. When a trader (hedger or speculator) *buys* futures contracts, he or she opens a *long* futures position. At that point, the trader is committed to accepting delivery of the underlying commodity at contract maturity time (unless the contract specifies cash settlement). The underlying commodity is the cash commodity upon which the futures contract derives its value. At the maturity of the futures contract, the futures in essence become the cash commodity and the two market prices converge to the same value, ensuring that cash and futures prices will correlate over the life of the contract. The trader can liquidate or close the long futures position through only two ways:

(i) The trader *sells* or takes an offsetting *short* futures position prior to the futures contract maturity. This offsetting transaction again takes place on the exchange.

(ii) The trader either accepts physical delivery of a specified quantity and quality of the commodity at a specified location at contract maturity, or cash-settles the position at contract maturity.

The vast majority of futures contracts are settled by taking an offsetting position. This two-step transaction will generate returns if the futures price at the time the contracts are sold is greater than the price at which the contracts were initially bought—the per unit return being the price difference. For example, a trader who bought one November CME rough rice futures contract at \$14/cwt and later sold it at \$14.50/cwt, the per unit return would be \$0.50/cwt and the total return would be the per unit return multiplied by the number of contracts and the number of units in each contract (\$0.50/cwt x 1 x 2,000 cwt), or \$1,000.

One of the least understood concepts of futures trading is that contracts can be initially sold and then bought back to offset a position even though the trader may not own the physical cash commodity. In this case, the trader is said to be opening a *short* futures position and is obligated to deliver the underlying commodity at the contract maturity time (unless the contract specifies cash settlement). The notion of selling something you do not own may seem odd, but when you sell a futures contract, the obligation of actually delivering on the contract is usually not required as the initial short position will typically be offset by buying the position back, or going long futures, prior to contract maturity. In contrast to the long futures trade described above, a short futures position will generate returns when prices fall and contracts are bought back at a lower price.

At this point, two things are worth noting. First, the quantity of commodities traded in established and successful futures exchanges is many multiples the size of the underlying cash market. This is because most contracts are offset many times by many different traders prior to maturity. Second, the two sides to a futures transaction-the buyer and the seller-are never made known to each other. The futures exchange is in effect the seller to every buyer and the buyer to every seller. In this way, the exchange through its clearinghouse is able to guarantee contract performance and eliminate counterparty risk. The clearinghouse settles all open positions daily, and through a procedure called margin accounting, requires traders to provide additional funds (known as margin calls) to match any trading losses. Initial margin money must be placed by traders with a brokerage-approved clearing firm when an initial futures position is opened. The amount of money required for margin is a small percentage of the face value of a contract. This system, originally invented by the Chicago Board of Trade, has guaranteed the creditworthiness of every futures transaction at the exchange for over 100 years. Every futures exchange across the world implements a similar system of margin accounting. It cannot be emphasized enough that financial integrity is of key importance to the success of any futures contract. Margin requirements set by the exchange must be large enough to guarantee financial integrity without being too onerous to deter trading volume.

#### 1.5. Economic Benefits of Futures Markets

The benefits of futures markets are twofold. First, price discovery allows market agents to be informed of the true market clearing price quickly and efficiently. This information is vital when making marketing and production decisions for all participants in the marketing chain, from farmers to exporters and retailers. For merchandising firms, the futures markets provide a transparent price that can be used as a benchmark to determine prices for a vast array of cash market contracts. For example, US rice and grain merchandisers make forward contract offers to farmers based upon contemporaneous futures prices. Similarly, US exporters base forward price offers to importers upon contemporaneous futures prices. The efficiency of futures

markets to discover price and provide unbiased forecasts of future prices is well documented (McKenzie and Holt 2002; McKenzie et al. 2002). However, it should be emphasized that futures markets cannot discover price in an information vacuum. In other words, futures markets need to trade based on comprehensive and frequently published fundamental supply and demand information. In the US, an important source of such information is the United States Department of Agriculture (USDA). The importance of such information is highlighted by McKenzie (2008), who found that USDA crop reports contain valuable information that is quickly incorporated by the corn futures market. Thus, government can play an important supporting role in the price discovery process by publishing good quality data on prices, production, storage, exports and imports, etc.

The second and perhaps most significant economic benefit of futures markets is price risk management. Risk management and basis trading are key activities for US agribusiness firms involved in the procurement, merchandising, processing, and marketing of grain and other commodities. The importance of these activities has been highlighted by globalization which has led to increased price volatility and competition for US grain. The grain industry is international in scope, with major players such as Cargill, Archer Daniels Midland (ADM), Bunge, and Louis Drevfus buying and selling grain within hundreds of countries worldwide. Evidence of globalization of the grain industry is visible in terms of elevator bids at major US ports that reflect international supply and demand conditions. Price shocks to world grain markets are quickly transmitted via bids at these ports to the hinterland (McKenzie 2005). However, a major advantage of the US grain industry over foreign competition is ease of access to developed commodity risk management markets (e.g., CBOT futures and options markets). To remain competitive, merchandising firms increasingly rely on basis trading skills, which developed alongside the futures markets to provide a cost-effective yet profitable service to grain buyers throughout the world. Thus, globalization can be seen as a driving force behind greater price risk and increased competition within the US grain industry.

Greater price volatility translates into higher levels of risk for agribusinesses at all levels of the marketing chain. Indeed, the biggest users of commodity risk management tools such as futures and options contracts are grain merchandising firms. The term grain merchandiser encompasses all agribusiness firms involved in the procurement, handling, storing and redistribution, and processing of grain. As such, grain merchandisers include country grain elevators, shippers and exporters, and processors and feeders. All of these types of firms are exposed to high levels of price risk on a daily basis. To manage this price risk, merchandising firms hedge their cash positions using futures contracts and are referred to as basis traders, where the basis is defined as the difference between the cash price and the futures price of a given commodity and market location. Unlike farmers who are price oriented, merchandisers focus on basis movements. In fact, basis quotes are the accepted means by which grain is traded within the industry.

Risk management skills needed to merchandise grain at this important level of the marketing chain are fundamentally different to the risk management skills useful in marketing grain at the producer level. Collins (1997) alludes to the differences between farmer and merchandiser hedging, and notes that the basis trading activities of merchandisers have been well understood by academics since Working (1953) described them over half a century ago. Given the importance of basis trading to the US rice and grain industry, and the potential for basis trading rice in ASEAN markets, assuming a viable Asian rice futures contract is established, a detailed explanation of how US rice elevators trade basis is next provided.

On a less positive note, it is important to emphasize that although futures contracts allow hedgers to mitigate seasonal price risk, prices can only be locked in over the duration of the hedge. The duration or hedging horizon is in turn determined by the maturity date specified on the futures contract. US grain futures contracts trade for maturity dates up to 3 years away— allowing hedgers to lock in prices for up to 3 years in advance. However, contracts for maturity dates beyond 1 year are typically not very liquid and may be difficult to trade at a reasonable price. It should also be emphasized that prices can only be locked in at the start of the hedging period. So from a seller's point of view, if futures prices at the time a hedge is initiated are relatively low, the hedge will lock in a low selling price. Conversely, from a buyer's point of view, if futures prices at the time a hedge is initiated are relatively high, the hedge will lock in a high buying price. In this sense, futures markets have a limited role in stabilizing prices across multiple years or seasons. In effect, they reflect current and expected future supply and demand conditions, and if those conditions result in higher or more volatile cash prices, futures prices will also be higher and more volatile. In this sense, futures markets are not a panacea for removing all market price volatility.

However, futures markets do contribute to some degree to reducing price volatility in a macroeconomic sense by helping to smooth prices over time and to dampen the price effect of supply and demand shocks. Storage is the mechanism by which this smoothing process works, and it is through hedging and basis trading in rice and other grain futures markets that merchandisers derive economic returns to storage. Futures prices for different delivery/maturity dates provide margin opportunities and signals as to when and for how long to store rice and other grains.

#### 1.6. Futures Market Role in US Grain and Rice Marketing System

The following section presents in some detail how futures markets are used to manage price risk through basis trading in the US grain and rice marketing system. While not wanting the reader to be overwhelmed by the technical details of basis trading, it is important to understand these principles as it is through basis trading that the true economic benefits of futures markets to the US grain marketing system are realized. In addition, because basis trading is a very applied topic, and somewhat specific to the grain industry, it receives little attention in generic academic risk management and futures and options texts. In this context, it is worthwhile presenting a comprehensive summary of the main concepts of basis trading.

#### 1.7. Rice and Grain Merchandising

Rice and grain merchandising describes the process of buying and selling rice and other grains. Agribusiness firms that merchandise rice and grain include rice dryers, rice mills, grain elevators, shippers, processors, feed mills, and exporters. Rice elevators, dryers, and mills purchase rice from farmers at harvest time and throughout the next crop year. The US crop year for rice spans the period of September to August of the following year. Over this same period, elevators, dryers, and mills will sell the rice to buyers on the next level of the marketing chain. Eventually, the rice will be milled and processed for domestic use or sold into the export market. Thus, in their role as "middle men," rice and grain merchandisers serve a critical marketing function—buying rice and other grains when farmers want to sell, and storing rice and other grains until users want to buy it. However, storing grain is an inherently risky business as it leaves merchandisers subject to volatile commodity prices. The examples on merchandising (hedging and basis trading) that follow refer to rice elevators. However, the examples are equally as effective for rice exporters and importers.

#### 1.8. Hedging

- Hedging in futures markets provides merchandisers with the main tool to conduct price risk management.
- A hedger is a firm that enters the futures market to remove price risk.
- The basic idea behind hedging is to take the opposite position in futures to the actual current or anticipated cash position.
- Merchandisers use two types of hedges: short hedge, to offset cash losses when prices fall, and long hedge, to offset cash losses when prices rise.

#### (1) Short hedge

Merchandisers initially sell futures contracts when buying cash rice and grain in either the spot market (price bids for immediate delivery) or on forward contracts (price bids for future delivery periods). The US rice and grain industry has an active forward and spot market that allows farmers to easily sell and buyers to easily buy at any point in time. The marketing system is very efficient at ensuring that supply meets demand for any time period. For example, buyers can call a rice elevator and get a price quote for delivery many months in advance. The merchandiser's short futures position is established when a merchandiser anticipates storing grain and is concerned that prices will fall before the rice is subsequently sold. The sold or short futures position. This type of hedge removes price risk by offsetting losses on the cash position should prices fall. The hedger is left with the basis risk, where the basis is defined as the difference between the cash price and the futures price (cash price – futures price).

For example, a grain elevator buys rice at \$14.50/cwt during harvest (September) in the cash market from farmers. By simultaneously selling November futures contracts, which are trading at \$14.70/cwt, a -0.20 December (20 cents under November) *buy basis* is formed. The elevator plans to store the rice for 1 month, and is concerned that the cash market price for rice will fall over this period. By October, when the elevator sells the rice, the cash price has fallen to \$14.40/cwt. The elevator sells the rice at the lower cash price and simultaneously buys the futures contracts at \$14.60/cwt. Thus, the \$0.10 loss in the elevator's cash position is offset by a \$0.10 gain in the elevator's futures position. Note that in this scenario, the basis remained unchanged over the period at -0.20 November. More often than not, relative price changes between cash and futures markets will differ over time, and hence a positive or negative basis change will occur. In the short hedging case, an increase in the basis will result in a net positive return to the hedge, while conversely a fall in the basis will result in a net negative return to the hedge. Hence, the final outcome of the hedge will be subject to unpredictable movements in the basis (basis risk). The following T-accounts illustrate this example (Table 1):

Time Cash Grain		NOV Futures			Basis
	Buy	Sell	Buy	Sell	
Sep	14.50	11.10	44.00	14.70	Buy Basis –0.20 NOV
Oct		14.40	14.60		Sell Basis –0.20 NOV
	-0.10	·	+0.10		0

#### Table 1: T-Accounts Example of Short Hedge

NOV = November, Oct = October, Sep = September.

#### (2) Long hedge

Merchandisers initially buy futures contracts when selling cash grain-creating a sell basis position. This position is established when merchandisers either (i) sell forward cash grain that they do not already own, or (ii) sell cash grain that is physically stored with the merchandiser but has not yet been priced with farmers. Grain elevators are able to execute such transactions by selling price later or deferred price (DP) grain, which are the terms given to grain that is owned by elevators under the terms of a price later contract. Under such contracts, a farmer delivers grain to an elevator but does not establish a price with the elevator until a later date chosen by the farmer. Once physical delivery takes place, the elevator takes ownership of the grain and has the right to sell it at any time (before or after it has been priced by the farmer). The merchandiser may (i) anticipate buying cash grain at a later date to cover forward sale positions, or (ii) anticipate farmers pricing their cash grain at a later date. Under both scenarios, the merchandiser is concerned that prices will rise before the grain is subsequently bought or priced. The bought or long futures position will be of equal size in terms of quantity of hundredweights as the sold or short cash position. This type of hedge removes price risk by offsetting losses on the cash position should prices rise. The hedger is left with the basis risk, where basis is defined as the difference between the cash price and the futures price (cash price – futures price).

In a similar vein to the previous short hedge example: assume that a grain elevator sells forward rice at \$14.50/cwt during November to a buyer for January delivery. By simultaneously buying March futures contracts, which trade at \$14.60/cwt, a -0.10 March (10 cents under March) sell basis is formed. The elevator plans to buy the rice from farmers in 1 month (January) to deliver on the forward contract, and is concerned that the cash market price for rice will rise over this period. By January, when the elevator is ready to deliver the rice to the buyer, the cash price has risen to \$14.70/cwt. The elevator buys the rice from the farmer at the higher cash price and simultaneously sells the March futures contracts at \$14.80/cwt. Thus, the \$0.20 loss in the elevator's cash position is offset by a \$0.20 gain in the elevator's futures position. Note that in this scenario, the basis remained unchanged over the period at -0.10 March. As before, more often than not, relative price changes between cash and futures markets will differ over time, and hence a positive or negative basis change will occur. In the long hedging case, a decrease in the basis will result in a net positive return to the hedge, while conversely an increase in the basis will result in a net negative return to the hedge. Hence, the final outcome of the hedge will be subject to unpredictable movements in the basis (basis risk). The following T-accounts illustrate this example (Table 2):

Time	Cash Grain		MCH Futures		Basis
	Buy	Sell	Buy	Sell	
Nov Jan	14.70	14.50	14.60	14.80	Buy Basis –0.10 MCH Sell Basis –0.10 MCH
	-0.20		+0.20		0

Table 2: T-Accou	Ints Example	of Long Hedge
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Jan = January, MCH = March, Nov = November.

#### 1.9. Basis Trading

In the foregoing hedging examples, net returns could have been either positively or negatively impacted by unpredictable movements in the basis. In reality, rice merchandising firms do not seek to eliminate basis risk, but to exploit predictable movements in the basis over time. For example, grain elevators automatically hedge cash positions with equal but opposite futures positions and trade the basis to enhance returns. Elevators prefer to trade basis (buy basis when basis is low and sell basis when basis is high) rather than to speculate in price changes, as basis movements are more predictable than price movements. Predictable basis behavior over the course of a crop year may be illustrated in basis charts that graph basis levels over time and incorporate futures spreads at contract rollover times (Figure 1).



#### Figure 1: Example of a Basis Chart for a Crop Year

Source: Author's presentation.

Futures spreads measure the price difference between two futures contracts for different maturities. For example, if it is currently January (in calendar time) and March (nearby or nearest to maturity), rice futures are trading at \$14.80 while May futures (a more distant delivery maturity date) are trading at \$15, and the spread is +0.20.

It is imperative to adjust basis levels for spreads as this creates a predictable upward trending basis chart pattern (when spreads are positive) and a predictable downward trending basis chart pattern (when spreads are negative). This type of basis pattern is illustrated in the basis chart in Figure 1. When futures contracts for different delivery periods (termed market structure) are trading at successively higher prices, the spreads between contracts will be positive and the market structure will be at a "carry." In other words, higher futures prices for later delivery periods provide firms with an incentive to store commodities and to sell at higher prices later in the year. Basis levels tend to follow spreads, so when there is a carry market structure, the basis will tend to increase over time (this phenomenon occurs because of arbitrage opportunities which force cash and futures prices together at delivery time—known as "convergence"). In this environment, elevators will have the opportunity to buy grain at low *buy basis* levels and to later sell grain at high *sell basis* levels—a marketing strategy known as going *long-the-basis*. Under this strategy, firms storing hedged grain (against nearby contracts)

will earn the spread (increases returns) as hedged positions are rolled into later maturing contracts (e.g., see Table 4 example of long-the-basis with spreads).

The theory of storage or the cost-of-carry model suggests that the returns to this type of storage and marketing strategy should be approximated by the cost of carrying grain over time. In other words, gains from storing hedged grain over time should be cancelled out by the physical and opportunity costs of storing grain. Physical costs of storing rice include drying, warehousing, insurance, and shrinkage, while opportunity cost comprises the foregone income that could have been earned by selling rice immediately and investing the proceeds (investment or holding period would equate to storage period) at the current bank interest rate. In reality, commodities like rice and soybeans in certain market locations can often earn storage returns (made up of basis change) far in excess of the cost of storing grain. This is because (i) production in these markets is highly seasonal, occurring at an annual harvest time; and (ii) local supply and demand shocks impact basis levels across geographically diverse local grain markets, and the costs of storing grain differ across market locations.

Note that for commodities like gold, where the cash market is not segmented into spatially separate market locations, production and consumption are not seasonal in nature and storage costs reflect only interest rates or opportunity costs; cash-and-carry arbitrage ensures that futures price spreads and basis levels are closely approximated by the cost of storing gold over time. Futures prices for investment commodities (e.g., gold, silver, etc.), whose primary use is for investment purposes, follow the cost-of-carry model theory. However, the cost-of-carry model only loosely explains futures price behavior for consumption commodities (e.g., rice and soybeans), which are characterized by seasonal production with many spatially diverse cash markets, each influenced by local supply and demand conditions.

In sum, basis trading is based upon the assumption that basis patterns may be identified across crop years using (i) current market structure (spreads), and (ii) historical basis charts for a given market location. Once discernible basis trends for a given market location have been identified, merchandisers can capture changes in the basis to enhance margins.

#### (1) Long-the-basis

Under this strategy, elevators will initially establish a low *buy basis* and later sell grain at a higher *sell basis*. Higher margins will be generated using this strategy as long as the (predictable) change in the basis is greater than the storage costs in dollar terms. To earn higher margins, the basis will increase or *strengthen* from period 1 (when the buy basis is established) to period 2 (when the sell basis is established).

For example, a grain elevator buys rice at 14.50/cwt during harvest (September) in the cash market from farmers. By simultaneously selling November futures contracts, which are trading at 14.70/cwt, a -0.20 November (20 cents under November) buy basis is formed. If the rice is stored for 1 month and then sold in October at a cash price of 14.40/cwt, the elevator creates a sell basis of -0.10 November (10 cents under November) by buying back the futures contracts at this time for a price of 14.50/cwt. The gross profit margin of 0.10/cwt is determined by relative price changes in the cash and futures markets, or in merchandising terminology, by change in basis. The following T-accounts in Table 3 illustrate this example.

Thus, in the example illustrated in Table 3, the elevator earned an additional 2 cents per hundredweight by basis trading or merchandising, as opposed to simply buying grain and immediately selling it (assuming a 2 cents per hundredweight handling margin).

Time	Cash Grain		NOV Futures		Basis
	Buy	Sell	Buy	Sell	
Sep Oct	14.50	14.40	14.50	14.70	Buy Basis –0.20 NOV Sell Basis –0.10 NOV
	-0.10		+0.20		+0.10

#### Table 3: T-Accounts Example of Long-the-Basis

NOV = November, Oct = October, Sep = September.

Gross Margin = 10 cents per hundredweight.

(Note that the cash position contributes –10 cents and the November futures position +20 cents to the Gross Margin, and that the change in basis is equivalent to the Gross Margin.)

Cost-of-carry (costs associated with storing grain over the period) is calculated:

\$14.50	х	5%	х	30	÷	360	=	6 cents
Estimated		Real		Number of		Cost of Carry		Cost of Carry
Opportunity		Interest		Days				
Price								

Estimated Opportunity Price = Estimated cash value of the position at the time of its purchase.

Real Interest Rate = Bank interest loan rate + 2% to cover miscellaneous expenses (shrink, insurance, etc.).

Number of Days = Number of days grain is owned. 360 days represent Bank Year.

Cost of Carry = Cents per hundredweight cost of owning grain.

After accounting for storage costs or cost-of-carry, net margin earned through merchandising is:

Net Margin = Gross Margin – Cost-of-carry

Net Margin = 4 cents per hundredweight.

#### (2) Long-the-basis with spreads

Under this strategy, elevators will again initially establish a low *buy basis* and later sell grain at a higher *sell basis*. However, in this case, grain is stored for a long period of time, and so hedged positions (buy basis positions) initially established against the nearby contract will have to be rolled or *spread* into deferred maturity contracts as the nearby contract approaches maturity. Recall that *spread* is defined as the price of a deferred contract less the price of a nearby contract. The number of times a position is spread depends upon the length of the storage period and the number of times nearby contracts reach their maturity dates. Elevators typically prefer to hedge in nearby contracts as they are uncertain as to when grain will be sold, and buyers of rice and other grains typically hold long hedge positions in nearby contracts. Thus, when elevators sell grain to buyers, nearby hedged positions can be unwound by *exchanging physicals* (whereby nearby contracts are exchanged between buyers and sellers of grain, cancelling out or offsetting futures positions).

It is important to note that spreads can be executed at any point in time, and the larger the price differential (spread value) between two contracts of different maturities, the greater the contribution to margins. In a long-the-basis situation, elevators will look for large carry (positive) spreads to enhance margins. Once the spread has been executed by simultaneously buying the nearby contract and selling the deferred contract, the spread is locked in, and the price differential between buying and selling adds to the margin. Higher margins will be generated using this strategy as long as the (predictable) change in the basis and the spread contribution are greater than the storage costs in dollar terms.

For example, a grain elevator buys rice at \$14.50/cwt during harvest (September) in the cash market from farmers. By simultaneously selling November futures contracts, which are trading at \$14.70/cwt, a -0.20 November (20 cents under November) buy basis is formed. If the rice is stored for 2 months and then sold in November at a point in time beyond the November futures maturity date, the elevator will have to, at some point prior to November maturity, buy back the November futures contracts and simultaneously sell the next maturity month of January futures. In reality, elevators, to avoid physical delivery obligations, never carry maturing futures positions into the contract maturity month. In our example, this would mean the November futures position would be spread to a January futures position before the first trading day in November. Let us assume that the elevator spreads the position in late October when November futures contracts are trading at \$14.80 and January futures contracts are trading at \$15.10/cwt. In this case, the spread would be defined as a +0.30 January carry spread. In basis mathematical terms, this carry spread is subtracted from the initial -0.20 November buy basis to create an adjusted buy basis of -0.50 January. Finally, let us assume that the rice is sold in December at a cash price of \$14.40/cwt, and the elevator creates a sell basis of -0.10 January (10 cents under January) by buying back the January futures contracts at this time for a price of \$14.50/cwt. The gross profit margin of \$0.40 is determined by the spread and by the change in the basis. The following T-accounts illustrate this example (Table 4):

Time	Cash Grain	N	IOV Futures		JAN Futures		Basis
	Buy	Sell E	Buy	Sell	Buy	Sell	
Sep	14.50			14.70			Buy Basis –0.20 NOV
Oct		1	4.80			15.10	+0.30 spread ABB –0.50 JAN
Dec		14.40			14.50		Sell Basis –0.10 JAN
	-0.10	_	0.10		+0.60		+0.40

Table 4. T-Accounts Example of Long-the-Dasis with Spreaus	<b>Table 4: T-Accounts</b>	Example of	Long-the-Basis	with Spreads
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ABB = Adjusted Buy Basis, Dec = December, JAN = January, NOV = November, Oct = October, Sep = September.

Gross Margin = 40 cents per hundredweight.

(Note that the cash position contributes –10 cents; November futures position, –10 cents; and March futures, 60 cents to Gross Margin, and that the change in the basis adjusted for the spread is equivalent to the Gross Margin.)

Cost-of-carry (costs associated with storing grain over the period) is calculated:

\$14.50	х	5%	х	60	÷	360	=	12 cents
Estimated		Real	-	Number of				Cost of Carry
Opportunity Price		Interest		Days				

Net Margin = Gross Margin – Cost-of-carry

Net Margin = 28 cents per hundredweight.

#### (3) Short-the-basis

Under this strategy, elevators will initially establish a high *sell basis* and later buy rice and other grains at a lower *buy basis*. Higher margins will be generated using this strategy as long as the (predictable) decreasing change in the basis materializes. This type of strategy is particularly appealing late in the crop year when market spreads are often *inverted* (deferred contract prices) are less than nearby contract prices). In this situation, there will be a natural tendency for the

basis to decrease over time. Also, this strategy does not incur storage costs, but instead the elevator (under some circumstances) earns interest on money generated from the initial cash grain sale.

A natural question that arises is: how can elevators initially sell rice (to form the sell basis) that they do not own? Recall from our earlier discussion of long hedging that this may be accomplished in two ways: (i) the elevator makes a forward contract to deliver rice at some later date to a buyer; (ii) the elevator sells rice that is physically stored under the terms of a *price later* or *deferred payment* contract. In the first case, the forward contract establishes a cash sales price with a buyer, but because physical delivery does not occur until a later date, the elevator is able to buy cash rice (from farmers) sometime after the initial sale but before rice is actually delivered. In this way, a sell basis is formed in period 1 by buying futures to hedge the forward cash sale. Then, in period 2, cash rice is bought to deliver on the forward contract, and the futures position sold to form the subsequent buy basis. In the second case, the rice that is delivered to the elevator by farmers under a price later contract is not priced at the time of delivery. Instead, the rice is stored with the elevator (who has physical ownership of the rice) and the farmer chooses a later date to price the rice (presumably when rice is at a higher price).

However, this type of marketing contract allows the elevator to sell cash rice to a buyer in period 1 (after the farmer delivers) and to simultaneously buy futures to establish an initial sell basis. In this case, rice is immediately delivered to the buyer and the elevator is able to earn interest on the cash receipts from the sale. When the farmer chooses to price the rice at a later date in period 2 (which is obviously equivalent to the elevator buying the cash rice), the elevator eliminates the hedge by selling futures contracts and establishes the buy basis. In either case, the elevator will generate higher margins as long as the basis decreases or *weakens* from period 1 to period 2.

For example, a grain elevator sells price later rice at \$14.50/cwt during May in the cash market to a buyer. By simultaneously buying July futures contracts, which are trading at \$14.40/cwt, a +0.10 July (10 cents over July) sell basis is formed. If the rice is priced 1 month later (June) by farmers at a cash price of \$14.55/cwt, the elevator creates a buy basis of -0.20 July (20 cents under July) by selling back the July futures contracts at this time for a price of \$14.75/cwt. The profit margin of \$0.30/cwt is determined by relative price changes in the cash and futures markets—or in merchandising terminology, by change in basis. The following T-accounts illustrate this example (Table 5):

Time	Cash Grain		JUL Futures		Basis
	Buy	Sell	Buy	Sell	
May		14.50	14.40		Sell Basis +0.10 JUL
June	14.55			14.75	Buy Basis 0.20 JUL
	-0.05		+0.35		+0.30

#### Table 5: T-Accounts Example 1 of Short-the-Basis

JUL = July.

Net Margin = 30 cents per hundredweight.

In reality, short-the-basis positions established using price later contracts will also earn fees and interest for the elevator. Fees are charged to farmers for storing rice or grain under the terms of the contract, and interest may be earned on rice or grain sold in period 1 of the hedging process. If it is assumed that fees are charged at a rate of 5 cents/month and interest accumulates at the rate of 6 cents/month (as in the previous long-the-basis examples), margins must be adjusted to account for these factors. In basis mathematical terms, the original sell basis is adjusted upward to account for fees and interest. Thus, in the current example, 1 month's fees and interest will create an *adjusted sell basis* of +0.21 July and the resulting net margin will be 41 cents/cwt. The following T-accounts illustrate this example (Table 6):

Time	Cash Grain		JUL Futures	6	Basis
	Buy	Sell	Buy	Sell	
Мау		14.50	14.40		Sell Basis +0.10 JUL Fees and interest of 11 cents ASB +0.21 JUL
June	14.55			14.75	Buy Basis –0.20 JUL
	-0.05		+0.35		+0.41

#### Table 6: T-Accounts Example 2 of Short-the-Basis

ASB = Adjusted Sell Basis, JUL = July.

Net Margin = 41 cents per hundredweight.

Note: 30 cents come from cash and futures price changes and 11 cents from fees and interest.

#### (4) Short-the-basis with spreads

In a similar vein to the long-the-basis with spreads, elevators will have to spread hedged positions to deferred futures contracts as nearby contracts reach maturity. Thus, if short-the-basis positions are held for periods longer than that covered by the initial futures contract, subsequent spreads will add or subtract from margins. Unlike long-the-basis positions, margins will be enhanced by negative (inverted) spreads while carry spreads will result in lower margins. As in the long-the-basis case, once the spread is set or executed, the resulting price differential is locked in and will adjust margins accordingly. An inverted spread will adjust the sell basis to a higher level while a carry spread will result in a lower adjusted sell basis.

For example, again assume a grain elevator sells price later rice at \$14.50/cwt during May in the cash market to a buyer. By simultaneously buying July futures contracts, which are trading at \$14.40/cwt, a +0.10 July (10 cents over July) sell basis is formed. If rice is not priced by farmers until July, the sell basis must be spread to September futures. Let us assume that the elevator spreads the futures position at the end of June when July futures are trading at \$14.30 and September futures are trading at \$14.00/cwt. The spread transaction (simultaneous sale of July futures and purchase of September futures) will result in an adjusted sell basis of +0.40 September. If farmers eventually price (sell) cash rice to the elevator under the price later contract in July at \$14.10, and the elevator sells September futures at this same point in time at \$14.05, a +0.05 buy basis will be established. After further adjusting the original sell basis for fees and an interest of 22 cents (11 cents/month) to +0.62 September, the elevator's overall margin from the transactions will be 57 cents/cwt. The following T-accounts in Table 7 illustrate this example.

Time	Cash Grain		JUL Futures		SEP Futures		Basis
	Buy	Sell	Buy	Sell	Buy	Sell	
May		14.50	14.40				Sell Basis +0.10 JUL
June				14.30	14.00		-0.30 spread ASB +0.40 SEP Fees and interest of 22 cents ASB +0.62 SEP
July	14.10					14.05	Buy Basis +0.05 SEP
	+0.40		-0.10		+0.05		+0.57

#### Table 7: T-Accounts Example of Short-the-Basis with Spreads

ASB = Adjusted Sell Basis, JUL = July, SEP = September.

Net Margin = 57 cents per hundredweight.

Note: 35 cents come from cash and futures price changes and 22 cents from fees and interest.

#### 1.10. Exporters and Importers

As already noted, the basis trading examples illustrated for elevators also apply to exporters and importers. However, exporters will buy from elevators (rather than farmers) and sell to importers. Conversely, importers will buy from exporters and sell to retailers. In both cases, exporters and importers can establish buy and sell basis positions and trade on basis movements. For example, Cargill, the largest private company in the world and one of the original proponents of basis trading, regularly takes short-the-basis positions when exporting US grains to international markets. Forward contracts of grain sales would be offset with long futures positions (creating a sell basis) and then cash grain would be procured and futures positions sold or offset (creating a buy basis) to match export shipments. Of course, exporters and importers will face additional risk in terms of currency exposure, which depending on markets could be hedged in currency forward or futures markets. As was the case with the elevators, the market structure will guide these firms as to the expected basis movement and buying and selling decisions.

#### 1.11. Producer Hedging

It is possible for farmers to remove price risk by selling futures contracts against their expected future cash sales. The producer takes an opposite (short) position in futures to offset price movements in his or her (long) cash position. This is an example of short hedging (see previous merchandising examples for more detail), and is typically used by large US producers to protect against price drops prior to harvest time. Hedging is always a two-step process. For example, a farmer could sell 5 November rice futures contracts sometime prior to harvest (e.g., June) to match against his or her expected harvest-time production of 10,000 hundredweight of cash rice. The specific contract month (November in this case) is chosen to closely match the time period when the cash sale will take place (harvest time in US rice markets is September). The closer the contract delivery or maturity date is to the time of cash sale, the lower the basis risk. By selling futures, the farmer can establish a lock-in price using the following formula:

Lock-in price = Futures price at time sold + Expected basis at end of hedge period

If futures prices are trading at \$14.70/cwt in June and the producer expects the harvest-time basis to be -0.20 November (based upon recent history), the lock-in price equals \$14.50. The actual effective sale price the farmer receives at the end of the hedge when rice is sold in his or her local cash market is determined by the actual basis at this time.

Effective sale price = Futures price at time sold + Actual basis at end of hedge period

As can be seen in Table 8, if the actual basis is equal to expected, the effective sale price is equal to the lock-in price. A stronger than expected basis results in a higher effective sale price, while a weaker than expected basis results in a lower effective sale price. This is the effect of basis risk.

Time	Cash Grain		JUL Futures		SEP Futures		Basis
	Buy	Sell	Buy	Sell	Buy	Sell	
Мау		14.50	14.40				Sell Basis +0.10 JUL
June				14.30	14.00		-0.30 spread ASB +0.40 SEP Fees and interest of 22 cents ASB +0.62 SEP
July	14.10					14.05	Buy Basis +0.05 SEP
	+0.40		-0.10		+0.05		+0.57

Table 8: T-Accounts Example on the Effect of Basis Risk

ASB = Adjusted Sell Basis, JUL = July, SEP = September.

Lock-in price in June = 14.50 assuming an expected harvest basis of -0.20 November.

Effective price in September = 14.50.

Thus, in contrast to merchandisers, producers are price oriented. Although basis risk impacts the producer's hedge, it results in a higher or lower lock-in price, rather than in the case of merchandisers where it directly determines margins.

#### 1.12. Financing and Margin Costs of Hedging with Futures

As noted previously, futures exchanges require futures traders to post margin money and to supplement any losses on a daily basis to a margin account. Although this is an essential feature of futures trading needed to guarantee financial integrity of markets, it can make futures trading prohibitive for small hedging firms (e.g., farmers and small country grain elevators) in times of sustained rising prices.

McKenzie and Kunda (2009) noted that the extreme price volatility in grain markets during 2008 led to large margin calls incurred by elevators on their hedged positions on a daily basis. Hedgers have historically relied on working capital or lines of credit to make margin calls, but market conditions over 2008 stretched these liquidity sources to the breaking point, in some cases exceeding 10 times their traditional lines of credit. When a hedger is unable to make a margin call, the futures position is liquidated, the hedge no longer exists, and the hedger becomes a speculator in the cash market. Thus, the transaction costs and risk levels associated

with hedging grain increased tremendously over that period, and as a result, during the summer of 2008, many elevators discontinued the practice of offering producers forward contracts for deferred delivery periods. McKenzie and Kunda presented hedging cost simulations based on price volatility of 20% (typical for the pre-2008 period) and 30% experienced over the 2008 period. Results indicated that for an elevator hedging 200,000 bushels of corn over an April to December time frame, there is a 5% chance that \$419,712 or more would be needed to finance the position, assuming the higher 30% volatility compared with just \$267,225 or more and assuming the lower 20% volatility.

### 2. Potential Futures Hedgers in ASEAN Rice Markets

Domestic ASEAN rice markets comprise both public and private market agents and traders. In general, the procurement, storage, and distribution chains are dominated by large state trading enterprises (STEs), referred to as parastatals. In contrast, private agents, who are typically small, play a somewhat peripheral role in moving rice from farmers to retailers and exporters. Similarly, both public and private ASEAN agents and traders participate in the international rice market; with the exception of Thailand, the vast majority of exports and imports within the region are handled by government agencies.

In section 2 of the report, it is first assumed that a hypothetical rice futures contract exists, and that it satisfies the key criteria of a successful risk management tool—i.e., its price correlates with cash market prices and hence provides an effective hedge. To what extent this is the case with any new Asian futures contract will depend on a number of factors. For example, a paddy or rough rice futures contract would be expected to correlate best with farm cash prices closely linked to physical delivery locations specified in the contract. Alternatively, a milled rice futures contract would be useful region wide—in other words, that would correlate with a wide array of cash prices for different types and qualities of rice in different locations—is a very difficult task. A critical component of contract success is determining optimal contract specifications to satisfy and attract both hedging and speculative demand. For the futures contract to be a useful hedge, the associated basis with respect to cash markets would at a minimum have to be less volatile than the respective cash prices. These issues are explored further in section 3, using a formal hedging effectiveness analysis that models cash price correlations and price volatilities across ASEAN rice markets.

Given the unique structural characteristics of ASEAN rice markets, it is of interest to outline which market agents in the current marketing environment would be potential beneficiaries and users (hedgers) of a rice futures contract. Section 2 will also provide policy recommendations needed to encourage futures market participation and to enhance food security and economic growth in the region. Although futures markets serve a broad risk management function, specific marketing strategies using futures contracts differ greatly across market agents. Therefore, section 2 documents potentially useful risk management and marketing strategies with respect to market agents across ASEAN countries.

#### 2.1. Producers

Paddy rice farmers represent the first type of agent in the rice marketing chain. Their primary price risk is that the price of paddy rice falls over the preharvest production period, resulting in a low sale price at harvest time. To the extent or degree to which this type of price risk exists will

determine hedging demand. If other forms of price stabilization mechanisms exist, such as government price support programs, futures hedging may be viewed as a less desirable substitute. However, even if price supports exist, when prices are well above support levels, downside price risk is important. This form of price risk may be eliminated by selling futures contracts when prices are at profitable levels and buying back futures contracts at the time of the cash sale. This risk management strategy is referred to as a short hedge, and in effect replaces price risk with basis risk. The basis is by definition the difference between the local cash market price for rice and the rice futures price. In other words, in theory, farmers could lock in a price level several months prior to selling their crop. They would effectively guarantee their sale price at the time futures contracts are sold, subject to movements in their local basis. Given that the basis is inherently more stable than price, much of the risk associated with marketing a farmer's rice crop would be removed.

However, in reality, the price risk benefits of futures hedging, for ASEAN farmers, would likely be mitigated by their complexity and the financing or margining costs associated with hedging. ASEAN farms, although numerous, are in general very small enterprises with low levels of production. As such, direct futures hedging is an unrealistic risk management strategy for ASEAN farmers. For example, the USDA has spent considerable resources educating US farmers how to hedge using futures markets, yet a very small percentage of farmers actively use US grain and rice futures markets to hedge their production. Typically, only very large US farm enterprises (with over 800 hectares of crop land) use grain futures markets to consistently market their crops. Instead, most US farmers prefer to manage their price risk by entering into forward marketing contracts offered by grain elevators and rice mills (the merchandising sector). It is at this level of the marketing chain that US grain and rice futures markets are most heavily used. US grain elevators and rice mills use futures contracts to hedge their price risk and basis trade. Of course, the risk management benefits of futures markets realized at the merchandising sector are passed on indirectly to farmers. Without futures markets, merchandisers would not be able to offer the range of forward contracts to farmers across the marketing season. In this sense, farmers hedge indirectly or vicariously through the merchandising sector.

In sum, the best and most realistic way for farmers to derive benefits from an Asian rice futures contract would be to follow the US example and encourage the development of forward contract markets between farmer cooperatives and merchandising firms.

#### 2.2. Merchandisers, Rice Millers, Traders, Exporters, and Importers

It is hard to generalize the marketing structure that connects rice producers to rice consumers across all ASEAN countries, and it is not the purpose of this report to provide a detailed analysis of all the firms involved in this sector of the rice industry. However, by making some broad assumptions and generalizations about market structure, the most likely users of a rice futures contract under the current market environment are identified.

To begin, the most likely hedgers will be large, well organized firms that are exposed to significant price risk or volatility, have good lines of financing and credit, have good storage facilities and distribution networks, and have minimal government interference in terms of market access, regulations, and competition from STEs. In general, these marketing conditions are not met across ASEAN countries.

Also, to reiterate, firms will only hedge if futures contract prices are correlated with the cash market price(s) that they are exposed to. If an international rice futures contract is established to serve the whole ASEAN region, the most likely underlying cash market for this instrument

would be some version of the world price (e.g., Thai 5% white milled rice freight on board [FOB] Bangkok, which is the underlying cash price for the current AFET rice futures contract, or Thai 100% Grade B rice FOB Bangkok). Therefore, such a futures contract will only have hedging value to (i) firms directly exposed to world cash price risk, presumably in the course of international trade; or (ii) firms merchandising and trading in domestic rice markets, which experience price volatility and at least to some extent correlate with the world rice price.

Government policies in many ASEAN countries are designed to stabilize domestic rice prices and insulate them from world rice price volatility. Given this economic policy environment, merchandising firms operating in domestic rice markets in most ASEAN countries are unlikely to find a rice futures contract either necessary or useful. Of course, long-term policy geared toward regional trade liberalization, and the removal or at least reduced involvement of government agencies and STEs in exporting, importing, and domestic rice procurement, would promote the role of the private sector and increase the relevance of a rice futures contract.

In the current economic policy environment, the most likely merchandising firms within the ASEAN region to use an international rice futures contract are the large international trading houses (e.g., Louis Dreyfus, Olam, etc.), and the Thai rice millers and Thai export firms. Thai millers and exporters, which are often integrated, satisfy the criteria of being exposed to significant price risk or volatility. They are typically large enough in size to have access to good lines of financing and credit, and have good storage facilities and distribution networks. In addition, their price risk exposure could be hedged by a rice futures contract based upon the world price. In other words, their cash futures price correlations should be high: Thai 100% white paddy rice prices are highly correlated to 100% white wholesale and retail rice prices, and to world rice prices.

However, reality would suggest otherwise. Two attempts by the Agricultural Futures Exchange of Thailand to successfully establish a 5% white rice futures contract have failed to attract enough trading volume. It appears that Thai rice mills and exporters have been reluctant to avail themselves of this risk management tool, which at least in theory should match their hedging needs. This, of course, begs the question why—an issue that receives attention in section 3. One potential reason for the lack of interest in the AFET contract could be government involvement in the marketplace, especially in warehousing or storing through the Public Warehousing Organization. Government storage crowds out private storage and removes the need of the private sector to use futures markets.

In a similar vein, the large trading houses are exposed to large levels of price risk on a daily basis and they have the know-how and financial muscle to trade futures. However, it should be noted that in the current environment of opaque market price information, these firms may be able to exploit their market knowledge to trade at profitable levels. In other words, the increased price transparency associated with a futures market would not necessarily be seen as an unambiguously good thing by the large trading houses. Therefore, their incentives to trade a rice futures contract are somewhat unclear. This is a huge problem for contract development as the size of the initial trading volume would be highly dependent upon the active participation of the international trading houses. Any government policies designed to encourage the development of a futures contract would need to incentivize the active participation of the trading houses. One way forward would be to create a regional forum in which private traders, exchange members, and government trade and commerce officials across the region can discuss policies needed to promote a trading environment conducive to the development of futures contracts. This forum could also consider alternative risk management tools such as swaps, and conduct and fund further research with respect to potential hedging effectiveness.

#### 2.3. Retailers

The growth and market share enjoyed by large supermarket chains across the ASEAN region have created another potential hedging pool on the buy side of the rice market. A rice futures contract could be used to hedge price risk and benchmark forward contract pricing between these large retailers and the packing firms that supply them with rice. Again, using the US as an example, large US food companies such as Kraft Foods, General Mills, and Kellogs actively hedge their raw commodity inputs and use futures prices when determining forward contracts with retailers.

#### 2.4. Government Agencies

From a government perspective, interest in the potential development of a rice futures market is motivated by food security issues. The negative impact of higher and more volatile rice prices on the ASEAN population, who spend most of their income on rice consumption, is a huge concern for governments throughout the region. Thus, a natural question is: how might a rice futures contract help alleviate this problem? Government parastatals or STEs that are involved in either the export or import of rice could use a rice futures contract to lock in prices. This could be a useful tool for net importing countries faced with large price rises as in 2008. For example, STEs such as the National Food Authority (NFA) in the Philippines, Padiberas Nasional Berhad (BERNAS) in Malaysia, or the Badan Urusan Logistik (Bureau of Logistics [BULOG]) in Indonesia could establish prices (subject to basis risk) for their imported rice many months in advance by implementing long hedging strategy, as described in section 1. If futures prices could be initially bought at relatively low levels prior to, or at least at the beginning of the price hike, they could be later sold at relatively higher levels for a profit. This profit would then offset higher cash prices paid for imported rice at the peak of the price crisis.

How well such a strategy would work would depend upon a number of factors. First, a systematic risk management plan would have to be implemented to remove subjectivity as to when to place hedges. As can be seen from the previous price hike example, market timing would be crucial in determining the hedges success. In other words, it would not be advantageous to lock in high purchase prices at the top of the market—of course, no one knows ahead of time when the top of the market is. Decisions would then have to be made as to whether to systematically hedge at certain times each year based upon expected quantities of imports, or to only selectively hedge when it is anticipated that prices will rise. In the first case, a systematic hedging program would sometimes result in losses (when prices fall), but would help to stabilize intrayear or seasonal price volatility, and would help to alleviate large cash expenses associated with large unexpected price spikes. However, the strategy (which could be thought of as a form of price insurance) could be costly to implement in terms of futures positions financing. In the second case, selective hedging would be a cheaper alternative, but would provide less coverage or price protection, and its success would depend on market timing. It should also be emphasized that as highlighted in section 1, futures markets cannot reduce sustained higher prices beyond contract maturity or hedging horizon. At best, futures hedging can help to stabilize prices around a long-term price trend. If there is a rising long-term price trend, importers will be faced with higher prices irrespective of whether they chose to hedge or not.

A second important factor to STE hedging success would be futures market liquidity. Again, referring to the above example of long hedging by an importing STE, who would take the short side of the futures transaction? Obviously, STEs of exporting nations such as the Viet Nam Food Corporation (VINAFOOD) could be short hedgers, but for the market to provide enough

liquidity, other traders such as speculators and private hedging firms would need to be attracted to the market. With this in mind, ASEAN governments would have to provide a trading environment, both in the cash and futures market, in which private firms could trade freely and fairly without government interference. Ideally, government and private exporters and importers would coexist on a level playing field. Of course, the extent to which private firms would want to take part in international trade along with government agencies is debatable. Such a system is subject to the problem of government crowding out the private sector.

Interestingly, the marketing monopoly of the Canadian Wheat Board on behalf of Canadian wheat farmers was ended on 16 December 2011. Prior to this date, and for the last 70 years, farmers had only been allowed to sell their wheat to the board, which then marketed the wheat on their behalf, with farmers receiving a seasonal pooled price for each marketing year. The Canadian Wheat Board had used the Chicago and Minneapolis wheat futures markets to hedge and market, but now this is the responsibility of Canadian famers and cooperatives. Many Canadian farmer groups, who wanted the opportunity to market their own wheat, had pushed for this change for some time. In the wake of this major change in Canadian agricultural policy, several futures exchanges are looking to capture the new Canadian wheat business by offering the best wheat contract tailored to Canadian needs. The Chicago Mercantile Exchange (CME), Intercontinental Exchange (ICE), Minneapolis Grain Exchange (MGEX), and the Canadian exchange, TMX Group, are all competing for this new market.

Hedging by government agencies in developing countries is not unprecedented. The World Bank's Agriculture and Rural Development Department presents some case studies on its website with respect to the Malawi government and maize hedging.<sup>2</sup> Note that the Malawi case is somewhat different as physical maize call options contracts issued by the Standard Bank in South Africa were used as the hedging instrument, rather than futures contracts issued on a futures exchange.

The Malawi case does show the potential of alternative risk management possibilities for ASEAN countries to manage rice price risk in the region. Specifically, the use of off-exchange or over-the-counter (OTC) risk-management contracts like swaps could be used by both the public and private sectors to manage price risk associated with international trade. Commodity swaps are a growing part of the world risk management market. The worldwide commodity OTC swaps market is now valued at \$2,403 billion, according to the Bank for International Settlements. In addition, the CME Group's Chicago Mercantile Exchange has recently started a cleared commodity swap market that has experienced rapid growth over the last year. A swap market may be more suited to the current ASEAN rice market structure than a futures market, and could be either established simultaneously with a futures market or as a forerunner to a futures market. However, if a swap market was to be established prior to a futures, swap markets do not require a high daily volume of transactions, and are characterized by large infrequent transactions. This seems a reasonable description of international trade in rice among ASEAN countries, especially government to government trade.

In essence, commodity swaps are bilateral agreements between two parties (firms) to fix a price for a commodity over some future time period. A floating or variable commodity price is thus exchanged for a fixed price between the buyer and seller of a commodity. In this sense, they are

<sup>&</sup>lt;sup>2</sup> World Bank. 2011a. http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTARD/EXTCOMRISMAN/0,,content MDK:22287 453~menuPK:6403347~pagePK:210058~piPK:210062~theSitePK:4827781,00.html

similar to a strip of futures contracts (multiple futures contract positions for different maturities) but are not traded or negotiated on an exchange. They are typically benchmarked and cash settled with respect to an underlying price index or futures price. So, for example, the swap buyer would agree to pay a fixed price of \$14/cwt (the price of the swap) for a certain quantity of rice over some future time period, and the swap seller would agree to sell the same quantity of rice over the same period for a fixed price of \$14/cwt. If the underlying index is higher than \$14/cwt at settlement time (e.g., \$14.50/cwt), the swap seller would pay the swap buyer the difference (e.g., \$0.50/cwt), and the swap buyer would buy cash rice at \$14.50/cwt (assuming no basis risk). In effect, the swap buyer, who in our case would be a rice importer, would have effectively locked in a fixed buying price for rice at \$14/cwt. The swap cash payment would compensate the importer for the higher cash price of rice at the time of purchase. Note that selling a financial swap in this manner does not commit the swap seller to physical delivery; the cash side of the transaction is separate from the swap payments. Considering the opposite side of the swap contract, the seller could be an exporter, and would be compensated by the swap buyer if the index at settlement was below the fixed price of the swap.

Although a swap market could be based upon a cash settlement index, futures markets are often used for pricing benchmark. Thus, a major benefit that a rice futures contract would bring to an OTC rice swap market would be price discovery. The negotiated fixed contract price for a commodity swap is typically based upon futures prices for differing maturities (the forward curve). So, just as commodity futures play an important pricing role for an array of forward contracts, they also play an important pricing role in swap markets. In sum, an ASEAN OTC rice swap market would be a way to formalize and manage the risks associated with existing regional trade contracts between exporters and importers. And importantly, its operational success would depend upon the formulation of a credible rice cash price index and futures contract. The index could be used as the underlying cash settlement price for the rice futures contract and the swap market, and the futures prices could be used to price the swaps. The rice futures exchange could also clear the swaps to remove counterparty risk.

#### 2.5. Summary

US grain and rice futures markets provide significant economic benefits to the US grain marketing system. The US marketing system is extremely efficient with tight handling, storing, and processing margins throughout the marketing chain. The futures markets allow merchandisers to enhance margins through basis trading while providing important marketing signals as to when to buy, when to sell, and for how long to store. In this environment of *laissez faire* of perfect competition, the "invisible hand" guides the private sector in providing commodities when needed, avoiding problems associated with large shortages and surpluses.

Domestic rice markets in ASEAN countries bear little resemblance to the US. Without greater participation of the private sector throughout rice marketing chains, and improvements in storage and transport facilities, it is difficult to see how the benefits bestowed by futures markets on the US grain industry can be replicated through an Asian rice futures market.

The greatest potential for an Asian rice futures contract lies in providing risk management benefits to international rice traders and exporters. The chance of success would be improved if the size of the international market expanded through increased trade liberalization policies and the increased role of the private sector in conducting exports and imports. The number of potential hedgers in the international rice market is a concern: is there enough to make a rice futures contract a success? For example, the Thai export market is very concentrated, with the 25 largest firms accounting for 90% of export sales. Outside of Thailand, the business of

exporting and importing rice is almost exclusively in the hands of government agencies (e.g., NFA in Philippines). Unless these government agencies become futures hedgers, or abdicate their importing responsibilities to private firms, the potential international market hedging pool is somewhat limited. Note that futures hedging by government agencies is not unprecedented. For example, the Canadian Wheat Board acts like a large government-run farmer cooperative, using CBOT wheat futures to market wheat on behalf of Canadian farmers. Indeed, given that the existing marketing system in ASEAN countries is dominated by government agencies, the success of futures contracts may depend upon government support, at least in the first phase of futures market development.

The viability of an Asian rice futures contract and exchange depends greatly upon industry hedging demands, which in turn will be heavily influenced by contract design and specifications. If cash settlement is chosen as the preferred delivery mechanism, it is imperative that a trusted price index—free from manipulation—be constructed and maintained by an independent body (equivalent to the USDA, which takes on this role in US agricultural markets).

The US futures markets in large part succeeded because they historically grew out of the needs of US elevators and merchandisers in Chicago—there was grassroots support for a forward market among private industry participants. Therefore, a critical component of the development of an Asian rice futures contract will be to have detailed discussions, focus groups, and surveys with rice industry traders, millers, and exporters, to gauge potential use. In addition, the exchange offering the contract would have to make a substantial investment in providing educational information for industry on how best to use the contract. Also, as a possible precursor to a rice futures market, alternative risk management tools should be considered. US futures markets grew out of an active forward market (to remove counterparty risk), so potential industry users should be consulted as to their preference for some type of over-the-counter bilateral swap market, which could be cleared at an exchange. The CME is currently offering such a service for corn, soybean, and wheat swaps.

On a final positive note, international support for futures hedging in developing countries has never been greater. The World Bank announced on 21 June 2011 the launch of a new risk management tool in cooperation with J. P. Morgan (World Bank 2011b).

The World Bank press release notes: "(The) IFC (International Finance Corporation) will commit up to \$200 million in credit exposure to clients that use specific price hedging products, while J. P. Morgan will take on at least an equal amount of exposure to them. Since the exposure associated with risk management operations is typically smaller than the principal amount of hedges made available to clients, these combined credit exposures should enable up to \$4 billion in price protection to be arranged by J. P. Morgan for emerging markets agricultural producers and buyers. Potential clients for the APRM (agriculture price risk management) product can include agricultural producers, consumers, aggregators, cooperatives, and local banks as well as others that meet predetermined requirements."

By helping with the financing side of futures trading, this could be an important step in making futures hedging more accessible to a wider pool of users.

### 3. Criteria for Asian Rice Futures Contract Success

#### 3.1. Necessary Cash Market Characteristics

Past studies (e.g., Black 1986; Carlton 1984; Brorsen and Fofana 2001) have identified several important cash market characteristics needed to promote the success of futures contracts:

- (i) Adequate cash price volatility. The regional/international ASEAN rice market is characterized by high levels of price volatility. Prices must be volatile to create hedging needs and attract speculators. Carlton (1984) notes that the 1970s and 1980s, which were characterized by turbulent price changes (e.g., 1973 and 1979 oil shocks), saw the rapid growth of futures markets. On the other hand, government intervention policies, across many countries in the ASEAN region, have been specifically designed to stabilize domestic price levels. Such policies are direct substitutes for a futures contract, and if successful, negate the need for a futures contract. Thus, under this criterion, a regional contract serving the highly volatile international market would have the greatest chance of success.
- A large competitive and well-defined underlying cash market that lends itself (ii) to standardization. Neither domestic nor regional/international ASEAN rice markets meet these criteria. The regional and international markets are thinly traded by a few private traders, and a significant amount of trade occurs directly between governments. Both exchange and international trading house representatives have expressed concern that the potential hedging pool (users of the contract) was not large enough to create enough liquidity in a contract. Significant information asymmetries also likely exist in the current opaque cash marketing system, with larger traders—like the major international trading houses-capturing economic benefits. Obviously, the price transparency that a rice futures contract would bring would help to remove these information asymmetries and increase the number of players in regional rice trade. Pirrong (1995) notes that information provided by exchanges is a public good in that it economizes on the costs associated with the collection and distribution of information. However, it is precisely this group-the international trading houses and large exporting firms—that would have to be active users of the contract to make it viable. Given that active participation and the creation of a successful contract is not necessarily the optimal scenario for this important group of traders, it is difficult to see how a contract can be launched successfully. Pirrong points out that private information reduces market liquidity and efficiency because of the lemons problem of information asymmetries. In this situation, the best way forward is to implement policies designed to increase information in regional rice cash markets.

In addition, the market is highly segmented between different rice varieties (Wailes 2002) and there is a lack of international grading standards to measure and standardize variety and quality differences. Both exchange and international trading house representatives emphasized that this lack of standardization on quality and product variety is a major obstacle to futures contract development. Even if grade and quality standards were better established, it would still be difficult to specify a futures contract that would adequately price all rice varieties. Thompson and Kunda (2000) noted that quality attributes cannot be effectively priced with a single contract with fixed premiums or discounts. When quality price differentials are not stable, fixed premiums or discounts specified in a futures contract for delivery will be ineffective for pricing and risk management purposes. In effect, under such conditions, multiple contracts for what are essentially different products would possibly have to be created

by an exchange, but of course this would hurt liquidity in any one contract. Ultimately, the viability of a single liquid rice futures contract would depend upon how well it correlates with cash prices of different rice varieties across the region.

On this issue of price correlation, results from the hedging effectiveness analysis reported later in this section show that a hypothetical futures contract (assumed to exactly track the Thai 5% white FOB price) would provide a successful hedge against volatility in Viet Nam 5% white FOB price, Thai Hom Mali FOB price, and to a lesser extent, Cambodia 5% white FOB price. Preliminary results indicated that the hypothetical futures contract would be an ineffective hedge for other rice varieties across the region, although these results should be qualified as only a few other varieties were considered and the data were limited to only a few observations.

Kroszner (1999) observed that the Chicago Board of Trade's adoption of grading standards for wheat in 1856, when it created three quality categories of wheat, was instrumental in creating a liquid wheat futures contract. The adoption of the grading standards permitted the fungibility of grains stored in elevators as warehouse receipts became denominated in the particular grade and did not refer to a particular lot owned by a specific person. Pirrong (1995) also emphasized the importance of grading standards:

Most important, exchanges provide an extensive variety of transactions-costreducing services, such as property rights definition and commodity measurement, contractual enforcement, and information provision. Some researchers have recognized the broader role of exchanges. Most notably, Telser (1981) and Telser and Higginbotham (1977) argue persuasively that they facilitate trade by standardizing transactions in two important dimensions. First, they devise rules to improve contractual performance. Second, they adopt standardized grading systems for commodities. These systems eliminate the need for repeated measurement at each trade and transform commodity claims into homogeneous, fungible securities.

The implication is that measurement and grading standards are important to both cash and futures markets. Irrespective of whether a rice futures market develops in the region, grading standards would be beneficial to cash markets, replacing the visual inspection of samples—and thus reducing "search" transaction costs between buyers and sellers that would greatly lessen marketing inefficiencies.

- (iii) Minimal government intervention in the underlying cash market. The general consensus among exchanges and traders is that government intervention across the region in the form of export bans and direct price intervention has undermined the development of a successful domestic or regional futures contract. In particular, exchange representatives cited export bans as most damaging as they remove supply sources needed to physically deliver on futures contracts. Shepherd (2011) noted that large-scale millers and traders contemplated the possibility of trading rice futures on the Indonesia Commodity and Derivatives Exchange (ICDX), but concluded that the lack of significant price fluctuations on the market, as a result of BULOG intervention, means that, for the time being, a rice contract would provide no benefit.
- (iv) Free flow of public information. Exchange representatives agreed on the need for an independent institution to document, publish, and disseminate rice market information on price and production data—akin to the role assumed by the USDA in US grain markets. The ASEAN Food Security Reserve Board could assume this responsibility. Such information is necessary to attract speculative interest to a contract, to aid in price discovery, and to make active participation in a rice futures

contract by international trading houses and large exporters an incentive compatible proposition.

#### 3.2. Interviews with Industry and Exchanges Representatives

The following section summarizes in bullet form the salient points gleaned from interviews conducted with key industry players and futures exchange representatives. These interviews provide critical information to guide future policy with respect to the development of rice futures. Lessons can be learned from existing innovations in rice futures contracts—in terms of both relative successes and failures, and from the perspectives of key industry participants. It should be emphasized that all points reflect the interviewers' interpretations of conversations and are not direct quotes from the interviewees.

#### Summary of AFET Meeting, 6 July 2011

- AFET representatives stated that there was a need for a strong commitment and support from the rice industry. They gave the example of the successful palm oil exchange in Indonesia that was started from the grassroots level by private traders.
- It was acknowledged that the previous 5% white rice contract (BWR5) was poorly written in terms of its contract specifications—it did not work well (only millers were interested), and delivery was costly for users.
- It was noted that the mortgaging (paddy pledging) program of the Thai government stabilizes paddy prices at above market levels—and as such, essentially removes the need for an exchange. It was hypothesized that the intended policy of the new Thai government will kill the rice futures contract on AFET.
- It was pointed out that the AFET rubber contract has been relatively successful because market prices have traded well above the government reference/support price for a long time. Hence, there has been no significantly negative government policy impact. Also, rubber traders are more knowledgeable and experienced with futures hedging.
- As an alternative to AFET, the Hong Kong Mercantile Exchange was mentioned as a potentially good location for a rice futures exchange.
- It was acknowledged that Thai exporters need a lot more education on how to use futures.
- There was concern that increased holdings of government stocks through the paddy program will crowd out private storage and futures use.
- The FOB contract is well written with good specifications. Bangkok is a good delivery point for any rice futures contract—even if the exchange is situated elsewhere, such as in Singapore.

#### Summary of SGX and SMX Meetings, September 2011

- Representatives of both exchanges recognized the two primary benefits of an Asian rice futures market: to increase price transparency and to provide the rice industry with an important risk management tool.
- However, representatives of both exchanges expressed major reservations about the development of a rice futures contract given current cash market conditions. Major obstacles to contract development were highlighted: government policy intervention, a thinly traded international market, and multiple varieties and grades of rice.

- Importantly, neither the SGX nor SMX had any plans to launch a rice futures contract over the next several years.
- Representatives of both exchanges indicated that physical delivery would be preferred over cash settlement. It was noted that the development and administration of a cash settlement index for rice would be difficult to implement. This would require a reputable independent body to establish and administer it, and it would be difficult to construct a cash settlement index that did not favor importing countries over exporting countries or vice versa.
- It was commented that although future markets increase price transparency, this can be seen negatively by governments. For example, the National Multi-Commodity Exchange of India Ltd. (NMCE) rice futures contract which began trading in 2004, was banned by the Indian government in 2008. The government argued that speculation in the contract was fuelling price inflation. However, exchange representatives suggested that the banning had more to do with the fact that the futures contract was putting a spotlight on rice price spikes. In effect, the futures contract was performing its price discovery and transparency function—and higher prices are a function of market fundamentals.
- A big question that was raised related to which should come first: domestic futures exchanges/contracts in respective Asian countries, or a regional contract offered at an existing exchange that would serve the whole ASEAN region? Opinion was divided on this issue. The benefits of focusing first on domestic exchanges would be that (i) these could potentially provide a more direct hedging benefit to farmers; and (ii) the successful development of domestic exchanges would require the standardization of local rice grades and varieties—which some exchange representatives considered an important prerequisite to the development of a regional rice futures contract. On the other hand, prioritizing the development of a regional exchange also has some advantages. Primarily, a regional exchange that addresses the needs of international/regional rice trade would theoretically attract traders who are currently equipped to use it now (in terms of futures hedging knowledge and financial capital), e.g., international trading houses and large exporting firms.
- The biggest obstacles to the development of domestic rice exchanges relate to the basic market structure of rice industries in the ASEAN, which is characterized by many small producers and government policy intervention. This current market environment means a lack of potential futures users. Ideally, farmers could benefit vicariously from domestic rice contracts as indirect hedgers through farmer-owned cooperatives (the US marketing model). However, for this to become a reality, cooperatives across the ASEAN region would have to develop marketing and futures skills, increase their financial capital and access to credit, and modernize and improve their postharvest storage facilities. However, such changes would take time and would likely have to be driven by a combination of private initiatives and government policy.
- The biggest obstacles to the development of a regional rice contract relate to the fact that the most likely potential users (e.g., international trading houses and large exporters) are reticent to participate. Various explanations were provided for this reticence (see the summaries of meetings with the Thai Rice Exporters Association and international trading houses). Without the active participation of these major players in the international and regional rice market, the successful development of a regional rice futures contract is a non-starter. This point was made abundantly clear by exchange representatives.
- From the point of view of the exchanges, two critical factors would have to be addressed prior to the successful development of rice futures contracts/exchanges: (i) the removal

of ad hoc government intervention in rice markets, and (ii) the harmonization of rice varieties and qualities through grading standardization.

#### Summary of Zhengzhou Commodity Exchange Meeting, September 2011

- The early rice futures contract started trading on 20 April 2009. It has 6 delivery months—January, March, May, July, September, and November—which are the same delivery months that are specified on the US (CBOT) rough rice futures contract. The early rice contract is however relatively small (10 tons per contract, which based on current prices and exchange rate is equivalent to about \$4,000 per contract) compared to the US rough rice contract (91 tons per contract, which based on current prices is valued at about \$29,000 per contract).
- The main harvest time in the People's Republic of China is in July, while in the US, harvest time is in September.
- The contract has experienced large variations in trading volume since its inception. Some 26,852,200 contracts were traded in 2010, with as many as 3,500,000 contracts trading on a single day (12 November 2010). However, there was a precipitous drop in trading volume beginning in 2011, and this lower level of trading volume has continued to the present. For example, monthly trading volume during November 2010 was 13,296,712 contracts. In contrast, monthly trading volume during November 2011 was 264,566 contracts. This represents a year-to-year fall in trading volume of 98%.
- The early rice futures contract is not as active as other commodity contracts traded on the Zhengzhou Exchange (e.g., sugar and cotton).
- It was mentioned that the level of trading activity across commodities was influenced by the degree of government intervention on price levels. The greater the level of price control (government price stabilization policies), the less active the contract. For example, the first significant amount of trading volume occurred in the mung bean futures contract during 1993, a market with no government price controls. On the other hand, although wheat futures began trading in 1993 at the exchange, the contract did not become actively traded until 1999 when the PRC government opened up the wheat market to free market forces.
- It was stated that physical delivery was preferred to cash settlement because it would be difficult to establish a fair cash settlement index that would not favor buyers over sellers or vice versa.
- It was emphasized that the contract specifications were drawn up based on discussions with the rice industry, and that much time and effort were spent on building a good relationship with the rice industry in terms of marketing, promoting, and educating potential users.
- It was emphasized that the small size of the Zhengzhou futures contract was instrumental in increasing trading volume and making it accessible to speculators and useful to industry hedgers. It was hypothesized that the AFET FOB (BWR5) futures contract may be too large to attract trading activity. The AFET contract is 15,000 kilograms per contract, and based on current prices and exchange rates, it is valued at about \$7,500 per contract—which places it in between the US and the Zhengzhou contract size.
- It was discussed that the Zhengzhou contract probably draws a lot of speculative trading (although data are not available to confirm this statement).

Summary of Thai Rice Exporters Association Meetings, 6–7 July 2011

- Government intervention in Thai rice markets is a big problem for the development of AFET rice futures contracts. It discourages participation and the use of futures contracts as a hedging instrument by members of the Thai Rice Exporters Association.
- The Thai government has set the paddy price 50% above the current market export price. This gives farmers a 150% margin over production costs and a 60% margin based on their sale price. By intervening to this extent on the buy side of the market makes it difficult for the private sector to grow.
- It was emphasized that futures markets can only be used effectively in free markets.
- It was suggested that the first AFET attempt at a rice futures contract (e.g., the BWR5 contract) should have been based on the paddy rice price rather than the milled price. It was noted that milled and paddy prices are not well connected or correlated, making the milled futures contract difficult to use for hedging against paddy prices. Note that the US rice marketing system (millers) uses the rough/paddy rice price contract.
- There was a general consensus that the lack of standardization in the paddy rice market (i.e., many different varieties with different milling yields) was detrimental to the success of rice futures. A paddy standard would be needed in the underlying cash market for basing the futures contract. However, it was recognized that such standardization would not be popular with farmers who were deemed to be selling lower standard rice.
- There was also a general consensus that the government policy to return to the paddy pledging program would be detrimental to the success of the AFET rice futures contract.
- The paddy pledging program would require the Thai government to carry large stocks of rice, which crowds out private storage and again removes the futures role in storage.
- Government intervention to support paddy prices at harvest removes seasonality from the Thai market and removes the need for futures. Note that in the US, elevators exploit seasonality by using futures to basis trade.
- It was suggested that there are currently too many millers in the Thai rice market, and that millers and exporters compete interchangeably with each other.
- Exchange rate risk is important to international rice trade and tools already exist to manage this risk.
- Lack of understanding was considered to be one reason for the lack of interest in the AFET contract. Thai millers and exporters are not used to using futures.
- Many export deals involve large quantities of rice traded infrequently, which are not conducive to futures hedging. It is hard to hedge large amounts of rice infrequently in an illiquid futures market.
- Education on futures hedging would have to be improved to encourage its use by the rice industry.
- There was some suggestion that the close relationship between AFET and Thailand's Ministry of Commerce created distrust of the AFET futures market among millers and exporters. It was suggested that the AFET closing futures price was often based upon the government-reported price—which did not reflect the true market clearing price.
- Currently, exporters hedge their (selling price) export price risk with forward contracts. The benefits of forwards over futures were pointed out (no margin money required, easily understood). There was recognition, however, that forwards are associated with counterparty risk. This was a particularly interesting comment. Certainly from a pure hedging point of view, forwards and futures may be considered as substitutes (you use

one or the other to lock a price). However, in the US marketing system, equivalent merchandising firms use both forwards and futures. When an elevator uses a forward contract with a buyer, the transaction is converted into a sell basis position by buying futures. In other words, US firms use futures to basis trade and enhance margins, not just to manage price risk. This is a level of futures market sophistication that Asian firms would have to develop, understand, and learn to truly derive the benefits of futures markets.

- There was general consensus that a futures contract based upon the international export price (e.g., 5% white rice FOB) is a most useful contract.
- There was also a general consensus that futures could be a useful tool for exporters, but greater liquidity would be needed in AFET to encourage its use by exporters. It is a "chicken and egg" situation.
- Another disadvantage of current AFET contracts mentioned was that the delivery process is too complicated in terms of contract specifications. There was some confusion if contracts were meant to be delivered upon. It was noted that over time, AFET expects the percentage of contracts to be physically delivered to be small. Informal discussions with economists at CME indicated that it is not uncommon for new contracts to have a large percentage of deliveries in the initial development stages.
- There was some recognition that international rice futures contracts based in Singapore might provide greater liquidity, and could be used by Thai exporters. Such a contract could be cash settled (against an index), or physically delivered to Bangkok.
- Bangkok would be a better location for a physically delivered futures contract as Thai markets are more closely linked to the underlying physical cash market.
- There was agreement that one way forward would be to improve cooperation in international trade between ASEAN countries. It would be beneficial to have national STEs formalize trading arrangements, e.g., buy certain amounts of rice at fixed times during the year from private traders. The STEs could even use the private sector to do the trading on their behalf.
- It was pointed out that there is no liquidity in AFET contracts and that the milled contract was only active in 2008 due to speculative interest.
- The paddy pledging program was said to have put off exporters' interest in AFET. This program was of greater immediate concern to exporters than the need for a futures contract.
- Although futures were acknowledged as a potentially useful tool, it was noted that AFET has not generated enough speculative interest to make the contracts liquid enough for hedgers.
- One reason suggested for the lack of speculation was that speculators find it difficult to read the physical market as the rice market is not transparent enough.
- The Thai rice marketing system was summarized thus: there are 4 million farmers selling rice to rice mills and paddy traders. Paddy traders sell to rice mills. Rice mills sell milled rice to domestic market packers (wholesalers) and also sell to local rice brokers and exporters. Local rice brokers sell to exporters. Exporters sell to traders (international rice brokers), international trading houses, and governments (NFA, etc.)
- It was agreed that the current AFET FOB futures contract should be potentially useful to millers, exporters, and packers.
- Large rice traders store rice for 35–40 days.

- International rice brokers will take short forward contract positions (sell forwards 30–45 days out) without owning physical cash rice. They will then go and buy cash rice to cover short forward sales. In the US, merchandisers would sell in the forward cash market and buy futures, i.e., go short-the-basis.
- It was mentioned that around 2008–2009, the Thai government used AFET to sell government-owned rice stocks. For example, the government sold rice futures and delivered on the contracts with physically owned cash stocks. The use of AFET by government in this manner is not conducive to creating a successful futures contract as it puts a question mark over the independence of the exchange to serve the private sector and to provide fair market prices.
- It was noted that rice traders face price risk when buying 5% broken for 7, 14, and 30 days delivery, but that the export price risk (sell side price risk) is greater than the domestic paddy/milled price risk (buy side price risk).
- Large rice trading firms use currency forwards, options, and swaps to manage exchange rate risk.
- There are over 1,000 rice mills (too many) and only 300 exporters (not enough to generate a liquid futures contract).

*Summary of Meetings with International Trading Houses: Louis Dreyfus and Olam International, September 2011* 

- The big international trading houses in the rice market were identified as Louis Dreyfus, Olam International, Novel Commodities S.A., Noble, ADM, and Glencore International AG.
- The price transparency associated with a rice futures market was considered to be a potentially large benefit.
- It was noted that for a liquid rice futures to be successful, it would be necessary for rice millers and exporters to trade contracts as well as with the large international trading houses.
- It was emphasized that the trading houses would use an Asian rice futures contract if it was liquid. An illiquid contract could mean that traders could not offset initial futures positions.
- The price risk period (i.e., the time between buying and selling rice for trading houses) is 1–2 months. Trading houses such as Louis Dreyfus do not physically store rice over this period.
- There is no active forward market for rice, and all transactions are negotiated on a purely cash basis.
- The many varieties of rice that trade in Asia—more than 40 grades and varieties—were highlighted as a major obstacle to the development of a rice futures contract. For example, 5% Thai rice is not the same as 5% Viet Nam rice and the quality differs over time. Given that the rice market is not based on a homogenous product, it is very difficult to design a contract based on a particular rice variety that would generate enough trading interest. However, it was acknowledged that Thai 5% white rice is probably the best underlying variety as it comprises the largest amount of international trade. Note, however, that this was the underlying variety used in AFET's failed contract.
- It was pointed out that given the wide range of rice varieties, a separate futures contract would be needed for each variety.

- In terms of contract specifications, the trading houses emphasized the importance of the contract being based upon physical delivery rather than cash settled against an index. It became apparent that a rice futures contract would be used to obtain physical deliveries of rice, rather than simply offsetting futures positions and obtaining physical rice in cash markets. In this sense, physical delivery would provide a source of cash rice of a known standard and quality (as written in the futures contract specifications).
- It was also noted that a futures contract that offered the option of either physical delivery or cash settlement would be acceptable—more is always better than less.
- The desire for a futures market to operate as a means of obtaining physical deliveries of rice stems from the large number of cash contracts that are defaulted upon in times of high price volatility. It was noted that in 2008, as many as 40% of all cash contracts negotiated by the trading houses defaulted and there is not a good legal system in place in the international community to ensure contracts are not reneged upon. This counterparty risk is particularly prevalent in the rice trade as most of the parties to the transactions are from developing countries.
- Although physical delivery was deemed to be better than cash settlement, the delivery location(s) would dictate contract usefulness. For example, if the costs of taking delivery (transportation costs to get the rice to the desired location from the futures delivery location) exceed profit margins, then obviously the contract would not be useful as a physical source of cash rice.
- Trading houses mostly trade with private firms and international brokers such as Jackson and Sons, but they do sometimes trade with governments through government tenders.
- Trading houses prefer to buy rice directly from exporters—which ensure a regular and reliable source—rather than to buy rice through international brokers, unless there is a significant price advantage.
- Price volatility continues to be an issue for trading houses, with large price jumps occurring within a few weeks.
- Importantly, rice trade is conducted through daily phone calls to negotiate deals and determine prices. No electronic bids and offers are posted on firm websites. This is in contrast to the US where electronic bids are available on broker and elevator websites. This highlights the need for greater price transparency in Asian rice markets.
- Government intervention in Asian rice markets was highlighted as a problem for the development of futures markets.
- Although rice futures markets offer the potential benefit of greater price transparency, it was noted that from the point of view of governments, this may not always be a good thing. Given the importance of rice as a staple food to Asian consumers and given the fact that rice is traded and consumed in essentially its raw commodity form, any increase in rice futures prices would be very visible to consumers, and add to political instability.
- It was agreed that an important part of developing a rice futures market would be to publish rice market information on supply and demand, similar to USDA reports.
- In the discussions, the benefits of greater trade liberalization to foster the growth of the international rice trade/market were highlighted. In fact, freer trade was seen as more important economically than the development of a rice futures contract.

#### 3.3. Hedging Effectiveness Analysis

As noted in section 1, one of the main benefits of a futures contract is price risk management or hedging, and the success of a futures contract is intrinsically linked to how well it performs this important role. A futures contract will only generate sufficient trade to make it liquid if it provides an effective hedge. The extent to which a futures contract is an effective price risk management tool depends upon its degree of correlation with respect to the cash market being hedged.

The hedging effectiveness analysis presented in this section is based on a hypothetical futures contract that is assumed to track the Thai 5% white broken FOB price. This is a standard approach for evaluating the potential usefulness of a new contract in the absence of any trading history (Sanders, Manfredo, and Greer 2003; Schroeder and Mintert 1988; Ditsch and Leuthold 1996). The idea is to show the hedging potential of a liquid futures contract with Thai 5% FOB as the underlying instrument. Note that this was the same underlying instrument chosen by AFET for its latest failed WRF5 milled FOB Bangkok rice futures contract. In particular, could such a contract be used to hedge a wide range of rice prices across different Asian countries? The more Asian cash prices that could be effectively hedged with such a contract, the greater its potential usefulness and the greater its likelihood of success. Thus, hedging effectiveness is determined by correlations between Thai 5% white broken and other Asian rice prices.

Monthly rice cash prices from January 2006 to July 2011 were taken from a number of sources (AFET, FAO GIEWS Food Price Data, and various editions of the *ASEAN Agricultural Commodity Outlook*). The data include representative country export, import, wholesale, and retail prices and are catalogued in column 1 of Table 9.

To simulate a monthly short futures hedge, as described in section 1, monthly cash returns for each cash price i during period t ( $CR_{it}$ ) were calculated as the cash price change between the price in period t and the price in period t–1. Similarly, monthly short futures returns during period t ( $FR_t$ ) were calculated as the futures price change between the price in period t and the price in period t–1. Similarly, monthly short futures returns during period t ( $FR_t$ ) were calculated as the futures price change between the price in period t and the price in period t–1 multiplied by (–1). "Short futures" position implies that a hedger or futures trader has initially sold futures contracts and will earn a positive return if prices fall over the following month. This is why the term  $FR_t$  is multiplied by (–1). Then, monthly hedged returns  $HR_{it}$  are simply the arithmetic sum of  $CR_{it}$  and  $FR_t$ . It is assumed that hedgers match the size of cash positions (in terms of quantity of bushels) with equal-sized futures positions, a strategy typically employed by US grain merchandisers.

To measure hedging effectiveness, I follow Fackler and McNew (1993) who measure hedging effectiveness in terms of the percentage reduction in variance (risk) of hedged position relative to unhedged position:

$$HE = 1 - \left(\frac{variance HR_{it}}{variance CR_{it}}\right)$$
, where *HE* is the hedging effectiveness measure.

Note that the higher HE is, the more effective is the hedge at reducing price risk. For example, if the variance of hedged returns is half the magnitude of the variance of unhedged cash returns, then the HE measure will be 50%. In the extreme case where the cash and futures prices are uncorrelated, and the variance of hedged returns is of the same size as the variance of unhedged cash returns, the hedge is totally ineffective and the HE measure will be 0.

Cash Price Series	Variance Cash Returns	Variance Hedged Returns	Hedging Effectiveness
Thai Hom Mali FOB (45) Feb 2007–Dec 2010	3,517	842	76%
Viet Nam Milled 5% FOB (44) Feb 2007–Dec 2010	4,744	1,393	71%
Cambodia Milled 5% FOB (42) Feb 2007–Dec 2010	3,492	1,669	52%
Myanmar Milled 25% FOB (35) Aug 2007–Aug 2010	414	3,764	N/A
Philippines Milled 5% CIF (20) Jul 2008–Jul 2010	64,920	64,028	1.4%
Philippines 10%–25% CIF (8) Mar 2009–Jul 2010	21,086	22,271	N/A
Philippines Broken CIF (7) Mar 2009–Jul 2010	26,784	26,881	N/A
Malaysia not specified (31) Jan 2008–Aug 2010	18,324	20,047	N/A
Singapore not specified (21) Jan 2009–Oct 2010	1,697	2,046	N/A
FAO Cambodia Wholesale (56) Jan 2006–May 2011	568	1,996	N/A
FAO Indonesia Retail (35) Feb 2008–May 2011	579	5,129	N/A
FAO LAO Retail (49) Jan 2006–May 2011	620	2,899	N/A
FAO Philippines Wholesale (56) Jan 2006–May 2011	591	2,234	N/A
FAO Philippines Retail (56) Jan 2006–May 2011	556	2,169	N/A
FAO Thailand Wholesale (56) Jan 2006–May 2011	2,432	821	66%
FAO Viet Nam Retail (33) Jan 2007–Feb 2010	1,216	3,174	N/A

Table 9: Hedging Effectiveness of Hypothetical Thai 5% White FOB Futures Contract

Notes: The time period from which each series is sampled is listed in column 1, and the numbers in parentheses in column 1 indicate the number of monthly observations available over the whole sample period.

Source: All numbers presented in the table are the author's computations.

From Table 9, we can see that hedges using the hypothetical futures contract would be effective at reducing the return variance with respect to Thai prices (e.g., Hom Mali FOB and Thai wholesale price), and to a lesser extent, Viet Nam milled 5% FOB. However, for all other cash series, the variance of hedged returns is actually larger than the variance of unhedged cash returns. In other words, a lack of price correlation renders the hedge ineffective. This is perhaps not a surprising result as most of the price are heavily influenced by domestic policies in the respective countries and are not well correlated with the world price as proxied by Thai 5% white FOB. However, the results highlight the importance of integrating ASEAN market and trade if an international futures contract is to play a useful hedging role across the region.

#### 3.4. Lessons from US Rice Futures Contract

The rough rice futures market is relatively new compared to the well established futures markets for corn, wheat, and soybeans. Rough rice futures trading was introduced at the Chicago Rice

and Cotton Exchange in August 1986. In 1994, futures trading was moved to the Chicago Board of Trade and a new rice options contract was introduced. Rice industry participants have referred to the rice futures market as a thinly traded futures market. This was certainly the case during the infancy of the contract that was characterized by both low levels of volume and open interest.

Since its inception in 1986, rough rice futures volume and open interest have increased steadily as shown in Figure 2. For example, daily open interest averaged between 4,000 and 7,000 contracts during 1999, while the volume of contracts traded averaged between 100 and 1,500 contracts per day. During 2011, daily open interest averaged between 15,000 and 27,000 contracts, while daily volume averaged between 2,000 and 12,000 contracts.



Figure 2: Rough Rice Futures Volume and Open Interest (Number of Contracts Traded)

Source: Commodity Research Bureau, CRB Bridge futures data.

Of course, these levels pale in comparison with other established grain futures markets such as soybeans and corn, which frequently register daily volume and open interest in excess of 200,000 contracts for soybeans and 100,000,000 contracts for corn. Although, the US rough rice futures contract is relatively thinly traded compared to other grain contracts on the CBOT, past research indicates it plays an important price discovery role for the US rice market (McKenzie et al. 2002).

From a risk management perspective, the US rough rice futures contract does a good job of performing its risk management role in terms of providing the market structure for merchandisers to basis trade and earn adequate returns to storage (as explained theoretically in section 1). This can be seen in terms of Figures 3 and 4 which display futures spreads (market structure) and basis levels for the last 2 rice crop marketing years. The spread structure shows a market carry throughout each of the crop years in 2009–2010 and 2010–2011. An increasing

basis trend is particularly evident for the 2009–2010 crop year (Figure 3), although a flatter basis pattern is shown for the 2010–2011 crop year (Figure 4).



Figure 3: 2009–2010 US Rice Marketing Year

Sources: CRB Bridge futures data; USDA, Agricultural Marketing Service, Rice Market News.

The futures spreads are constructed from CBOT daily settlement futures prices measured on a weekly basis through the crop year. The spreads represent the dollar per hundredweight difference in price between the two nearest to maturity futures prices measured at rollover dates (i.e., at the point in time that a hedger would roll/spread or substitute the nearest to delivery futures contract for the next delivery month). This roll time is assumed to occur at the time the calendar month coincides with the futures delivery month. For example, in the first week of November, calendar time futures spreads are measured between January and November futures prices. This price difference (January futures price - November futures price) is shown as the first spread line on the charts in Figures 3 and 4. Weekly basis levels are measured as the dollar per hundredweight price difference between the USDA average farm price received for all rice varieties and across all states and the nearby or nearest to delivery futures contract month. Note that since the futures contract is based on long-grain rice, and delivery locations are specific to Arkansas, the USDA cash price series will not correlate as well and will have a wider basis to futures compared with the Arkansas elevator cash price bids. This may explain in part the flatter and wider basis pattern (i.e., where the basis trend does not follow the spread structure) observed for the 2010–2011 crop year (Figure 4). Unfortunately, historical price data are not available for the Arkansas elevator cash price bids, which I surmise would better track the market spread structure.



Figure 4: 2010–2011 US Rice Marketing Year

Sources: CRB Bridge futures data; USDA, Agricultural Marketing Service, Rice Market News.

In Figures 3 and 4, the spreads (short horizontal lines) and the basis (continuous jagged line) are measured in dollars/cwt or hundredweight. The first short horizontal line in both figures represents November futures; the second short line represents January futures, etc.

This tendency for the US rice market to follow this carry market structure is also confirmed in Figure 5, which shows average futures spreads for the crop marketing years from 2004–2005 to 2010–20011. The average spreads are positive for all months except July–September, indicating that, on average, the rice futures market compensates merchandisers for storing in a systematic way over time. The average negative July–September spread is characteristic of all US grain markets which have a tendency to invert at the end of the crop year in anticipation of the forthcoming harvest. Note that the July–September spread has a wide 95% confidence band, which shows the greater market uncertainty (price volatility) that takes place as markets transition from one crop year to the next. This feature is also characteristic of all US grain markets. Simpson and McKenzie (2010) show that the basis movements in US corn markets are more predictable than cash or future price movements, that basis trading yields systematic positive returns to storage in US corn markets, and that the basis returns to storage are less risky than unhedged cash returns in US corn markets.

In sum, the main lessons to be learned from the US rice futures contract are that it was designed to serve the marketing needs of merchandisers—the primary users/hedgers—and that it performs this role by providing merchandisers with returns to storage. However, the contract is widely regarded as very much a domestic US contract with limited hedging potential for international (non-US) firms.



Figure 5: Average Rice Futures Spreads 2004–2005 to 2010–2011 Rice Marketing Years

Source: CRB Bridge futures data.

#### 3.5. Lessons from AFET Rice Futures Contracts

The Agricultural Futures Exchange of Thailand (AFET) was established in 1999 and has since launched two future contracts for white rice and one for Hom Mali rice. The first white rice futures contract for AFET BWR5 5% began trading in March 2007. The contract was based on standard Ministry of Commerce 5% white rice and traded in units of 15 metric tons. However, as can be seen from Figures 6 and 7, the AFET BWR5 5% milled white rice contract failed to attract enough trading volume and open interest to make it viable.

In fact, much of the trading was actually generated by the Thai Ministry of Commerce with its use of AFET as a vehicle for releasing Public Warehouse Organization (PWO) rice stocks. For example, the large spike in volume and open interest that occurred in September 2009 was due to the release of some 0.9 million tons of PWO rice using AFET rice futures contracts. Although such government actions are a way to inject temporary liquidity into the futures market, it probably had a negative long-term impact on AFET by casting doubt in the minds of private traders on the independence of AFET from government influence.

A second attempt at introducing a 5% white rice futures contract occurred in April 2011 with the launch of the WRF5 5% white rice FOB contract. This contract was designed to attract greater interest from exporters and the contract size was increased to 50 metric tons. However, this contract, like its predecessor, failed to generate enough trading interest.



Figure 6: Daily Trading Volume of AFET BWR5 Rice Futures Contract

Source: AFET data.





Source: AFET data.

A number of lessons can be learned from the AFET futures contracts. First and foremost, government involvement in the underlying cash market should be kept to a minimum—price distorting policies are not conducive to the successful development of a futures contract. This was highlighted by concerns about Thai government intervention in Thai rice markets during the life of AFET contracts, which representatives of Thai exporters, international trading houses, and the Singapore exchanges expressed during interviews. These representatives made it very clear that they believed the forthcoming introduction of the Thai paddy rice pledging program on 7 October 2011 would extinguish any remaining hope of success for the AFET FOB 5% white rice futures contract. Under the program, it is anticipated that prices will not fluctuate, hence removing any need for millers and exporters to hedge and removing any incentive for speculators to trade. It is probably worth emphasizing that the futures markets can thrive in the presence of government-imposed price supports and ceilings, as long as free market forces are allowed to determine prices within the government-imposed price bands, and that the bands are set at wide enough levels.

Secondly, in terms of contract specifications, the appropriateness of delivery terms with respect to the BWR5 contract and the frequency of contract delivery periods could be questioned. It is imperative to make sure that contract specifications are written with the needs of potential hedgers in mind. However, AFET representatives acknowledged that the BWR5 contract was poorly designed to meet the delivery needs of hedgers. Although the delivery terms of the second WRF5 FOB contract were better specified, history shows that exchanges often only have one chance at launching a successful contract and that it is vitally important to get specifications right the first time.

In addition, it is somewhat unusual to see futures contract maturity dates set for every month in the calendar year—as is the case for the 5% white rice futures contracts. Both the CBOT and Zhengzhou contracts have only 6 delivery months: January, March, May, July, September, and November. Given that each delivery month in effect represents a different futures contract, it is difficult to generate enough trading volume in multiple contracts offered for every month of the year.

The issue of contract delivery months raises an important question in terms of the basic structure of the Thai rice industry compared with the US rice industry, and how the price risk/basis trading/storage benefits bestowed by the US rice futures market may not be as readily transferable to Thai rice markets. Dawe et al. (2008) note that Thai rice production is less seasonal than rice production in the Philippines because of multiple harvests and greater exposure and integration with world market prices. Given these marketing conditions, which as Dawe et al. point out result in a cropping system that resembles continuous factory production, it is understandable why AFET based its contracts on continuous delivery (every month). These factors result in short storage periods for rice of 1-2 months following harvest and reduced seasonality in farmgate paddy prices. Also, at other levels of the marketing system (i.e., wholesale and export levels), ownership of rice is for relatively short periods, reducing price risk exposure and the ability to benefit from trends in the basis. Thus, in this marketing environment, market agents are less able to take advantage of the main economic benefit of futures markets-basis trading-which is enjoyed by US rice merchandisers. Shepherd (2011) comments that Thai exporters are forced to store rice between the two main harvests so that they can blend the higher quality first harvest rice with the lower quality second harvest rice. If returns to storage are not possible during this period, this practice is costly and inefficient.

As Peck (1985) notes, basis trading—she refers to it as arbitrage hedging—is by far the most common usage of futures markets by commercial agricultural firms. She continues to note that a

less common usage of futures contracts relates to operational hedging, whereby US commercial firms take advantage of the greater liquidity afforded by commodity futures markets over commodity cash markets to price contracts for the future physical purchase or sale of commodities. For example, a contractual obligation to buy corn in 2 months time can be accomplished by buying corn futures today (fixing the purchase price of corn without pushing up the price of cash corn) and providing the firm with time to accumulate the specific type and quality of corn needed from cash markets over the 2 month period. This form of operational hedging could be used by rice exporters and international trading houses, but the extent to which the benefits of basis trading could be enjoyed by such firms is less obvious. The extent to which basis trading could be used in Thailand, or other ASEAN domestic rice markets, or in the international/regional rice market would require further research.

#### 3.6. Lessons from Zhengzhou Rice Futures Contract

The first 2 years of the Zhengzhou early rice futures contract have seen large changes in trading volume and open interest. As can be seen in Figure 8, the contract attracted much attention toward the end of 2010, but trading volume dropped precipitously thereafter. A likely reason for this fall in trading interest was the fact that the Zhengzhou Exchange implemented regulations that made it difficult to speculate in Chinese futures by increasing the margin requirements for the nearby contract. This regulatory change is related to fears of excessive speculation driving up prices and market manipulation (corners and squeezes) in futures and cash markets as contract months reach maturity times. In a similar vein, and with similar motivations and concerns, recent US legislation has given the US Commodity Futures Trading Commission the power to implement a futures position limits rule, which would cap the number of futures contracts a trader can hold on 28 commodities, including rice, corn, and soybeans.



Figure 8: World Long-Grain Rough Rice Prices (\$/cwt)

Source: Hamilton, FirstGrain Inc. (2011).

These fears also possibly stem from a series of speculative trading abuses on newly created Chinese futures exchanges during the 1990s, which eventually resulted in tighter trading regulations and huge reduction in the number of exchanges licensed to trade. The Zhengzhou Exchange's mung bean contract, which registered the highest trading volumes on the exchange in the late 1990s, was itself the subject of manipulation attempts in January 1999. The manipulation attempt resulted in a cessation of trading in the contract for a month. Again, in late November, the Zhengzhou Exchange believed another mung bean manipulation attempt was imminent, and margin requirements were raised to discourage unwanted speculation. Following these tighter capital restrictions, trading volume in the mung bean contract dropped precipitously during 1999–2000. Irrespective of whether the concerns were legitimate, this does provide us with a good example of the effects of increased regulations on trading volume.

In an article, Oryza provides an interesting comparison between the Zhengzhou and Chicago long-grain rice futures contracts (Oryza 2011). As of August 2011, Oryza noted that the Zhengzhou contracts represented about 1 million tons of rice compared with about 1.6 million tons of rice for Chicago contracts. Figure 9 shows a price comparison between the two contracts over the last 2 years. To make a fair comparison, Oryza converted Zhengzhou rice futures prices into dollars using the daily exchange rate for the Chinese currency during the last 2 years. The graph shows that the two contracts are for two very different products, and prices can show little correlation over certain time periods. The Oryza article also points out that "outstanding Chicago rough rice futures represent about 10% of the US long-grain crop while outstanding Chinese rice futures represent about half a percent of the Chinese long-grain crop." Thus, in relative terms, the Chinese contract represents a very small percentage of its domestic cash market.



**Figure 9: Chicago Rice Futures–Zhengzhou Rice Futures** (Left axis: prices in US dollar per metric ton | Right axis: US dollar per 100 pounds)

Source: Oryza (2011).

In practical terms, it is hard to draw many lessons from the Zhengzhou early rice futures contract as it is somewhat unique when compared to traditional Chicago-type contracts. The Zhengzhou contract is specifically designed for domestic Chinese use, and the proportion of the

contract traded for purely speculative purposes as opposed to hedging purposes is unknown (official statistics on the breakdown of user groups are not available).

Discussions with international trading houses and Singapore Exchange representatives revealed that major trading houses such as Louis Dreyfus and even banks like J. P. Morgan, which are able to trade futures contracts onshore in the People's Republic of China, have thus far not done so in any significant way. This is due to several reasons: (i) too much speculative trade in some contracts has resulted in volatile futures prices that do not reflect underlying physical cash markets; (ii) it is too difficult for international firms to take physical deliveries on the futures contract; (iii) international firms have limited opportunities to repatriate the renminbi outside of the PRC; thus, the exposure that international firms take in Chinese futures contracts is limited to the amount of renminbi that they have access to on a daily basis; and (iv) specifically with respect to the Zhengzhou rice futures contract, prices are not well correlated with other Asian rice prices—leaving significant basis risk. For example, Thai rice exporters normally trade 5% to 25% white rice and fragrant rice for direct human consumption, while the underlying Zhengzhou rice is further processed into rice noodles—making price correlation unlikely.

In sum, the Zhengzhou rice futures contract is very much a domestic Chinese contract with substantial basis risk for international (non-Chinese) firms to use for hedging purposes.

# 3.7. Is Speculation in Commodity Futures Contracts Responsible for Higher and More Volatile Cash Grain Prices?

The question of whether speculative forces in commodity futures markets are responsible for higher and more volatile cash grain prices is pertinent to the development of an ASEAN rice futures contract. If speculation in commodity futures contracts actually destabilizes cash markets and leads to greater price volatility, then the social welfare costs associated with such contracts would likely be greater than the social welfare benefits of price discovery and risk management. If this were the case, it would be necessary for governments and exchanges to impose rules and regulations limiting speculation in commodity futures markets. On the other hand, if commodity futures speculation has no detrimental effect on cash market price discovery and risk management role of futures markets. Such legislation, based on the fear that excessive speculation in commodity futures markets causes higher and more volatile prices, has in fact recently been approved in the US to cap the size of futures positions that any one trader can take.

Over the last several years, the effects of speculation, index funds, and the financialization of commodity futures markets are topics that have received much attention in the literature. In particular, the issue of whether speculative forces created a "pricing bubble," whereby futures and cash markets became separated from market supply and demand fundamentals, has been widely discussed in academic and government circles. Irwin and Sanders (2011) present an excellent review of this literature. They conclude that no systematic direct causal link has been proven empirically between increased speculative futures trading or index trading, and futures or cash price movements. Studies that have claimed to have found such a causal relationship can be criticized in terms of their data and methodology. Setting aside the empirical evidence, I am not aware of any academic study that is able to explain the actual economic mechanism by which futures trading by index funds is able to influence cash market price movements. The only way for futures speculators to profit (illegally) from cash price movements is for the speculators to accumulate large cash positions and to corner and squeeze the market at delivery time.

However, the accumulation of such cash positions by index funds has not been observed in any of the commodity markets.

The only way that I would consider it possible for futures prices to influence cash prices is through changes in price expectations. In this case, I would concede that irrational "bubble like" spikes in commodity futures prices could theoretically influence and drive up speculative price expectations in cash markets. However, I would argue that past literature has generally found a consensus that commodity futures markets are efficient—not irrational—and that the observed price spikes in futures markets in recent years reflect market price expectations based on market fundamentals. Of course, with respect to rice, it has been argued that speculative forces in cash markets—in the absence of futures markets—fuelled higher cash prices.

Undoubtedly, higher levels of speculative commodity futures trading coincided with a period of higher and more volatile cash prices, but we should be reminded of the statistical fact that correlation does not imply causation. Higher volatility attracts speculative interest as it provides the potential for greater returns as well as greater risk. Thus, it is not surprising that through history, increased speculative activity and higher price volatility are observed together.

#### 3.9. Role of Government

ASEAN governments have devoted much resources to increasing rice production efficiency. In fact, in light of the recent 2008 rice price crisis, self-sufficiency at all costs appears to be a priority goal for net importing countries like the Philippines. However, policies to encourage the development of private market storage and supply chain links have largely been neglected. An overriding goal has been to protect rice farmers from cheap imports. However, this goal is incompatible with the objective of also providing cheap rice to domestic consumers. The somewhat schizophrenic role played by governments has led to market price distortions and inefficiencies throughout the marketing section of ASEAN countries. In my opinion, market-oriented tools, with the increased involvement of the private sector, are necessary for economic growth within the rice industry across ASEAN countries. Futures markets would play one key role in this development. Importantly, the success of a rice futures contract would at least in part depend upon other market improvements in terms of storage facilities, transportation infrastructure, and better market integration between the farm and the retail consumer. The futures market will only be used for hedging purposes if there is deemed to be a need. In other words, market participants, including farmers, grain handlers, exporters, and merchandisers, must believe that the futures market is a useful tool to hedge price risk and to facilitate storage and trade.

In sum, futures markets as the bastions of unfettered capitalism are not well suited to marketing systems characterized by high levels of government intervention. To a large degree, futures markets and government price stabilization programs are substitutes, not complements. Carlton (1984) states that if the equilibrium price is heavily influenced by government regulations or controlled by one firm, the likelihood of finding a futures market decreases. The implication being that, government policy that limits price variation removes the need or demand for futures.

Government programs come at a cost to society—these take economic resources and create market distortions, diverting resources away from more productive uses. In my opinion, the best way forward is for governments to increase regional cooperation on rice trade policies, and to provide an economic environment designed to encourage and stimulate private market firms— both domestic and international—to merchandise rice. Government agencies have an important part to play in ensuring grading standards and quality for different rice varieties. Also,

governments should seek to improve basic transportation infrastructure to make markets more accessible and efficient. Another critical role of governments in the rice marketing system is the documentation, publication, and dissemination of rice market information on price and production data. Increased rice cash market transparency would aid in improving market efficiency.

However, it would be unrealistic and naïve to expect ASEAN countries to abandon existing government rice programs and policies overnight in favor of free trade. Indeed, in the short term, such a policy shift would result in legitimate food security issues. In this context, the development and potential economic benefits of an Asian-based rice futures contract could be seen as taking place in a series of stages. The first stage would target hedging needs of international rice traders. If private exporters and importers across the ASEAN region are allowed to trade rice free of government restrictions, both government and private rice trade could possibly coexist, and both sectors could use a rice futures market for hedging purposes. If the politics could be taken out of Asian rice markets, and government intervention reduced over time, a rice futures market could play an important role in helping food security through greater economic growth—of course, that is a big if.

A rice futures contract could be part of the solution to provide greater food security and increase regional economic growth. However, its benefits and likely success would depend upon the existence of other factors. The creation of an international rice futures contract could complement policies designed to create freer regional trade. Contract success would depend upon the removal of uncertainty with respect to government trade and stabilization policies.

#### 3.10. Policy Conditions Needed to Create a Successful Asian Rice Futures Contract

In spite of the many factors that make the launch of a successful ASEAN-based rice futures contract unlikely in the short run, a number of policies could help facilitate its development in the long run. Such policies should be designed to promote the following conditions:

- Create an economic environment in which the private sector can play a more active role in both the domestic and the regional/international rice marketing systems.
- Increase regional cooperation on rice trade policies.
- Improve harmonization of rice quality and grading standards. Warehouse receipts and grading standards should replace the system of visual inspections.
- Improve basic transportation infrastructure and pursue policies to increase investment in private storage facilities and to facilitate better access to credit.
- Create an independent institution to document, publish, and disseminate rice market information on price and production data. The AFSRB could assume this responsibility.
- Ensure an adequate regulatory framework exists to police futures exchanges.
- Provide adequate sources of credit and financing to potential hedgers.
- Provide educational support for potential hedgers and government trade and commerce officials.
- Survey potential industry users to determine the optimal contract specifications. Numerous studies have found the success of futures contracts to be highly dependent upon contract specifications (Working 1954; Gray 1960; Thompson et al. 1996).
- With respect to the development of domestic rice futures contracts and exchanges, the marketing role of cooperatives should be developed. Specifically, polices should target

improving marketing education and providing access to affordable credit. Educational materials and courses about the US futures markets, grain merchandising, and hedging and basis trading are available at the Chicago Mercantile Exchange website. In addition, the University of Arkansas offers a unique online course in grain elevator basis trading.<sup>3</sup>

- Create a regional forum in which private traders, exchange members, and government trade and commerce officials across the region can discuss policies needed to promote a trading environment conducive to futures contract development. This forum could also consider alternative risk management tools such as swaps, and conduct and fund further research with respect to potential hedging effectiveness. Again, the AFSRB could assume the responsibility for such a forum.
- The introduction of mandatory price reporting, akin to legislation introduced in the US in 1999 to increase price transparency in the US livestock industry, could be considered as a possible regional policy option. The impetus behind the US legislation came from the public policy concern that concentration in US wholesale livestock markets had led to abuses of market power in terms of short-term pricing and a lack of price transparency.

This Livestock Mandatory Price Reporting Act requires the USDA to collect price and volume information on cattle, swine, and lamb transactions, and to provide the information in a format that can be readily understood by producers. For example, the act requires beef processing plants with an annual slaughter of over 125,000 heads to report fed cattle purchase prices and transaction quantities twice daily to the USDA's Agricultural Marketing Service. Prior to the act, all price reporting to the USDA was purely voluntary (Cai, Stiegert, and Koontz 2011). In addition, the 2008 US Farm Bill directed the USDA to improve its website for providing information required by the 1999 mandatory pricing act. The new USDA website, called the Cattle Dashboard, provides cattle marketing information for different regions and states of the US.<sup>4</sup>

Similar legislation for ASEAN rice markets could help to remove the asymmetric information advantage of trading houses and open up the market to new players for increasing competition. Without the informational advantage currently enjoyed by trading houses, there would likely be greater interest on their part to actively participate in and support a regional rice futures exchange. Of course, the potential benefits of such a policy would have to be carefully weighed against the increased burden of reporting costs that would face the private sector. Along these same lines, price transparency in government-to-government transactions would also be beneficial. Also, any type of mandatory price reporting legislation would have to be negotiated and implemented as a regional policy, not on a country-by-country basis, to avoid putting any one country's marketing system at a competitive disadvantage.

Also, it should be emphasized that according to Cai, Stiegert, and Koontz (2011), several studies (e.g., Wachenheim and Devuyst 2001; Azzam 2003; Njoroge 2003; Njoroge et al. 2007) have argued that greater price transparency in US livestock wholesale markets may facilitate coordination among beef packers and actually reduce competition.

• Along the lines of price discovery, there is a need to spend resources on developing a cash price index for the ASEAN region. This would be a good first step to a futures market.

<sup>&</sup>lt;sup>3</sup> Chicago Mercantile Exchange website: http://www.cmegroup.com/. University of Arkansas online course: http://globalcampus .uark.edu/Distance\_Education/Grain\_Basis\_Trading/index.html

<sup>&</sup>lt;sup>4</sup> United States Department of Agriculture–Agricultural Marketing Service. Direct Slaughter Cattle Reporting Dashboard. http://mpr.datamart.ams.usda.gov/amsdashboard/cattle/Cattle\_Dashboard\_Option\_1.html

## 4. Concluding Comments

- Economic benefits. The general consensus among potential exchanges (SMX and SGX), existing exchanges (AFET and ZCE), Thai Rice Exporters Association members, and international trading houses is that an ASEAN-based rice futures contract would provide two important economic benefits to the market: price discovery and price risk management. ASEAN rice markets are currently opaque and a futures contract could help increase market price transparency, which would aid all market participants in marketing and production decisions. Representatives of the international trading houses who were interviewed confirmed the hedging need for a liquid rice futures contract.
- Limitations of futures markets. Futures markets have a limited role in stabilizing prices across multiple years or seasons. In effect, they reflect current and expected future supply and demand conditions, and if those conditions result in higher or more volatile cash prices, futures prices will also be higher and more volatile. In this sense, futures markets are not a panacea for removing all market price volatility.
- Current feasibility of developing a rice futures contract. I would argue that current cash market characteristics are not conducive to the development of a successful rice futures contract at either the domestic or regional level. Exchange and international trading house representatives confirmed this opinion, highlighting government intervention, lack of quality and grading standardization, and the limited size of private trade as major obstacles to contract development.

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#### Prefeasibility Study of an ASEAN Rice Futures Market

In this paper, Andrew McKenzie looks into the economic benefits and limitations of rice futures market in stabilizing prices across multiple years or seasons. He identifies several important cash market characteristics needed to promote the success of a futures contract, namely, adequate cash price volatility, a large competitive and well-defined underlying cash market that lends itself to standardization, minimal government intervention in the underlying cash market, and free flow of public information. The paper concludes that the current cash market characteristics in the ASEAN region are not conducive to the development of a successful rice futures contract at either domestic or regional level.

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