# PRICING AND MARGINING OF AGRICULTURAL COMMODITY FUTURES: THE CASE OF TURKEY

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## ABSTRACT

The price of some agricultural products are volatile in Turkey. Commodity futures can be used to avoid volatility. With the use of simple pricing and margining, commodity futures can be recognised and more commonly preferred. On the other hand some cities are focused on the production of some certain agricultural products. Somehow, these cities can own a commodity exchange market and a futures clearinghouse. The synergy which is expected to arise between these institutions can support the improvement of agriculture.

**Keywords:** Agricultural products, commodity futures, futures clearinghouse.

## TÜRKİYE'DE TARIM EMTİA FUTURES FİYATLAMASI VE MARJİN BELİRLENMESİ

## ÖZ

Türkiye'de bazı tarım ürünlerinin fiyatları oldukça volatildir. Emtia futures volatiliteden kaçınmak için kullanılabilir. Basit fiyatlama ve marjin belirleme yöntemleri ile, emtia futures daha fazla tanınabilir ve daha fazla tercih edilebilir. Diğer taraftan bazı şehirler belirli tarım ürünlerinin üretiminde uzmanlaşmışlardır. Bu şehirler bir ticaret borsasına ve futures borsasına sahip olabilirler. Bu iki kurum arasında ortaya çıkması beklenen sinerji, tarımın gelişmesine destek olabilir.

**Anahtar kelimeler:** Tarım ürünleri, emtia futures, futures borsası.

## I. INTRODUCTION

The production of agricultural products needs to be protected. This protection can be provided by the futures. Futures and futures options are the derivatives which can provide the necessary hedging. Commodities can be subject for the use of these derivatives.

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The most important reason of the volatility of the agricultural product prices, is the share of Turkish production. Turkey has a significant production share of the several agricultural products. The unsystematic production which is mostly dependent to the decision of the farmers, increases volatility. The expectations and the factors that affect the expectations such as the prices of the recent years, are able to have a great impact on the size of the production.

The agricultural organizations are not strong enough to protect the farmers. The agricultural insurance is supported by the government, but it is still not frequently preferred by the farmers yet. On the other hand any insurance is not an option for the farmers to hedge themselves from the price volatility.

There has been a great demand for derivative instruments using operational contingencies embedded in delivery contracts. But the use of derivatives is not spreaded in Turkey. The commodity futures are not also recognized by the farmers. To encourage this use, simple methods of margining and pricing can be used. Simplicity can increase the demand. Because it will be easier to understand and embrace simple methods.

In recent years, commodity markets have experienced a dramatic growth in trading volume, the variety of contracts and underlying commodities. However it is not something new for many companies. Australia has been using futures markets for years. The Sydney Futures Exchange (SFE).commenced operations on 11 May 1960 as the Sydney Greasy Wool Exchange. The success of Australia on agriculture can be correlated with the strong structure of the futures markets.

New futures clearinghouses can be established in Turkey if the use of futures is widespread. Futures clearinghouses promote the liquidity of their associated futures markets by guaranteeing performance on the open futures positions of firms which are members of the clearinghouse (Shanker and Balakrishnan, 2006). In other words, if one party defaults, the exchange clearinghouse must fulfill the contract instead (Chiu et al, 2006). Therefore, the exchange clearinghouse sets margin requirements for both parties to guarantee futures contracts performed.

New futures markets and clearinghouses mean new financial markets. The volume of the financial markets can also increase and the capital which is necessary for the improvement of the economy can be provided with the rise of the new financial markets like futures market.

## II. COMMODITY FUTURES

The margining and the pricing of the futures are prepared as simple as possible in VOB, which is the only futures clearinghouse of Turkey, together with the options exchange market. The initial and maintenance margins of the commodity futures are fixed. The fixed margins are prepared on the behalf of the clearinghouse owners. The demand for futures is not high enough to provide a growth on the futures markets. The limited volume of the futures markets increases the risk.

The wheat contracts can be elaborated as a sample of commodity futures. The size of the contract is 5.000 kg. The minimum price offer for this contract is 2,5 TL. Initial margin is

240 TL and the maintenance margin is 180 TL. 10.000 contracts are fixed and the positions which are over 10.000 are limited with the %10 of the open positions. The conditions are also similar for the cotton contracts, margin amounts are the same.

New commodity futures on agricultural products are planned by VOB. Especially commodity futures on oil, such as olive oil is expected to be issued. This intention is obviously explained by VOB on the related web site. Not only commodity futures on oil, but also new commodity futures can be issued only with adequate demand of the investors.

### III. MARGINING

There are two types of margin transactions that are currently practiced in Japan; the first is negotiation based margin trading and the second is standardized margin trading (Hirose, Kato and Bremer, 2009). Negotiation margin transactions are usually between large financial institutions. The terms and fees are freely negotiated.

The standardized margin trading is used in Turkey. But for some agricultural commodity futures, negotiation margin can be used. The use of negotiation margin is a result of demand of the both sides. Therefore this method can increase the volume of the transactions. The institutions can take their own risk and they may try to encourage the production of the agricultural products.

The high amounts of production can be made after making agreement with huge corporations. The negotiation margins can be opportunities of big sized agreements.

### IV. FUTURES PRICING

The most usual futures pricing model is cost of carry. Arbitrage assumption is not involved in the carrying costs involved in holding an underlying asset until maturity. Currency futures contracts are contracts in which the underlying asset is a foreign currency, and the carrying costs are essentially domestic and foreign risk-free rates of interest (Sequeiraa, McAleer and Chow, 1999).

Under a no-arbitrage argument, the futures prices of foreign exchange currency futures are derived by Amin and Jarrow (1991) within the framework of Heath, Jarrow and Morton (1992). These prices are shown below:

$$F_{t+k/t} = S_t \cdot \frac{P^f_{t+k/t}}{P^d_{t+k/t}} \cdot \exp\theta_{t+k/t} \qquad (1)$$

$S_t$ is the costs which arises before or after the trade of the futures. Here $P^f_{t+k/t}$ is equal to $-kr^f_{t+k/t}$, just like $P^d_{t+k/t}$ is equal to $-kr^d_{t+k/t}$. $r^f_{t+k/t}$ represents the foreign k-period interest rate at time t, and $r^d_{t+k/t}$ represents the domestic k-period interest rate at time t, and $\exp\theta_{t+k/t}$ represents an adjustment term for the marking-to-market feature of futures markets contracts. Marking-to-market term depends on the volatilities of the interest rate and spot processes, as

**AKADEMİK BAKIŞ DERGİSİ**
**Sayı: 35      Mart – Nisan 2013**
**Uluslararası Hakemli Sosyal Bilimler E-Dergisi**
ISSN:1694-528X İktisat ve Girişimcilik Üniversitesi, Türk Dünyası
Kırgız – Türk Sosyal Bilimler Enstitüsü, Celalabat – KIRGIZİSTAN
http://www.akademikbakis.org

well as the forecast time horizons, and decreases to zero as k goes to zero (Brenner and Kroner, 1995). For the commodity futures, $P^S_{t+k/t}$ can be used instead of $P^d_{t+k/t}$. Because the foreign interest rates are not necesary to take into account. $P^S_{t+k/t}$ represents the spot prices, the k-period spot prices at time t. The use of classical cost of carry model can be preferred in Turkey. Because it is easy to understand and seems to be reflecting the expected results. The appropriate pricing for the commodity futures can be seen on equation 2.

$$F_{t+k/t} = S_t . \frac{P^S_{t+k/t}}{P^d_{t+k/t}} . \exp\theta_{t+k/t} \qquad (2)$$

Asay (1982) and Lieu (1990) have derived a pricing model for futures options that are subject to futures style margining. The assumptions used in deriving the model are similar to those of Black (1976). The underlying futures price is assumed to be log-normally distributed, markets are assumed to be frictionless with trading taking place continuously, and the short term interest rate is assumed to be known with certainty (Brown and Taylor, 1997).

The call premium, *C*, for a European option on the underlying futures, *F*, satisfies

$$C = FN(d_1) - XN(d_2) \qquad (3)$$

Where

$$d_1 = \frac{\ln(F/X) + (1/2)q^2 t}{q\sqrt{t}} \qquad (4)$$

$$d_1 = d_2 - q\sqrt{t}$$

F = futures price; X = exercise price; C = call price; t = time to maturity; q = instantaneous volatility.

The put premium, with the other variables above, P is given by

$$P = XN(-d_2) - FN(-d_1) \qquad (5)$$

The model given by equations 4 and 5 is similar to Black's (1976) model for pricing options on commodity futures, the difference being the absence of the interest rate term in the equations above.

## V. CONCLUSION

Increasing food demand will keep the price of agricultural products rising. The need for hedging will be increasing. 2008 crisis has shown that the price of agricultural products can arise sharp rises. The need for hedging will become more important and the agricultural commodity futures will be major concern of the main producer countries like Turkey.

Some agricultural products such as hazelnut, chestnut and apricot can be hedged by commodity futures. In some certain cities -like Ordu, Trabzon- the hazelnut production is very high. Production of Ordu forms almost %30 of the Turkish hazelnut production and it is almost equal to %15 of the world production at least (Deniz, 2009). It is similar for the chestnut production of Aydın. Chestnut production of Aydın is almost %14 of the world hazelnut production (Subaşı, 2004). World apricot production was 3.473.710 in 2008 (FAO, 2010), 362.873 tons of apricot was produced in Malatya in the same year (TÜİK, 2010).

The futures clearinghouses can be established to these cities. The existing commodity exchange markets can colloborate with these clearinghouses. These colloborations can increase the quality of the products and the speed of the transactions. The synergy which is expected to come out with these cooperation will support the development of both agricultural industry and financial sector.

The future margins are fixed and the margining system is very simple in Turkey. This is not an efficient use of the leverage factor of the futures. Simple margining is not suitable for a successful risk management. The complicated margin systems like SPAN can be used in time.

The future pricing methods are variable. To determine the theoretical price of the futures, the investors can use any pricing methods. The differences between spot prices and the futures prices can be volatile at the beginning. The investors can behave manipulative. The futures options can also be used for hedging. The use of futures options can provide coherent prices.

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