Comparative Analysis of Forecasting Performance: Crude Palm Oil Futures vs Expert Opinions

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Introduction

The main economic functions of the futures market are to provide price discovery and risk management facilities. If the market is not efficient, effective transmission of information from one market to another will be impaired, thus the value of the futures market in price discovery and hedging. In the present article we analyze a particular commodity futures market, namely MDEX (Malaysian Derivatives Exchange) crude palm oil futures et al. with comparing expert opinions. The creation of the crude palm oil (CPO) futures market in Malaysia was to fulfill the need for an efficient pricing and hedging mechanism for Malaysia's palm oil. Therefore, the extent to which CPO futures market has served as an efficient center of price discovery and risk management has been the focus of considerable research. In general, debate has centered around the extent of which CPO futures market provide price leadership to cash market and the ability of futures market to predict subsequent spot price in accurate way. Empirical evidence has shown that CPO futures prices performed relative better compared to other forecasting models. However, no comparison is made in forecast accuracy of CPO futures with expert opinion. This approach is unique in the sense that it examines the relative efficiency of ex ante forecasts rather then ex post. The purposes of this study are: firstly, to evaluate the forecast accuracy of the CPO futures market relative to expert prediction. Secondly, to test the relationship between the futures, forward and cash prices, to examine whether these price series have the same properties and relationship in the long run.

Materials and Methods

Using time-series techniques, its possible to estimate the nature of the relationship between two prices. These price series in generally believed to be nonstationary and therefore much of the variability in the results may have had to do with the spurious nature of regressing nonstationary series on each other. In order to overcome this problem, the cointegration technique as proposed by Engle et al. and Granger et al.(1987) could be used. This analysis is carried out in three stages.

Firstly, there is a need to examine for the existence of nonstationary in price series. If the two price series are nonstationary and the presence of unit root in both the price series is confirmed, they are examined then to determine whether they are cointegrated or not. The stationarity of the price series are tested with Phillips et al. and Perron (PP)(1988), and ADF (1979) tests. One the nature of cointegration is established the second step involves measuring the direction of the causality between variable and error correction model can be tested to investigate the forecasting power of CPO futures and forward prices. Engle et al. and Granger et al.(1987) proposed that if a linear combination of two difference time series each is integrated of order one, denoted I (1) is stationary, then the two difference time series are cointegrated, and they expected to move together in long-run.. When both the spot price ($Spt+i$) and the futures price (Fpt, h) are each nonstationary and they require a single difference to make them stationary, their linear combination is also generally I (1). By integrating the concept of cointegration and causality in the Granger et al. sense it is possible to develop a model that allows for the testing of the presence of both a short and long run relationship between the variable Fpt and Spt,. This model is known as the error correction model (ECM) proposed by (Engle et al. and Granger et al., 1987). The ECM model investigates the potential long and short run impact of the variable, Fpt on the variable Spt or vice verse. Lastly a test is carried out to measure the relative accuracy of CPO futures to forward prices as predictor of cash prices. A variety of summary statistics have been computed from futures forecast error (eit+h) to compare with forward forecast error (ejt+h) to evaluate the forecast accuracy of the futures market. The statistics used for comparing economic forecasts are based on mean absolute error (MAE), mean square errors (MSE), mean absolute percentage errors (MAPE), mean percentage errors (MPE), and their variants such as root mean square errors (RMPSE) and root mean percentage errors (RMAPE). Most of these measures involve averaging some function of the difference between actual values and its forecast values. The purpose of an error measure is to provide an informative and clear summary of the distribution, which could be easily comparable. The best forecasting model would be the one that produce the lowest statistical descriptive.

Three types of data have been used for this study. The first data is the daily spot price or cash price of CPO traded in Malaysia. This data can be obtained from the statistical handbook "Palm update" of the Malaysian Palm Oil Board (MPOB). The second is daily forward prices of crude palm oil et al. that can also obtained from various additions of PORLA et al. Update. The third is historical data on CPO futures prices and their settlement prices for trading days in COMMEX, which is available to producers, and trader from their COMMEX WebPages. The CPO futures contracts are traded on the

COMMEX for every month up to five-month ahead and alternative months after up to twelve months ahead. Since more distant futures contracts are usually inactive or untraded, only contract prices up to four months forward has been used in this study. The data are collected over the 10-years period, from January 1989 to December 1999 of the daily prices on last trading day of the each month. The last trading day of the each month was utilized, under the assumption that the latest price would incorporate the latest information and thereby provides the most accurate and up-to-date forecast.

Results and Discussion

The results of ADF and PP tests of stationarity for the levels and first difference of the price series of spot and futures suggest that the null hypothesis of the presence of unit root in price series cannot be rejected and therefore, the spot and futures prices are nonstationary in the level model. But their results on the first differences of spot and each of four futures price series shows that the null hypothesis of unit root is rejected at 5% levels of significance for all trading months. Based on these ADF and PP test results, it can be concluded that the cash and futures prices are integrated of the first order I (1). Similar tests of ADF and PP were applied on the spot and forward price series (one, two and three months ahead) for detection of unit root in price series. The tests indicate that all the prices are integrated of the first order; that is, I(l).

The spot and futures price for the spread of one, two, three and four months were first checked for cointegration. The results suggest that cointegration with rank equal to one($r = 1$) exist between the spot and futures price for spreads to one and two-months. Hence, the one-and two-month spread models are cointegrated with one cointegration vector. Besides, there is a long-run relationship between spot and futures prices series in one and two months ahead while the spot and futures price series more than that spreads and do not have such relationship.

The cointegration tests were repeated on spot and forward prices for the one-month, two-month and three-months ahead. It was found that cointegration with rank equal to one exist between spot and forward prices for spreads of one months and two-months, while there is no such cointegration evidence existing between spot and forward prices with three months ahead.

It can be concluded that the spot and futures up to two months and spot and forward prices up to two months are cointegrated. These finding suggest that futures and forward markets of CPO price discovery are efficient up to two months. Such relationships do not exist for further futures and forward prices of CPO, implying that those series are separately generated and cannot be expected that further futures price provide information for predicting CPO cash prices. The further the distance the period is into the future, the more fluctuations in both spot, forward and futures markets are expected. As such, the shorter the period ahead futures prices may move along the spot price, while the longer the period ahead futures prices may not due to the greater uncertainty.

The results of ECM in futures, forward and cash price series imply a futures market that is working in an efficient manner and one that is providing a forward pricing function up to one and two months spreads. The estimated result indicates that a movement in spot price is causing a correction to the futures price. It was also found that the futures responded faster to a change in the spot price in the one-month than in the two-months spread futures.

In general, the mean square error level of bias is larger in futures compare to forward errors in both one and two-month spreads. The MSE of futures in one-month (F1) and two-month (F2) horizons are 556.32 and 1704.16, respectively, while the MSE of forwards are 331.59 (Fw1) and 1046.78 (fw2), respectively. This indicates that the error bias of futures is nearly 70 per cent over the error of forward price.

Conclusions

A number of studies found that CPO futures prices perform well relative to model forecasts. Given the efficiency and implications of these studies, a relevant issue is whether alternative comparisons yield similar results. One alternative is to compare the accuracy of CPO futures prices and forward prices. This approach is appealing because ex ante futures prices are compared to ex ante forecasts, rather than ex post forecasts. This study compares the forecasting accuracy CPO futures price to PORLA's et al. expert predictions (forward prices). The sample period is the end-of-month trading daily price of the 10-year period beginning in January 1989 and ending with December 1999. This provides a sufficient number of observations to conduct valid statistical tests (Williams et al., 1993). A test developed by Ashley et al., Granger et al., and Schmatensee (1980) is used to assess the significance of differences in forecasting accuracy and cointegration analysis developed by Johansen et al. (1988,1991) to test the long-run relationship between prices series. While there is long-run relationship between futures and cash prices, which implies that the futures market is forecast efficient until one-and two-month spreads for using cointegration analysis, the AGS's test results indicate conflict outcome than former. The forecast accuracy of forward pricing outperforms futures pricing. This suggests that a forecast taken from the futures market is not likely to provide the user the most accurate information. Hence, the results did not support the efficiency of CPO futures pricing. Thus, the CPO producers and traders might be better off to use the forward price to predict subsequent cash prices since it has more accurate information than CPO futures markets.

Benefits from the study

The study provides an understanding of the relationship between physical, forward and futures market of CPO. It also provides some empirical evidence on the relative forecasting efficiency of futures vs expert opinion. The findings of the study are useful for policy analysis and further research on this subject matter.

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