Price Formation in the Salmon Futures Market

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Abstract

The study examines the relationship between salmon spot market prices and up to 12 month maturity futures contract prices. Mixed results are found but in majority of the cases; countintegration relationship is established and unbiasedness hypothesis is found to hold, revealing the presence of risk neutrality and market efficiency. Also, futures contracts tend to lead the spot market. The shorter the futures contract, the higher the volatility and hence the higher would be the risk premium. The evidence points towards a maturing exchange market capable of serving as a price risk management tool.

Introduction

Futures market have been used in the agricultural sector for decades as a price risk management. Extension into the seafood industry has been a challenge. For example:.

- Frozen shrimp futures in 1960s was discontinued due to low trading volumes on the Chicago Mercantile Ex
- Another on the Miami & Grain Ex. discontinued due to lack of interest (Engle & Quargrainie, 2008).
- That of Japan could not achieve global reach.

Comparatively, grains and frozen shrimp are effectively storable/non-perishable commodities. On the contrary, fresh salmon is non-storable non-perishable resource (Ewald, 2013) and perishable. However, the salmon futures exchange has existed for a decade.

The unbiasedness hypothesis requires the restriction of risk neutrality (a = 0) and efficiency (β = 1) and ut to be white noise, Eq.1 is estimated using Johansen (1988) ML approach to avoid spurious results. The term structure of futures volatility is analyzed based on the:

- Samuelson (1965) hypothesis/Maturity Effect: that futures price volatility decreases as the futures contract approaches its expiration date (TTM).
- Bessembinder et al (1995,1996): maturity effect holds in markets that exhibit negative covariance between the spot price changes (Δs) and changes in net carry cost (ΔC).

The following empirical models were estimated:

\[ r_t = \mu + \beta_1 r_{-1} + \beta_2 \Delta S_{-1} + \epsilon_t \]  
\[ \sigma^2 = \alpha_1 + \beta_1 \sigma_{t-1}^2 + \epsilon_t \]  
\[ \Delta C_t = \gamma_1 + \gamma_2 \Delta S_t + \epsilon_t \]  

where \( r_t \) is the futures contract log return for time \( t \), \( \sigma^2 \) is the error term with mean zero and conditional variance \( \sigma_t^2 \), \( c_t \) is the net carry cost: \( c_t = (\ln(F_t) - \ln(S_t))/TTM, TTM \) is the time left to maturity at time \( t \). The hypothesis holds if \( \delta \) and \( \gamma_1 \) are strictly negative and significant.

Data

The spot and futures (ft) contract prices were obtained from the Fish Pool website (www.fishtpool.eu). The data span from 2005 to 2015 and 1 to 12 month maturity futures contracts were included in the analysis. The evolution of prices is shown in figure 1 below.

The summary statistics is shown in figure 2 below:

As observed, the mean and coefficient of variation decreases with increasing futures contract maturity. Imposing that near month contracts are more volatile.

Results

First, all series tested unit root using theADF test and a series of panel unit root test. Following this, the countintegration test of Johansen ML approach is undertaken. The results are presented in Table 1 below:

The parameters: \( \delta \) and \( \gamma_1 \) are statistically significant and negative.

\[ \text{Volatility increases with time to maturity} \]

- Not surprising since Atlantic salmon exhibit short term seasonal cycles as agricultural products.

Conclusion

- The salmon futures market shows a maturing market and is capable of being used as a price risk management tool.
- Long running contracts are less volatile and hence the cost of insurance paid in the form of risk premium will be less in such contracts.

References