

Time-Varying Term Structure of Oil Risk Premia

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A commodity risk premium is defined as the difference between the expected spot price and the futures price for the same maturity. Given that spot market price expectations are not observable, estimating their level and behavior may provide valuable information to market participants. For agents who treat commodities as an asset class it may give insight on investment returns. It may also shed light on some public policy implications since the risk premia is related to some macroeconomic and commodity market variables. Even though the existence of risk premia is generally accepted in the literature, there is no consensus on their magnitude, behavior and appropriate estimation procedure.

We propose a framework for estimating the time-varying commodity risk premia from multi-factor models using futures prices and analysts' forecasts of spot prices. The model is calibrated for oil using a 3-factor stochastic commodity-pricing model with an affine risk premia specification.

Two different data sources are used to estimate the oil risk premia: Futures prices and analysts' forecasts. The estimation period ranges from January 2010 to June 2017 allowing us to capture significant variations in macroeconomic trends. WTI crude oil futures prices are obtained from NYMEX for maturities between 0 to 9 years. Analysts' forecasts are obtained from Bloomberg for short- and medium-term (up to 4 years) data and from the US Energy Information Administration for longer maturities.

From the annualized risk premia term structures obtained three things stand out. First, risk premia varies stochastically through time suggesting the possibility that they could be influenced by some market variables. Second short-term risk premia tend to be higher than long-term risk premia, suggesting that on average investors have higher hedging demands for short-term contracts. Finally, risk premia volatility is much higher for short maturities hinting higher disagreement between market participants for shorter term contract prices.

To understand the stochastic behavior of oil risk premia we chose a set of macroeconomic variables and oil market variables previously used in the literature and test for their explanatory power on the risk premia. We find that oil inventories, hedging pressure, and the bond default premium have a positive and significant effect on the risk premia. Also, the interest rate term premium has a negative effect on the risk premia. Finally, the 5-year Treasury bill shows an unexpected positive effect on the risk premia, which could be due to the extremely low rates prevailing during our sample period, which may affect the way in which interest rates relate to business cycle.

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