

TESTING THE INTERNATIONAL CRUDE OIL MARKET INTEGRATION WITH STRUCTURAL BREAKS

Kentaka Aruga, Ishikawa Prefectural University, Phone: +81-76-227-7410, E-mail: kentaka.aruga@gmail.com

Overview

The recent surge in shale oil production in the US is causing the West Texas Intermediate (WTI) crude oil market to diverge from the international crude oil market. The increased shale oil production in the US is related to the Bakken oil boom in Montana, North Dakota, Saskatchewan, and Manitoba after mid-2000 and this rise in the unconventional oil production is likely affecting the WTI crude oil market to move apart from the international oil market. As seen in Figure 1, the price of WTI crude oil remains at a lower price compared to the Brent crude oil price since late 2011. The WTI and Brent crude oil markets are historically well connected and considered as integrated. However, if this spread between the two markets continue to exist and widens in the future, it can be expected that the inter-relationships between these two markets will become weaker or it could be that the market linkages between these two crude oil markets are on the verge of structural change.

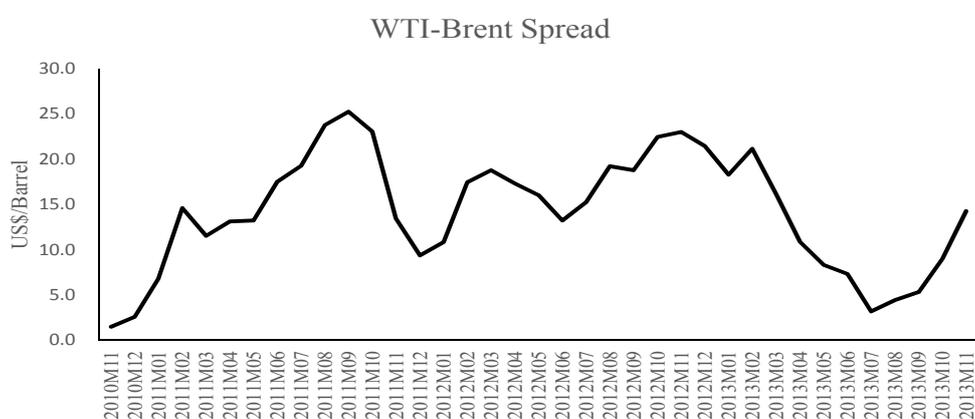


Figure 1 Price difference between WTI and Brent crude oil since Nov. 2011

This study will shed light on this issue and confirm if the WTI crude oil market is still integrated with the international crude oil markets when effects from structural breaks in the WTI crude oil price series are considered. The study analyzes the recent price linkages among the WTI, Brent, and Dubai crude oil markets for this purpose. There are quite a few studies examining the oil price differentials (Fattouh, 2010; Borenstein and Kellogg, 2012; and Buyuksahin et al., 2013) but not many have focused on how such differentials affect the international oil price linkages.

Methods

First, all variables used in this study are tested for their stationarity. This is conducted using the KPSS and Lee-Strazicich (2003) unit root tests with two endogenous breaks. Second, the Bai and Perron (1998) multiple structural break test is conducted on the WTI, Brent, and Dubai crude oil price series to see if structural breaks persist in these markets. Finally Hatemi-J (2008) cointegration with two structural breaks is applied to see whether international price linkages sustain among the WTI, Brent, and Dubai crude oil markets.

Table 1 Hatemi-J cointegration test
Results of modified ADF, Z_t and Z_α cointegration tests.

	Modified ADF	Z_t	Z_α
WTI vs. Brent	-6.682***	-5.943	-60.516
WTI vs. Dubai	-6.638***	-5.774	-57.479
Brent vs. Dubai	-7.039***	-6.986***	-77.139**

*** and ** denote significance at the 1% and 5% levels based on the critical values taken from Hatemi-J (2008).

Results

The results of the unit root tests suggested that all variables are integrated to the first order. The Bai-Perron test identified three potential breaks in the investigated oil price series which indicates that structural breaks contain in the price series. As seen in Table 1, The Hatemi-J cointegration test confirmed that long-run relationships still persist among the international oil markets but the test result implied that price linkages between the WTI and the other markets were weaker compared to the linkage between the Brent and Dubai oil markets.

Conclusions

Although the WTI-Brent spread became apparent since late 2010, our results show that market linkages still hold among the WTI and international crude oil markets. However, our study also revealed that the linkage between the WTI and international oil market is becoming weaker compared to that between the Brent and Dubai oil markets. This might be implying that the recent surge in the shale oil production in the US is affecting the WTI market to move apart from the international oil market. If so, the WTI-Brent spread might not narrow down and it might be that this spread will remain for a while.

References

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