TRADING VOLUME AND CRUDE OIL MARKET EFFICIENCY

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MOTIVATIONS

➢ Trading volume and price relationship suggests whether technical or fundamental analysis should be used in developing trading strategies.

➢ It also help to explain the informational efficiency of the futures market.

➢ Examine whether information regarding trading volume contributes to forecasting the future price in the market.

Data 1: Cushing, OK Crude Oil Future Contract 1 (Dollars per Bar

Volume

OVX
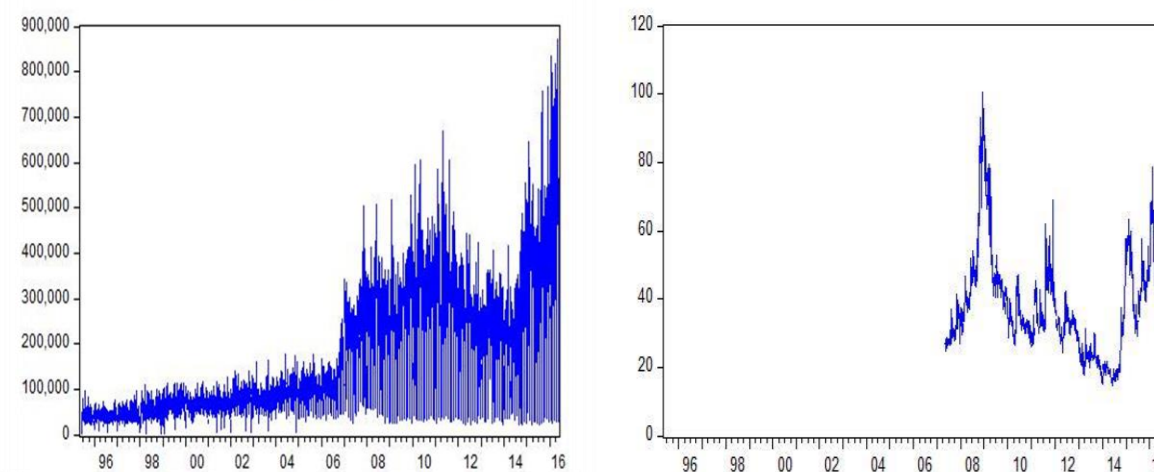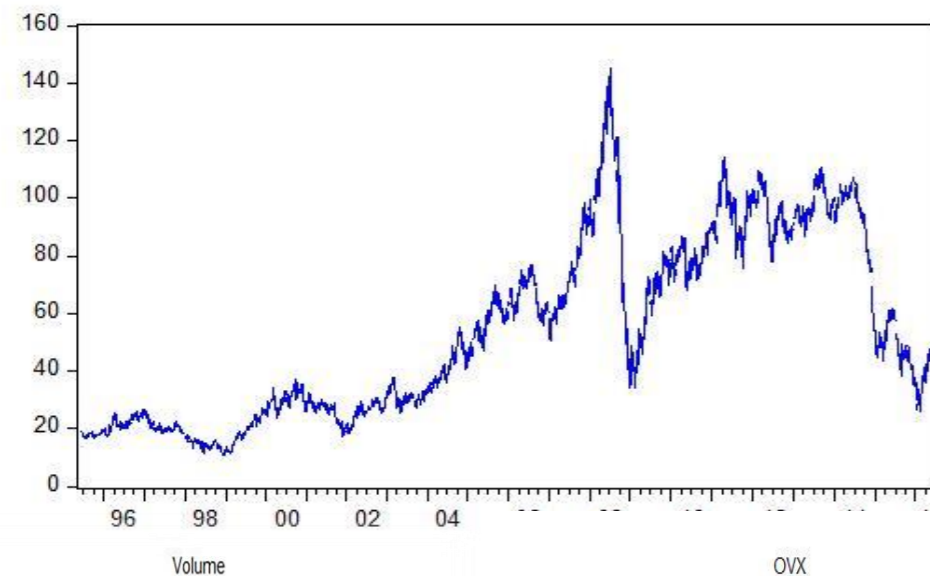
➢ Efficient market hypothesis states that markets utilize all available information instantaneously and reflect it correctly, making abnormal returns impossible while trading on available information.

METHODOLOGY

➢ Unit root test is a necessary condition for random walk process. If the proposition is not satisfied, we can infer that the random walk hypothesis does not true, that is, the oil futures market is not a weak form efficiency market. If the proposition is satisfied, carry on the variance ratio test.

➢ Variance-ratio test VR (q) $=\frac{\delta^2(q)}{\delta^2(1)}$, Where $\delta^2(q)$ is 1/q the variance of the q-differences and $\delta^2(1)$ is the variance of the first differences. A unit variance ratio should be represented by a random time series, there is a positive autocorrelation if a variance ratio that is greater than unity, and negative autocorrelation represented by a variance ratio which is smaller than unity.

➢ Comparing p-value, median of trading volume and oil price volatility index.

MAIN RESULTS

➢ Under variance ratio test with standard error estimates assume no heteroskedasticity, we should accept random walk hypothesis during P2, P3 and P5. Meanwhile, variance ratio value for individual tests during P1 and P4 are more significant from one relatively.

Variance Ratio Test Joint Tests (Standard error estimates assume no heteroskedasticity)				
Null Hypothesis		Max |z|	Wald (Chi-Square)	
	Observations	Value	Probability	Value	Probability
Log Future Price is a random walk	5264	2.648267	0.0320	8.65492	0.0703
Log Period 1 is a random walk	1749	2.184798	0.1107	17.57479	0.0015
Log Period 2 is a random walk	1499	1.516992	0.4252	4.636559	0.3267
Log Period 3 is a random walk	1008	1.458379	0.4649	2.250645	0.6898
Log Period 4 is a random walk	502	2.238521	0.097	9.72757	0.0453
Log Period 5 is a random walk	502	2.07315	0.1441	4.966762	0.2907

Variance Ratio Test Individual Tests (Standard error estimates assume no heteroskedasticity)					
Sample Period	observations	number q of base observation aggregated to form			
		q=2	q=4	q=8	q=16
01/06/1995-01/06/2016	5265	0.978784	0.933087	0.892029	0.844128
		0.1237	0.0095	0.0081	0.0102
01/06/1995-01/06/2002	1750	1.033903	0.951811	0.873627	0.770044
		0.1562	0.2814	0.074	0.0289
01/06/2002-01/06/2008	1500	0.960818	0.962057	0.937046	0.86049
		0.1293	0.4323	0.4099	0.2198
01/06/2008-01/06/2012	1009	0.967288	0.914064	0.871756	0.86084
		0.299	0.1447	0.1687	0.3155
01/06/2012-01/06/2014	503	0.90009	0.914928	0.827722	0.793899
		0.0252	0.3083	0.1919	0.2941
01/06/2014-01/06/2016	502	0.907471	0.881313	0.917647	0.957338
		0.0382	0.1552	0.5328	0.8281

➢ Under variance ratio test with heteroskedasticity robust standard error estimates, we could accept the null hypothesis for entire time period.
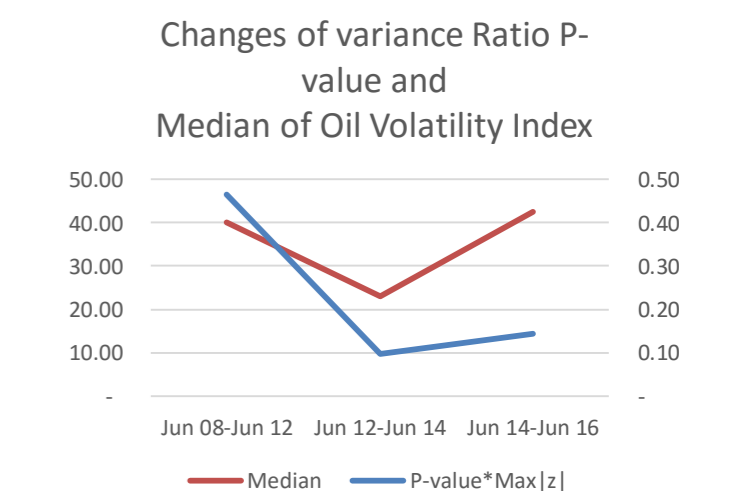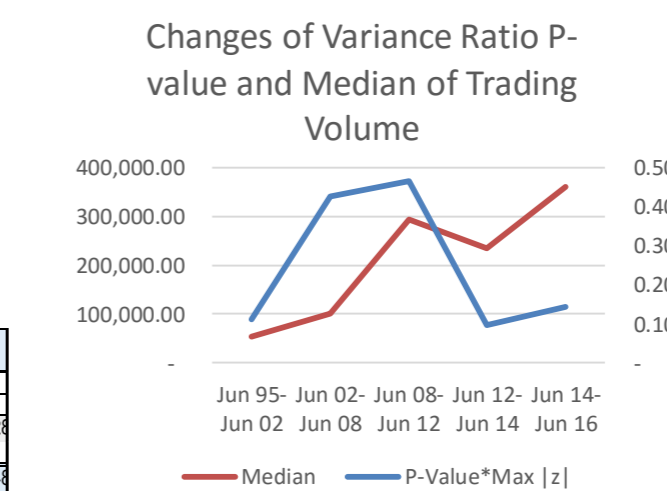
➢ Similarly, we get the same results from individual test that in P2, P3 and P5, variance ratio are more closer to unit.

Variance Ratio Test Joint Tests (Heteroskedasticity robust standard error estimates)		
Null Hypothesis		Max |z|
	Observations	Value	Probability
Log WTI Future Price is a martingale	5264	1.832209	0.159
Log Period 1 is a martingale	1749	1.898024	0.1338
Log Period 2 is a martingale	1499	1.396968	0.3414
Log Period 3 is a martingale	1008	0.923391	0.6674
Log Period 4 is a martingale	502	1.5977	0.238
Log Period 5 is a martingale	502	1.477686	0.2978

Variance Ratio Test Individual Tests (Heteroskedasticity robust standard error estimates)					
Sample Period	observations	number q of base observation aggregated to form			
		q=2	q=4	q=8	q=16
01/06/1995-01/06/2016	5265	0.978784	0.933087	0.892029	0.844128
		0.287	0.0728	0.0674	0.0708
01/06/1995-01/06/2002	1750	1.033903	0.951811	0.873627	0.770044
		0.2796	0.3920	0.1388	0.059
01/06/2002-01/06/2008	1500	0.960818	0.962057	0.937046	0.86049
		0.1558	0.4698	0.4524	0.265
01/06/2008-01/06/2012	1009	0.967288	0.914064	0.871756	0.86084
		0.5044	0.3664	0.4014	0.5356
01/06/2012-01/06/2014	503	0.90009	0.914928	0.827722	0.79389
		0.1186	0.4629	0.3184	0.3898
01/06/2014-01/06/2016	502	0.907471	0.881313	0.917647	0.957338
		0.1424	0.3092	0.6396	0.8676

CONCLUSIONS

➢ The empirical results using the variance ratio test indicate that it is almost a random walk of the WTI crude oil future prices in view of the whole period. We accept the weak form efficient market hypothesis and from the P-value of the variance ratio test

➢ No prediction especially during P2, P3 and P5 because market efficient hypothesis become more powerful.

Changes of Variance Ratio P-value and Median of Trading Volume
Median — P-Value*Max |z|

Changes of variance Ratio P-value and Median of Oil Volatility Index
Median — P-value*Max|z|

➢ Trading volume and oil price volatility index (OVX) have same trend with market efficiency.

➢ During P3 (2008-2012), p-value rapidly declines which may be explained by financial turmoil experienced during this period.

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