Dynamic of financial asset prices: An Econometric analysis done in energy sector

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Abstract: We study the long-run and short-run dynamics of stock prices and exchange rates in energy sector. The exogenous shocks and its impact on these markets are studied with Johansen (1991) co integration test and unit root tests. We apply the unit root test to find out the unity among the market price and shares traded in energy sector from 2004 to 2013. The result suggests that stock and foreign exchange markets are positively related to volume of the shares and share traded on the period. The average deviation between the volume and shares traded is 11.84 percentages. Finally, through the application of recursive estimation the result shows that the financial crisis had a temporary effect on the long-run co movement of these markets.

Keywords: Stock markets, Foreign exchange markets, Capital market integration, financial crisis, Energy sector.

JEL classification: F21,F31, F36.

Introduction

Financial press has long asserted that stock prices and exchange rates are closely intertwined. In recent times, the depreciation of the dollar against the euro and other major currencies has been argued to put pressure on the investor sentiment and the US stock markets. Similarly, the previous decade associated with high productivity gains and a stock market boom in the US was accompanied by an exchange rate appreciation. Surprisingly, these connections have rarely been highlighted in workhorse models of exchange rate determination. This paper develops a framework in which the same forces that drive exchange rates, also influence countries’ stock markets, and argues that a great deal can be learned about foreign exchange markets by examining stock markets, and vice versa. Identifying interrelations between these markets would also shed light on some widely debated spillovers, such as, for example, international financial contagion.

The paper is structured as follows. Section 2 provides the literature review and main debates surrounding the dynamics between stock markets and economic markets, together with impacts from energy and oil price movements. In section 3 we describe the data used in the analysis and discuss econometric concepts and methodology surrounding multivariate co integration analysis and the out-of sample testing framework. The estimation results are presented in section 4, and in section 5 we draw some important policy conclusions with respect to monetary policy and policies designed for stock markets to withstand oil price movements.

Objectives of the study

- To study about the energy sector of selected companies in India.
- To analyze the share price and trade volumes of selected companies in energy sector.
- To assess the liquidity and short-term solvency position of the selected companies in energy sector.
- To assess the growth potentiality of the energy sector.

Literature review

Research conducted by Sadorsky (1999) concluded that oil price changes influence the economic activity. More specifically they found that an increase in the oil price is followed by declining stock returns, this is especially true for after the mid 1980s. Papapetrou (2001) and Park and Ratti (2008) came with the same conclusion for Greece and some European countries. Moreover, Guo and Kliesen (2005) concluded that oil price uncertainty has a negative impact on economic activity especially when they included oil price changes. Cong, Wei, Jiao, and Fan (2008) did not find any statistical significant results at 5 percent level, however they noted that some “important” shocks to oil prices do have a negative impact on the stock market. On the other hand, work by
Huang et al. (1996) came to a different conclusion. Results revealed that the oil future price does not play any role in determining the stock returns.

In addition, the paper of Heriques and Sadorsky (2011) related oil price volatility with investment. Early work by Bernanke (1983) found that during a high volatility of oil price, firms find that waiting for new information is the best investment behavior. Even though waiting can result in losses for the firm (since they lose opportunities), it is still often in the best interest for the firm to wait since it could sometimes help firms make the right investment decision. Inspired by Bernanke (1983), Heriques and Sadorsky employed panel data sets and found a U shape relationship between oil price and investment.

**Econometric techniques**

1. Unit root test
A series is said to be stationary if the mean and auto covariance of the series do not depend on time. Any series that is not stationary is said to have unit root. A company which do not face liquidity and bankruptcy risks have stable price change, which could be captured by drift(Value of A) and trend(Value B) of the first order auto regression \[\text{AR}(1)\]

Hence for such companies,

\[Y_t = a + bT + cY_{t-1} + u\]

Coefficient ‘c’ will have value of significantly less than one and hence will be stationary. In case the company is facing high risk, the above equation will have value of coefficient ‘c’ which is equal to one. Such companies will have unit root in their \[\text{AR}(1)\] equation. The reason for this behaviour is that in case the risk is high, \[Y_{t-1}\] will influence \[Y_t\] to great extent than when the risk for the company is low. Hence, the series tends to diverge. In that case the risk for the company is low; the share price tends to behave in random manner which is not the case if the risk is high. In order to test this hypothesis, we applied ‘Augmented Dickey-Fuller’ (ADF) test (Dickey & Fuller, 1979).

2. Co-integration test
While the company facing liquidity risk is co-integrated with index, companies facing volatility risk are not. The price of the companies facing liquidity risk trend to converge in case of companies facing unsystematic risk.

The study applies both Engle-Granger test (Engle & Granger, 1987) and Johansen test (Johansen, 1991) to determine whether the share price of the companies under study are co-integrated with trade volumes. Since nine companies with very high risk were deliberated chosen, there was high possibility that share prices of the nine companies would be having unit root test with their share price and trade volumes. Hence the authors try to find the stationary of the first difference to see if they have unit root or not. Co-integration could be applied only if the series showed unit root but the difference between them showed stationary trend.

**Findings**

1. Unit root test
All the nine companies Balmer& co, cairn, Castrol, Deepak, Linde, Petronet, Punj Llyod, Selan Explor and Tide water have unit root. As per table 1.1, all the nine companies have ADF test statistic less than critical value at 5% rejection level. Since a series which does not show stationary tends has increasing mean, volatility, and covariance over a period of time, this increase in variance is what we call high risk. The empirical evidence shows that any company whose price is changing significantly in either direction (liquidity risk) or in single direction trends to have unit root with their share price and trade volumes.

<table>
<thead>
<tr>
<th>Scripts</th>
<th>Augmented Dickey-Fuller Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In Levels</td>
</tr>
<tr>
<td></td>
<td>T-Statistic</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Balmer Lawrie &amp; Co. Ltd</td>
<td>-1.819079</td>
</tr>
<tr>
<td>Cairn India Ltd</td>
<td>-1.141682</td>
</tr>
</tbody>
</table>
2. Co-integration test

The result of co-integration test between volume of the share and no of shares traded is presented in table 3. The lag is eight and is based on Akaike Information Criterion. Results show that both trace test and maximum Eigen value test indicate no co-integration in 5% level. This implies that the VAR model can be conducted for all variables including Balmer& co share volumes and no of shares traded, and both variables are not correlated in the long run.

<table>
<thead>
<tr>
<th>Company</th>
<th>Volume (Aug)</th>
<th>Shares (Aug)</th>
<th>Volume (Dec)</th>
<th>Shares (Dec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Castrol India Ltd</td>
<td>-2.168593</td>
<td>-3.434505</td>
<td>-2.863262</td>
<td>-2.567735</td>
</tr>
<tr>
<td>Deepak Fertilizers and Petrochemicals</td>
<td>-1.655063</td>
<td>-3.434505</td>
<td>-2.863262</td>
<td>-2.567735</td>
</tr>
<tr>
<td>Linde India Ltd</td>
<td>-0.968626</td>
<td>-3.434505</td>
<td>-2.863262</td>
<td>-2.567735</td>
</tr>
<tr>
<td>Petronet LNG Limited</td>
<td>-0.862547</td>
<td>-3.434505</td>
<td>-2.863262</td>
<td>-2.567735</td>
</tr>
<tr>
<td>Punj Lloyd Ltd</td>
<td>-0.942331</td>
<td>-3.434505</td>
<td>-2.863262</td>
<td>-2.567735</td>
</tr>
<tr>
<td>Selan Exploration Technology Ltd</td>
<td>-1.034131</td>
<td>-3.434505</td>
<td>-2.863262</td>
<td>-2.567735</td>
</tr>
<tr>
<td>Tide Water Oil Company India Ltd</td>
<td>-1.068993</td>
<td>-3.434505</td>
<td>-2.863264</td>
<td>-2.567735</td>
</tr>
</tbody>
</table>

Sources: Eviews

Table 2.1: Co-integration test volume and traded shares using Johansen test (Balmer&co)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Eigen value</th>
<th>Trace</th>
<th>0.05 Critical Value</th>
<th>Probability Value **</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.080198</td>
<td>127.1287</td>
<td>15.49471</td>
<td>0.0001</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.001438</td>
<td>2.151944</td>
<td>3.841466</td>
<td>0.1424</td>
</tr>
</tbody>
</table>

Unrestricted Co integration Rank Test (Maximum Eigen value)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Eigen value</th>
<th>λ - Max</th>
<th>0.05 Critical Value</th>
<th>Probability Value**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.080198</td>
<td>124.9768</td>
<td>14.26460</td>
<td>0.0001</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.001438</td>
<td>2.151944</td>
<td>3.841466</td>
<td>0.1424</td>
</tr>
</tbody>
</table>

(**) denotes rejection of the hypothesis at the 0.05 level

Source: Eviews (**)


There is co-integration between the number of shares traded and price. Since the Max-Eigen value and trade value are greater than its critical value, null hypothesis is rejected and alternative hypothesis is accepted. Hence the volume of trade can be predicted with the help of price.

Table 2.2: Co-integration test volume and traded shares using Johansen test (Cairn)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Eigen value</th>
<th>Trace</th>
<th>0.05 Critical Value</th>
<th>Probability Value **</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.035336</td>
<td>54.28940</td>
<td>15.49471</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.000339</td>
<td>0.506783</td>
<td>3.841466</td>
<td>0.4765</td>
</tr>
</tbody>
</table>

Unrestricted Co integration Rank Test (Maximum Eigen value)
There is co-integration between the number of shares traded and price. Since the Max-Eigen value and trade value are greater than its critical value, null hypothesis is rejected and alternative hypothesis is accepted. Hence the volume of trade can be predicted with the help of price.

Table 2.3: Co-integration test volume and traded shares using Johansen test (Castrol)

Unrestricted Co integration Rank Test (Trace)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Eigenvalue</th>
<th>Trace</th>
<th>0.05 Critical Value</th>
<th>Probability Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.035336</td>
<td>53.78261</td>
<td>14.26460</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.000339</td>
<td>0.506783</td>
<td>3.841466</td>
<td>0.4765</td>
</tr>
</tbody>
</table>

(*) denotes rejection of the hypothesis at the 0.05 level

Source: Eviews

Table 2.4: Co-integration test volume and traded shares using Johansen test (Deepak)

Unrestricted Cointegration Rank Test (Trace)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Eigenvalue</th>
<th>Trace</th>
<th>0.05 Critical Value</th>
<th>Probability Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.107193</td>
<td>173.9884</td>
<td>15.49471</td>
<td>0.0001</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.002991</td>
<td>4.477567</td>
<td>3.841466</td>
<td>0.0343</td>
</tr>
</tbody>
</table>

(*) denotes rejection of the hypothesis at the 0.05 level

Source: Eviews

Table 2.5: Co-integration test volume and traded shares using Johansen test (Linde)

Unrestricted Co integration Rank Test (Trace)

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Eigenvalue</th>
<th>Trace</th>
<th>0.05 Critical Value</th>
<th>Probability Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.061774</td>
<td>97.48130</td>
<td>15.49471</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.001440</td>
<td>2.154176</td>
<td>3.841466</td>
<td>0.0343</td>
</tr>
</tbody>
</table>

(*) denotes rejection of the hypothesis at the 0.05 level

Source: Eviews

There is co-integration between the number of shares traded and price. Since the Max-eigenvalue and trade value are greater than its critical value, null hypothesis is rejected and alternative hypothesis is accepted. Hence the volume of trade can be predicted with the help of price.
Hypothesis | Eigenvalue | $\lambda$ - Max | 0.05 Critical Value | Probability Value**
--- | --- | --- | --- | ---
None | 0.085899 | 134.2730 | 14.26460 | 0.0001
At most 1 | 0.000484 | 0.724431 | 3.841466 | 0.3947

(*) denotes rejection of the hypothesis at the 0.05 level

There is co-integration between the number of shares traded and price. Since the Max-Eigen value and trade value are greater than its critical value, null hypothesis is rejected and alternative hypothesis is accepted. Hence the volume of trade can be predicted with the help of price.

Table 2.6: Co-integration test volume and traded shares using Johansen test(Petronet)

Unrestricted Co integration Rank Test (Trace)

Hypothesis | Eigen value | Trace | 0.05 Critical Value | Probability Value **
--- | --- | --- | --- | ---
None | 0.057452 | 89.14229 | 15.49471 | 0.0000
At most 1 | 0.000459 | 0.685664 | 3.841466 | 0.4076

Unrestricted Co integration Rank Test (Maximum Eigen value)

Hypothesis | Eigen value | $\lambda$ - Max | 0.05 Critical Value | Probability Value**
--- | --- | --- | --- | ---
None | 0.057452 | 88.45663 | 14.26460 | 0.0000
At most 1 | 0.000459 | 0.685664 | 3.841466 | 0.4076

(*) denotes rejection of the hypothesis at the 0.05 level

There is co-integration between the number of shares traded and price. Since the Max-Eigen value and trade value are greater than its critical value, null hypothesis is rejected and alternative hypothesis is accepted. Hence the volume of trade can be predicted with the help of price.

Table 2.7: Co-integration test volume and traded shares using Johansen test(Punjlyod)

Unrestricted Co integration Rank Test (Trace)

Hypothesis | Eigen value | Trace | 0.05 Critical Value | Probability Value **
--- | --- | --- | --- | ---
None | 0.028535 | 44.39620 | 15.49471 | 0.0000
At most 1 | 0.000746 | 1.116128 | 3.841466 | 0.2908

Unrestricted Co integration Rank Test (Maximum Eigen value)

Hypothesis | Eigen value | $\lambda$ - Max | 0.05 Critical Value | Probability Value**
--- | --- | --- | --- | ---
None | 0.028535 | 43.28007 | 14.26460 | 0.0000
At most 1 | 0.000746 | 1.116128 | 3.841466 | 0.2908

(*) denotes rejection of the hypothesis at the 0.05 level

There is co-integration between the number of shares traded and price. Since the Max-Eigen value and trade value are greater than its critical value, null hypothesis is rejected and alternative hypothesis is accepted. Hence the volume of trade can be predicted with the help of price.

Table 2.8: Co-integration test volume and traded shares using Johansen test(Selan explor)
Table 2.9: Co-integration test volume and traded shares using Johansen test (Tide water)

There is co-integration between the number of shares traded and price. Since the Max-Eigen value and trade value are greater than its critical value, null hypothesis is rejected and alternative hypothesis is accepted. Hence the volume of trade can be predicted with the help of price

Conclusion

This paper analyses the long-run interaction among stock prices and the real exchange rate in four oil exporting Middle East countries using co integration analysis of whole sample period. This exercise produces evidence of co integration between stock prices and trade volumes in the companies under investigation. In line with Phylaktis and Ravazzolo (2005) we argue that this result may be due to the omission of an important variable, which acts as a conduit through which the market price and volumes are linked. Therefore we incorporate additional variables to the system such as oil prices and market index (using the BSE stock prices as a proxy). Again the analysis that focuses on the full sample point out the evidence of co integration. We therefore, the long-run equilibrium relationship among the stock prices, the real exchange rates and oil prices in India. We find that, oil prices have a long-run positive effect on stock prices.

Our results indicate that, firstly, the oil price is an important variable, which acts as a conduit through which the real exchange rates and domestic stock prices are linked, so that the oil exporting countries as policy makers in OPEC should keep an eye on the effects of changes in oil prices levels on their own economies and stock markets. Secondly, government policy makers may play a role in influencing real exchange rates and stock prices through the use of oil prices, as the countries in our sample are among the biggest oil producers in the world. Thirdly, the relationship between real exchange rates and stock prices may be useful for portfolio managers interested in global asset allocation or investors trying to hedge against foreign exchange risk. Also the co integration among the share price and trade volumes of stock market give the
foreign investors an opportunity to benefit from diversifying their portfolio between the major stock markets like US stock exchange and the emerging markets in the Middle East region.

References:


