Does Design Affect Utilization? An Empirical Study of the Market for Offshore Support Vessels

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North Sea OSV market in crisis

Figure 4: PSV utilization 2007-2016

Figure 5: Number of employed and unemployed PSVs 2007-2016

Figure 6: AHTS utilization 2007-2016

Figure 7: Number of employed and unemployed AHTS vessels 2007-2016

Data: 20,000+ contracts and vessel specifications from ODS Petrodata and Clarkson Research
Dayrates for vessels tell only half the story!

- Real spot market earnings, adjusted for vessel utilization, are far below nominal dayrates even in good markets!
Research question

• Which vessel specifications are demanded in the market (i.e. results in a higher probability of obtaining a contract)?
  - Is there a difference between the PSV and AHTS segment?
  - Is there a difference between the spot and term market?
  - Have the relationships changed since the oil price fall in 2014?
Why is this important?

• Multi-purpose or multi-useless?
  - Are designs adapted to market reality?
  - ....or do designs reflect a wish to have the ”biggest and best”?
  - Important for vessel designers, yards and suppliers

• What fleet composition gives the best earnings per invested $?
  - Which specs increase utilization (and/or dayrates, in a second stage)?
  - Key for shipowning companies and their financiers
What does market experience say?

Table 1: Answers from market participants’ questionnaire

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Large clear deck area</th>
<th>Powerful vessel</th>
<th>Large bulk capacity</th>
<th>DP2</th>
<th>ROV</th>
<th>Ice class</th>
<th>Fuel efficiency</th>
<th>FIFI</th>
<th>Low emissions</th>
<th>Skill of crew</th>
<th>HSEQ record</th>
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<tbody>
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<td><strong>PSV</strong></td>
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<td>Shipowner avg.*</td>
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<td>Other participants avg.*</td>
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<td><strong>Total</strong></td>
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* % of participants denoting the feature as important for obtaining a contract
Formalized in a LOGIT model

\[ V_{i,t} = f(\text{age}_{i,t}, \text{size}_i, \text{bulkcap}_i, \text{fexp}_i, \text{dp}_i, \text{ic}_i, \text{rov}_i, \text{fifi}_i, \text{heli}_i, \text{moon}_i, \text{nwe}_i, \text{utilization}_t) \]

- \( V(i,t) = 1 \) if vessel \( i \) is under contract on day \( t \), otherwise 0

\[ Pr(V_{i,t} = 1|\Omega_t) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 \text{age}_i + \beta_2 \text{deck}_i + \beta_3 \text{bulkcap}_i + \beta_4 \text{fexp}_i + \beta_5 \text{dp}_i + \beta_6 \text{ic}_i + \beta_7 \text{rov}_i + \beta_8 \text{fifi}_i + \beta_9 \text{nwe}_i)}} \]

- We assume that \( V(t,i) \) is a function of the vessel’s:
  - Age
  - Size – deck area (PSV) or Brake Horsepower, BHP (AHTS)
  - Bulkcap - total under-deck bulk capacity
  - Fexp – deviation from average fleet daily fuel cost (at design speed)
  - DP – Dynamic positioning type
  - Ic – ice class
  - ROV support, FiFi, helideck
  - Nwe – built in North West Europe
  - Utilization – total fleet utilization
Empirical findings: PSV segment

• The PSV market prefers
  - Younger and larger tonnage (spot and term)
  - Ships built in Northwest Europe
  - DP2
  - Energy-efficient tonnage for term contracts when the fuel price is high (2011, 2012)

• Changes post-2014?
  - Preference for mid-size deck area rather than the largest vessels (cost saving)
  - The term market now value low fuel consumption (cost saving)
Empirical findings: AHTS segment

• Two-tier term market: Preference for smaller/basic vessels…
  - Ships that just pass the minimum requirements of a tender?
• …or very large, advanced vessels
  - Helideck, moonpool, FiFi count positively
  - No preference for NWE-built ships
  - No change since 2014
• Spot market: Preferences for
  - Younger tonnage with high BHP
  - Ice class, DP2, ROV support counts positively
  - Fuel consumption more important in recent years
PSV marginal effects: Best vs worst designs in an oversupplied market

(a) Most suitable vessels term
(b) Least suitable vessels term
(c) Term sensitivity to market condition
(d) Most suitable vessels spot
(e) Least suitable vessels spot
(f) Spot sensitivity to market condition

Figure 9: Probability of obtaining a contract in the PSV term and spot market 2015-2016
AHTS marginal effects: Best vs worst designs in an oversupplied market

Figure 11: Probability of obtaining a contract in the AHTS term and spot market 2015-2016
What have we learnt?

• AHTS:
  - Have a simple and low-cost vessel or a large and advanced one – not designs that are “in between”

• PSV:
  - Younger and larger tonnage gets better utilization
  - Energy efficiency can give better utilization

• Future research
  - Consider both pricing and utilization simultaneously (i.e. both the contract rate obtained and the probability of getting a contract)
  - Some design elements (e.g. energy efficiency) may increase utilization but is not priced in the market
Spørsmål?