

# Preface

Wells are the only means to produce reserves, and the only way to create a well is to hire a rig and drill. The first offshore wells were drilled from wharfs off the California coast in 1898, and during the next half century, drilling moved into swamps, lakes, and coastal zones throughout the world. In 1947, the first well out of sight of land was drilled 9 miles off the coast of Louisiana. Today, about one-third of the world's 85 million barrels per day oil production is sourced offshore, and rig chartering is big business. Over the past decade, the contract drilling market spud about 39,000 offshore wells at a total estimated rig hire cost of \$372 billion.

Jackups, semisubmersibles, and drillships are the marine vessels used to drill offshore wells and are referred to collectively as mobile offshore drilling units or MODUs. The fleet has grown and evolved over time into larger, more sophisticated rigs in response to operator's movement into deeper and more challenging environments. MODUs are supplied through newbuild construction primarily in Asian shipyards, and because rigs are long-lived assets, the legacy fleet contains a number of old rigs constructed in the U.S. and elsewhere. Offshore drilling is highly competitive, but the sector has consolidated over the past several decades through an active secondhand market.

The purpose of this monograph is to describe the structure of the offshore contract drilling market and the newbuild construction industry during the decade 2000–2010. We begin with background information on rig types and market organization in Chaps. 1 and 2. The rest of the monograph divides into two parts, covering the contract drilling market in Chaps. 3 through 8 and the newbuild market in Chaps. 9 through 15. In the newbuild market, our focus is on jackup construction in the United States.

Chapter 1 describes the types of rigs employed in the industry and their technical specifications. The fleet that exists today consists of both old and new technologies built to wide-ranging specifications. Contractors diversify by rig class and specification, and specialization plays an important role in determining dayrates and utilization. The activity states through which all rigs transition during their life cycle concludes the discussion.

In Chap. 2, the five markets that make up the MODU industry are described. Mobile offshore drilling units are owned and operated in the contract drilling market, constructed in the newbuild market, exchanged in the secondhand market, enhanced and maintained in the upgrade market, and end their life in the scrap market. For each market, the players, prices, size, and market values circa 2010–2011 are summarized. The newbuild and contract drilling markets are the largest and most transparent sectors of the industry.

Chapters 3 and 4 introduce the contract drilling industry and market structure. In Chap. 3, supply, utilization, and dayrates are summarized over the decade 2000–2010. A regional categorization of the market is employed with an emphasis on the largest competitive sectors. Dayrates are the mechanism by which contractors generate cash flow, and utilization reflects excess capacity in the market and provides signals to the industry on dayrate and investment trends. A summary of contracts used in the industry concludes the chapter.

In Chap. 4, we describe the ownership structure and specialization of drilling contractors and the degree of concentration in the market. A cash flow model of net asset value is introduced and compared to industry algorithms. In 2012, the contract drilling market was dominated by a small number of publicly traded firms, most notably Transocean, Seadrill, Noble, Ensco, and Diamond. Ensco, Noble, and Transocean are generalists with assets in all rig classes, both the high and low specification segments, across a broad range of geographic markets. We show that a company's degree of diversification is a good indicator of its business strategy. Markets appear competitive despite significant barriers to entry and consolidation trends over the past two decades.

In Chap. 5, the factors that impact MODU dayrates are quantified. A body of "common knowledge" has developed over the years, and the purpose of our evaluation is to review these expectations to support/refute selected claims. We show that oil prices explain a large proportion of the variation in the number of active rigs and average dayrates, while utilization is a weak predictor of dayrates. We find no evidence that large contractors are able to use their market power to capture higher dayrates than would be expected by the quality of their fleet. State-owned exploration and production companies, however, tend to pay higher dayrates than other oil companies, which suggests that ownership plays a role in investment decisions and negotiation strategies.

In Chap. 6, we describe newbuild strategies and develop conceptual models of firm stacking and newbuild decision-making to gain insight into the relationship between market drivers and investment criteria. A net present value model of newbuilding shows that relatively high combinations of dayrates and utilization are needed to justify investment. A simple stacking model is presented to show why operating a rig may be preferred over stacking even if operating expenses exceed the dayrate.

In Chap. 7, factors that impact contractor value, including fleet value and diversity, operating margin, financial structure, and business strategies are discussed. In Chap. 8, models of market valuation are developed for a cross-section

of publicly owned drilling contractors. Fleet value is the single best predictor of market capitalization and enterprise value.

The second part of the monograph examines the newbuild market and begins in Chap. 9 with a historical overview of construction trends. Through the mid-1980s, the U.S. was the dominant player in newbuild construction, but comparative advantages change as technologies and experience evolve and governments support labor intensive industries. Today, U.S. yards represent a small fraction of the global market and the majority of rig construction is concentrated in Asia. In the U.S., only two shipyards build jackups – the LeTourneau shipyard in Vicksburg, Mississippi, and the Keppel AmFELS shipyard in Brownsville, Texas. The LeTourneau shipyard was sold twice in 2011 and, barring any major change, is unlikely to deliver future rigs.

In Chaps. 10 and 11, the technical aspects of jackup design and construction are presented. Chapter 10 describes the designs used in jackup construction and the trade-offs that arise between technical and economic factors. The most frequently built jackup designs are highlighted. Chapter 11 describes the workflows and stages of construction in U.S. shipyards.

In Chaps. 12 and 13, the factors that influence construction and replacement costs are discussed and cost functions of jackups, semisubmersibles, and drillships are derived. Many factors impact newbuild and replacement costs, including market conditions, design type and class, shipyard, rig specifications, and time of construction. Cost functions combine these variables to identify the relative importance of individual factors when evaluating newbuild programs and the value and insurance liability of fleets. Water depth is shown to be the single best predictor of rig cost.

In Chap. 14, an algorithm of jackup lightship displacement is presented. The weight of a rig is an important variable in cost estimation and in determining the amount of steel required in construction. In the marine construction industry, lightship displacements are widely reported, but in jackup construction, information on the weight of the unit is protected because weights are an indicator of the strength of a rig's legs which is an important distinguishing feature among designs. Using primary and secondary data, a regression model of jackup lightship displacement is derived.

Chapter 15 concludes the monograph with an analysis of the labor and market requirements of jackup rig construction in the United States. Rig deliveries in the U.S. peaked in 2008 at \$1 billion and averaged \$700 million annually from 1997 to 2011. We show that labor and drilling equipment are the largest cost components of rig construction and account for over half of the total cost of a rig. Future newbuild activity in the U.S. is contingent on regional demand and is expected to remain depressed.

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Mark J. Kaiser



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Kaiser, M.J.; Snyder, B.F.

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