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Measuring the Systematic Risk of South Pars Field

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Measuring the Systematic Risk of South Pars Field

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I. Introduction

The most significant energy development project in Iran is the offshore South Pars field, which produces about 35 percent of total gas produced in Iran. Discovered in 1990 and located 62 miles offshore in the Persian Gulf, South Pars has a 24 phase's development scheme spanning 20 years. Each phase has a combination of natural gas with condensate and gas liquids production. Phases 1-10 are online. The majority of South Pars natural gas development will be allocated to the domestic market for consumption and gas re-injection. The remainder will be exported as liquefied natural gas (LNG) and used for gas to liquids (GTL) projects.

In this paper, Section 2 provides background. In Section 3, CAPM is presented. In Section 4, systematic risk (β), section 5 South Pars field and in section 6 empirical results are presented and Section 7 covers conclusion.

II. Background

A study by Douglas (1969) showed that intercepts were larger than existing risk free rates and the coefficients for the systematic risk were not significant. Sharpe and Cooper (1972) discovered a positive return and risk relationship between NYSE common stocks during the period 1931-67, although it was not completely linear.

Black, Jensen and Scholes (1972) studied the risk and return relationship for portfolio of stocks and found a positive linear relationship between monthly excess return i.e. return over and above the risk free rate and portfolio beta, although the intercept was higher than the expected value.

Fama and French (2004) revealed that empirical work since the late 1970s challenged the Black version of the CAPM. Specifically, evidence mounts that much of the variation in expected return is unrelated to market beta.

A study by Basu (1977) showed that when common stocks were sorted on the basis of earnings/price ratios, future returns on high E/P stocks were higher than those predicted by the CAPM. Banz (1981) documented a size effect; when stocks were sorted on the basis of market capitalization (price times shares outstanding), average returns on small stocks were higher than those predicted by the CAPM. Bhandari (1988) found that high debt-equity ratios (book value of debt over the market value of equity, a measure of leverage) also helped explain the cross section of average returns after both beta and size are considered. A study by Fama and French (1992) concluded that during the period 1963 to 1990, beta was not relevant. The study also showed that the most significant predictor variables were book to market value and size.

Ansari, Naeem and Zubairi (2005) stated that, according to CAPM, the market rewards risk bearing, since people are generally risk averse. The risk premium for the aggregate of all risky assets must be positive to induce people to hold the total amount of risky assets in a financial system. The market (according to CAPM theory) rewards only efficient risk bearing. The risk premium on any individual security is not related to its own risk but to its contribution to the total risk of an efficiently diversified portfolio.

Zubairi and Farooq (2011) investigates whether CAPM and APT are valid models for determining price/return of the fertilizer and the oil & gas sector companies listed on the Karachi Stock Exchange (KSE). The purpose of their research is also to identify plausible reasons for deviations from the theories. The conclusions arrived at through data analysis reveal weak correlation between realized excess returns (i.e. actual returns over and above the risk free rate) and the expected return based on CAPM. With respect to APT model, the study reflects that macroeconomic factors including changes in GDP, inflation, exchange rate and market return do not serve as valid determinants of returns on oil, gas and fertilizer stocks.

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III. CAPM (Capital Asset Pricing Model)

CAPM developed by Sharpe (1964), Lintner (1965) and Mossini (1965) builds upon the "Portfolio Theory" introduced by Harry Markowitz (1959). CAPM presents the basis for determining the required rate of return on all risky assets[1].

The CAPM provides an elegant model of the determinants of the equilibrium expected return ERit on any individual risky asset in the market. It predicts that the expected excess return on an individual risky asset $(ER_i - r)_t$ is directly related to the expected excess return on the market portfolio $(ER_m - r)_t$, with the constant of proportionality given by the *beta* of the individual risky asset:

$$(ER_i - r)_t = \beta_i (ER_m - r)_t \qquad (1)$$

Where beta

$$\beta_i = \text{cov}\,(R_{it}, R_{mt})/\,\text{var}(R_{mt}) \qquad (2)$$

The CAPM explains the expected excess return on asset i, given the expected market excess return. The CAPM is not a predictive equation for the return on asset i, since both the dependent and independent variables are dated at time t. Rather, the CAPM implies that contemporaneous movements in $(ER_i - r)_t$ are linked to contemporaneous changes in the excess market return. ER_{mt} is the expected return on the market portfolio and is the 'average' return from holding all assets in the optimal proportions w^2.

ER_{mt} is the expected return on the market portfolio and is the 'average' return from holding all assets in the optimal proportions w^*_i. Since actual returns on the market portfolio differ from expected returns, the variance var (R_{mt}) on the market portfolio is non-zero. The definition of firm *i*'s beta, indicates that equilibrium expected return of asset *i* depends on:

(i) The covariance between the return on security *i* and the market portfolio, cov (R_{it}, R_{mt})

(ii) Is inversely related to the variance of the market portfolio, var (R_{mt}).

IV. Systematic Risk (β)

If we define the extra return on asset i over and above the risk-free rate as a risk premium,

$$ER_i = r + rp_i \qquad (3)$$

Then the CAPM gives the following expressions for the risk premium:

$$rp_i = \beta_i\,(ER_m - r) = {}_{\lambda m}\,\text{cov}(R_i, R_m) \qquad (4)$$

The CAPM predicts that only the covariance of returns between assets i and the market portfolio influence the cross-section of excess returns, across assets. No additional variables such as the dividend–price ratio, the size of the firm or the earnings–price ratio should influence the cross-section of expected excess returns. All changes in the risk of asset i is encapsulated in changes in cov(R_i, R_m). Strictly, this covariance is a conditional covariance – the agent at each point in time forms her best view of the value for the covariance/beta[3].

V. South Pars Field

This gas field covers an area of 9,700 square of which 3,700 square kilometers is in Iranian territorial waters and 6,000 square kilometers (North Dome) is in Qatari territorial waters[4].

The South Pars Field was discovered in 1990 by National Iranian Oil Company[5]. The Pars Oil and Gas Company. A subsidiary of NIOC has jurisdiction over all South Pars-related projects. Field development has been delayed by various problems - technical (i.e., high levels of mercaptans and foul-smelling sulfur compounds), contractual issues and recently politics[6].

Gas production started from the field by commissioning phase 2 in December 2002 to produce 1 billion cubic feet per day of wet gas. Gas is sent to shore via pipeline, and processed at Assaluyeh.

Condensate production from South Pars is currently 200,000 barrels per day, and by 2010, could increase to over 500,000 barrels per day. As of December 2010, South pars gas field's production capacity stands at 75 million cubic meters of natural gas per day. Gas production at South Pars rose by nearly 30% between March 2009 and March 2010. The field's reserves are estimated at 14 trillion cubic meters of natural gas and 18 billion barrels of natural gas condensates. Production at South Pars gas field will rise to 175 million cubic meters per day in 2012.

NIOC is planning to develop the field in 24 to 30 phases, capable of producing about 25 billion cubic feet to 30 billion cubic feet of natural gas per day.

Each standard phase is defined for daily production of 1 billion cubic feet of natural gas, 1500 tones of liquefied petroleum gas (LPG) and 200 tones of sulfur, however some phases have some different production plans.

By the beginning of 2008 phases 1, 2, 3, 4 and 5 has been brought to production and by the end of

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[2] Cutberson K, Nitzsche D, Quantitative Financial Economics, Second edition

[3] Cutberson K, Nitzsche D, Quantitative Financial Economics, Second Edition

[4] http://www.igu.org/html/wgc2006pres/data/wgcppt/pdf/

[5] NIOC

[6] http://www.offshore-technology.com/projects/southpars

2008 phases 6, 7, 8, 9 and 10 will be on stream. Phases 12, 15, 16, 17, 18, 19, 27 and 28 are under different development stages[7].

VI. Emprical Results

Systematic risk is sensitive of ever share to return of market index. Therefore if systematic risk (β) for a share be bigger than 1, then industry is high risk and against if systematic risk (β) be smaller than 1, then, industry is low risk. In this paper, we want measure systematic risk (β) of South Pars project.

For this aim, we use natural gas price and extract return of South Pars field production, then we use Matlab 7 software for modeling. According to this modeling, systematic risk (β) of South Pars project is 1/036 and we can conclude that this project is relatively high risk. This project is high risk, because we cannot use machines and equipments of this field for other projects.

VII. Conclusion

The South Pars field is a natural gas condensate field located in the Persian Gulf. It is the world's largest gas field, shared between Iran and Qatar. According to the International Energy Agency (IEA), the field holds an estimated 1,800 trillion cubic of in-situ natural gas and some 50 billion barrels of natural gas condensates[8].

In this paper, we measure systematic risk (β) for South Pars field. Results reveal that this project is relatively high risk, because machines and equipments which uses in this project, cannot be used in other projects.

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