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Review

Impact of Domestic Inflation on Cost of Development Phases 17 and 18

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ABSTRACT

South Pars gas field is the largest gas field in the world and is shared between Iran and Qatar. One of the most important projects in this field is the development of Phases 17 and 18. This mega project is one of the most important projects implemented in the South Pars gas field. This paper examines the impact of domestic inflation on the costs of implementing these phases over a period of ten years(2003-2013).The main purpose of this study is to calculate and compare the costs of implementing this project under non-inflationary conditions. For this purpose, the main and standard activities of this phases is selected and its costs calculated and then neutralize inflation indicators for the desired time period to be compared between inflation and non-inflationary states. Wilcoxon test used to compare two dependent groups. Based on statistical analysis, assuming the absence of other factors, the expenditures of selected activities in phases 17and 18 of South Pars in the inflationary state were significantly higher than the non-inflationary state.

1. Introduction

In this paper, initially, phases 17 and 18 of South Pars gas field is described. Then, the problem statement, importance, necessity, statistical society, research objectives and questions, data collection, and analysis methods are explained.

South Pars gas field is the largest gas field in the world, where phases 17 and 18 are close to large and important projects implemented in this field. The development costs of phases 17 and 18 of South Pars gas field have been affected by three factors: internal inflation, sanctions, international price changes.

In this article, we examine the effect of internal inflation on the cost of this phases. For this purpose,15 activities from the development activities of these phases have been selected, then the costs of each activity are presented based on the documentation. By neutralizing the effect of other non-domestic factors, adjusted costs are obtained. Then, the differences in the development costs of the selected activities are obtained and compared and analyzed by using appropriate statistical analysis

Cost estimation is in line with strengthening project management and program implementation. Therefore, it is necessary to provide the necessary information to the estimator or to obtain it by himself. Regardless of the documentation and steps required to make and make an estimate, there is a general process that consists of a total of six key activities which include:

- Define project objectives.
- Estimation and planning of work resources.
- Improved cost estimates.
- Risk identification and quantification.
- Adjustment.
- Review and approval.

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2. Literature Review

The prerequisite for the success of any project is the simultaneous achievement of all three factors of time, cost and quality, and the departure of each of these three factors from the set limits, can lead to a failed project. To do it in a timely and cost-effective manner and with the desired quality of the plan and avoid losses due to delays and increased costs, there is no other way but to analyze and review and recognize these factors and deal with them properly and finally manage them.

The reason for choosing phases 17 and 18 is that they are among the phases that have been fully developed by domestic contractors so that the role of domestic inflation in the implementation of such projects can be better explored.

The development plan for phases 17and18 is designed and is currently being implemented to produce 4.2 million cubic meters gas from the South Pars reservoir.

Primary purpose:

- Production of 5 million cubic meters of sweet gas daily.
- Five thousand barrels of condensate.

For implementation of Phases 17 and 18 a consortium consisting of Iran Development and Renovation Organization (IDRO), Iranian Offshore Engineering and Construction Company (IOEC), National Iranian Drilling Company, and Iranian Offshore Industrial Company (OIEC) has been assigned.

2.1. Offshore

- The four drilling rigs produced consist of 44 wells
- Two 32-inch marine gas pipeline
- Two 4-inch pipelines carrying glycol solution

2.2. In-Shore

The project was constructed on an area of approximately 155 hectares adjacent to phases 9 and 10 of South Pars, including: four gas sweetening units, condensate stabilization and storage tanks, gas desalination and dehumidification unit, gas refrigeration and separation, butane, sulfur and mercury decontamination, gas condensation units, sulfur recovery and granulation unit, and monoethylene glycol resuscitation unit.

Steam, fresh water and refinery cooling will also be provided by refinery and electricity support units at the joint power plant.

2.3. Research Background

Among the similar researches in the field of oil and gas industry from the perspective of economic and financial, we address the following.

Behrouz Dori, Ehsan Hamzaei, 2010, with a case study of North Azadegan oil field using AND technique to study risk management to adopt an appropriate solution in project management to deal with risks and events that may occur in an industrial project.

Mohammadi, Behzad,2012, Challenges of launching South Pars gas field development projects, One of the most important problems for the completion of this project is the challenges that exist in launching them. In this article, an attempt has been made to describe these challenges from a scientific perspective.

Farrokhzad Jahani,2017, in a research study, they analyzed the exploitation of joint oil and gas fields in the South Pars gas field.

3. Research Methodology

In this part, first, all factors affecting the increase in the expenditure on selected activities in the development of phases 17,18 and the domestic indicators are described. Then, the process of selecting activities of phases 17,18 is divided into several components which provide the basis for the present research.

In this study, the two primary states are compared with each other:

- Cost of selected activities under the influence of domestic indicators.
- Cost of selected activities without affecting domestic indicators.

The 15 selected activities of phases 17,18 are analyzed and the costs of these two states will be compared.

The factors described below have directly and indirectly effect on cost of phases 17,18

3.1. Domestic Indices

- Indicative price of industrial goods.
- Electricity price index.
- Mechanical equipment prices;
- The freight price.
- Property price.
- Service price.

Table 1. Indices of internal indicators.

Index	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Industrial Goods Price Index	100	122.0	188.3	244.0	329.3	362.0	360.5	373.5	402.8	418.5	436.8
Electricity Price Index	100	115.7	135.4	217	257	279	282	295	325	358	366
Mechanical Price Index	100	110.5	129.3	185	228	248	257	268	299	310	329
Freight and Fuel Price Index	100	106	113.5	128	154	200	251	273	309	312	331
Building Price Index	100	113.2	135.5	189.0	226.0	244.4	238.8	251.1	283.8	311.6	320.8
Services Price Index	100	111.8	128.5	157.6	201.5	253.2	288.2	313.1	364.9	390.2	410.3
Average	100	113.2	138.4	187	233	264	279	296	331	350	365

Source: central bank

3.2. Indices of International Price Changes

- Capex and OPEX Cost – upstream Oil & Gas
- International index of Oil & Gas equipment
- International index of Oil & Gas pipes
- Index of rental drilling rig

Table 2. Indices of international price changes.

Index	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392
Capex and OPEX Cost – upstream Oil & Gas	100	104.3	113.7	115.5	116.4	117.9	109.9	104.8	105.6	106.5	107.3
International index of Oil & Gas equipment	100	99.1	101.2	103.9	105.2	106.8	106.8	106.1	106.9	107.9	108.8
International index of Oil & Gas pipes	100	102.3	93.8	101.5	103.2	99.8	98.6	99.3	99.3	99.4	99.4
Index of rental drilling rig	100	91.2	93.6	110.3	142.0	146.0	96.0	72.4	71.2	70.4	69.2
Average	100	99.2	100.6	107.8	116.7	117.6	102.8	95.7	95.8	96.1	96.2

Source: Central bank

3.3. Indices of Sanctions

- Brokers fee.
- Transfer fee.

Table 3. Indices of Sanctions.

Index	1382	1393	1384	1385	1386	1387	1388	1389	1390	1391	1392
Brokers Fee	100	108	108	108	108	108	114	117	117	117	117
Transfer Fee	100	104	104	104	104	104	104	105	105	105	105
Average	100	106	106	106	106	106	109	111	111	111	111

Source: Central bank

3.4. Wilcoxon Test

Nonparametric tests such as the Wilcoxon test can be used to compare two dependent groups when a goal is to compare a variable in two different situations, and if the sample is not assumed to be normal. In this test, the hypotheses are as follows:

H0: There is no difference between the two groups.

H1: There is a difference between the two groups.

4. Results

4.1. Data Analysis

Table 4 lists the historical costs of the 15 selected activities in development of phases 17,18.

Table 4. Costs before applying any indices.

Activities	Cost (Million USD)
Transportation Activities	80
Excavation operations	105
Detailed Engineering	10
utilities	20
Site Establishment	150
Plant Construction	800
Pre-Commissioning	15
Construction Camp	40
Site Work	204
Start-up Activities	38
Pre-Commissioning test	18
Appraisal Wells	110
Deviated Wells	680
Logistic Base Services	90
Yard Fabrication	40
Total	2400

Source: Planning management of NIOC(1394)

4.2. Neutralize the Effect of International Price Index and Sanctions Index

In order to calculate the final indexes adjustment for each activity, the average relevant indices has been considered. Since expenditures have been extracted based on the issued documents in the year 2003 ,therefore the year 2003 was chosen as the base year.

In order to neutralize other factors(international prices and sanctions) , apply indicators related to these factors to costs of selected activities.

Table 5. Costs after applying international price and sanction indices.

Activities	Cost (Million USD)
Transportation Activities	77
Excavation operations	101
Detailed Engineering	9.6
utilities	19
Site Establishment	145
Plant Construction	773
Pre-Commissioning	14.4
Construction Camp	37
Site Work	197
Start-up Activities	36
Pre-Commissioning test	17
Appraisal Wells	106
Deviated Wells	657
Logistic Base Services	87
Yard Fabrication	37
Total	2313

Source: Researcher calculations

4.3. Inferential Analysis

In the inferential statistics section, the normalization of variables is first checked. Then, an appropriate sampling method is selected to compare the contractors. It is more appropriate to use the Shapiro-Wilk test to ensure that the data is normal with a small volume. Based on the Shapiro-Wilk test used herein, two assumptions are considered:

H0: The associated variable has a normal distribution.

H1: The associated variable does not have a normal distribution.

The results of the Shapiro-Wilkes test are presented in Table 8:

Table 6. Shapiro-Wilk test results.

Test Type	Condition	Significance Level	Statistics	Research Variables
Nonparametric	Abnormal	0.013	0.753	Total Cost

4.4. Comparing Total Expenditures

In order to compare the two cases investigated in this article, statistical assumptions are defined as follows:

H0: There is no significant difference between the total expenditures on the two states

H1: There is a significant difference between the total expenditures on the two states

The corresponding results of the Mann-Whitney test are presented in Table 9:

Table 7. Results of the Wilcoxon Test.

Significance Level	Statistics	Total Cost	Number	Contractor
0.085	-1.72	17898	10	Internal
		16440	10	Foreign
		34338	20	Total

The findings in the above table show that after applying international price changes and sanctional indices, the significance level of the Wilcoxon test statistics is more than 0.05,thus the zero hypothesis is accepted. In other words, by neutralizing the indicators of sanctions and international price changes, there has been no significant difference in expenditures at the 95% confidence level. That is, significant difference was due to internal factors (internal inflation).

5. Conclusions

According to the results of the statistical data analysis, assuming the absence of other factors, the expenditures of selected activities in phases 17and 18 of South Pars in the inflationary state were significantly higher than the non-inflationary state and other factors(sanctions and international price changes),although increasing the desired expenditures, have not had a significant impact on these expenditures.

Therefore, since gas production of joint gas fields, especially the South Pars gas field, is of great importance, optimal production and earning more revenue from this field will also have a significant effect on gross national production. Therefore, due to the significant impact of domestic inflation on the development costs of such national projects, necessary action should be taken in this regard.

Researchers can study and analyze the effects of other factors such as international prices, etc. On the development of this phases.

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