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# 17

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## Portfolio Analysis

**P**ortfolio analysis is a broad and diversified concept that has specific purposes that differ by industry. The most common application of portfolio analysis involves security analysis during which a portfolio of investments, such as stocks, bonds, and other financial instruments, are analyzed to determine if expected investment returns match the risk tolerance or investment mandate of an investor seeking to optimize overall risk and return.

Another common application of portfolio analysis is to assist a company, usually in the consumer products industry, review its product lines to determine the best possible allocation of company resources. While an element of performance analysis may be involved in these activities, strategic positioning is more the overall focus.

Portfolio analysis can become heavily performance-based and it is in this form that it is most applicable to the oil and gas industry. In this case, portfolio analysis seeks to break down and analyze an oil and gas portfolio – think oil and gas fields – in order to determine if the portfolio is capable of meeting desired goals and objectives in light of historical performance.

Oil and gas portfolio performance analysis can be used for a variety of purposes. At the strategic level, portfolio analysis seeks to determine whether a portfolio has the desired commodity mix of oil and gas, the ability to grow, and a sufficient rate of return on investment that meets stated goals.

At the more granular level, portfolio analysis can be used to compare fields within a portfolio and to allocate capital in a way that optimizes value and profitability. It is also a vital component of portfolio rationalization in which certain fields, not just poorly performing fields, are divested in order to provide additional capital for various fields and acquisitions or other strategic initiatives.

Portfolio analysis is typically a function that resides in the planning or business development hierarchy of an oil and gas company. However, there are significant benefits for a field manager or team to conduct their own portfolio analysis even with limited data. The reason for this is simple; it is always beneficial to know how a particular field is viewed within a portfolio. This can provide insight into potential executive-level decisions that may result from a higher-level portfolio analysis. For example, if a series of capital investments have failed to achieve desired production and growth, even though a field is performing well under a variety of operational



metrics, it would be wise to plan for a reduction in capital and a possible shift in field priorities to one of “harvest” and decline.

## Basic Portfolio Analysis

There is no set approach to analyzing an oil and gas portfolio. While it is important, as with all performance analysis, to define the purpose and set forth the scope of the performance analysis, the procedures used to analyze portfolio performance data may be exceptionally varied. In most cases, portfolio analysis requires some level of performance data on each of the fields or assets within the portfolio, which makes necessary some form of field performance “pre” analysis. However, this analysis need not be as thorough as the field analysis described in the previous chapter.

When initiating a portfolio-level performance analysis, it is highly recommended to begin the process by preparing a spreadsheet that captures most of the portfolio’s key performance metrics o as a whole, or , or in aggregate. This may require some additional analysis using aggregated operational, reserve, and financial data. An example of a spreadsheet that captures many key performance metrics is presented in Table 17-1. The goal of this portfolio or “aggregate” analysis is to understand how the entire portfolio of fields is meeting strategic goals and , to understand what key aspects of performance are not meeting desired expectations. Another beneficial aspect of analyzing the portfolio as a whole is to benchmark the performance against key industry performance metrics. This will provide information on just how well or how poorly a portfolio is performing when compared with industry averages.

Once the performance of an entire portfolio of oil and gas assets has been analyzed, it is very beneficial to compare individual assets within the portfolio, especially if areas of concern with performance become apparent in the initial aggregate performance analysis. Again, using a template or spreadsheet can help facilitate this form of analysis. Table 17-2 is an example of a spreadsheet that can be used to compare a wide number of fields within a portfolio. This more granular level of analysis will quickly reveal how fields within a portfolio are impacting overall portfolio performance and can provide significant information that may be used to to improve or optimize a portfolio of fields to meet targets and goals.

If it is sufficiently rigorous, the spreadsheet or model can be used for advance levels of portfolio analysis including stress testing by changing prices and other assumptions, the impact of acquisitions and divestitures, and for strategic planning purposes, although these will not be discussed in this book. Finally, it must be remembered that most portfolio assessments do not include debt and financing or the impact of corporate G&A on portfolio performance, as once these data are included, the analysis typically falls under the purview of company analysis, which is discussed in the next chapter.

**Table 17-1.** Portfolio Performance Template

Portfolio	2013	2014	2015	2016	2017
<b>Operations Summary</b>					
<b>Production (BOEPD)</b>					
Oil (bopd)					
Gas (mcf/d)					
<i>YOY production Growth</i>					
<i>Three Year CAGR</i>					
<b>Revenue</b>					
<b>Operating Expenses</b>					
<b>Operating Profit</b>					
<i>WTI Price</i>					
<i>HH Price</i>					
<i>Revenue / BOE</i>					
<i>OPEX (\$/BOE)</i>					
<i>Margin (\$/BOE)</i>					
<b>Cash Flow Analysis</b>					
<b>Operating Profit</b>					
<b>Workovers</b>					
<b>P&amp;A</b>					
<b>Operating Cash Flow</b>					
<b>Development Capital</b>					
<b>Acquisitions</b>					
<b>Free Cash Flow</b>					
<i>Free Cash Flow Margin</i>					
<b>ROIC Metrics</b>					
<b>Net Book Value</b>					
<b>One Year (Current) ROIC</b>					
<b>One Year (Current) Category</b>					
<b>3 Year ROIC</b>					
<b>3 Year Category</b>					
<b>Reserves</b>					
<b>Reserve Adds (Million BOE)</b>					
<b>YE Reserves Total (Million BOE)</b>					

<b>YE PDP Reserves (Million BOE)</b>					
<b>% PDP</b>					
<b>RP Ratio</b>					
<b>F&amp;D Costs</b>					
<b>Recycle Ratio</b>					

Table 17-2. Portfolio Performance Template

<b>Performance Summary</b>	<b>Field #1</b>	<b>Field #2</b>	<b>Field #3</b>	<b>Field #4</b>	<b>Portfolio</b>
<b>Operations Summary</b>					
<b>Production (BOEPD)</b>					
<b>Oil (bopd)</b>					
<b>Gas (mcf/d)</b>					
<i>YOY production Growth</i>					
<i>Three Year CAGR</i>					
<b>Revenue</b>					
<b>Operating Expenses</b>					
<b>Operating Profit</b>					
<i>WTI Price</i>					
<i>HH Price</i>					
<i>Revenue / BOE</i>					
<i>OPEX (\$/BOE)</i>					
<i>Margin (\$/BOE)</i>					
<b>Cash Flow Analysis</b>					
<b>Operating Profit</b>					
<b>Workovers</b>					
<b>P&amp;A</b>					
<b>Operating Cash Flow</b>					
<b>Development Capital</b>					
<b>Acquisitions</b>					
<b>Free Cash Flow</b>					
<i>Free Cash Flow Margin</i>					
<b>ROIC Metrics</b>					
<b>Net Book Value</b>					
<b>One Year (Current) ROIC</b>					
<b>One Year (Current) Category</b>					

<b>3 Year ROIC</b>					
<b>3 Year Category</b>					
<b>Reserves</b>					
<b>Reserve Adds (Million BOE)</b>					
<b>YE Reserves Total (Million BOE)</b>					
<b>YE PDP Reserves (Million BOE)</b>					
<b>% PDP</b>					
<b>RP Ratio</b>					
<b>F&amp;D Costs</b>					
<b>Recycle Ratio</b>					

## Advanced Portfolio Analysis

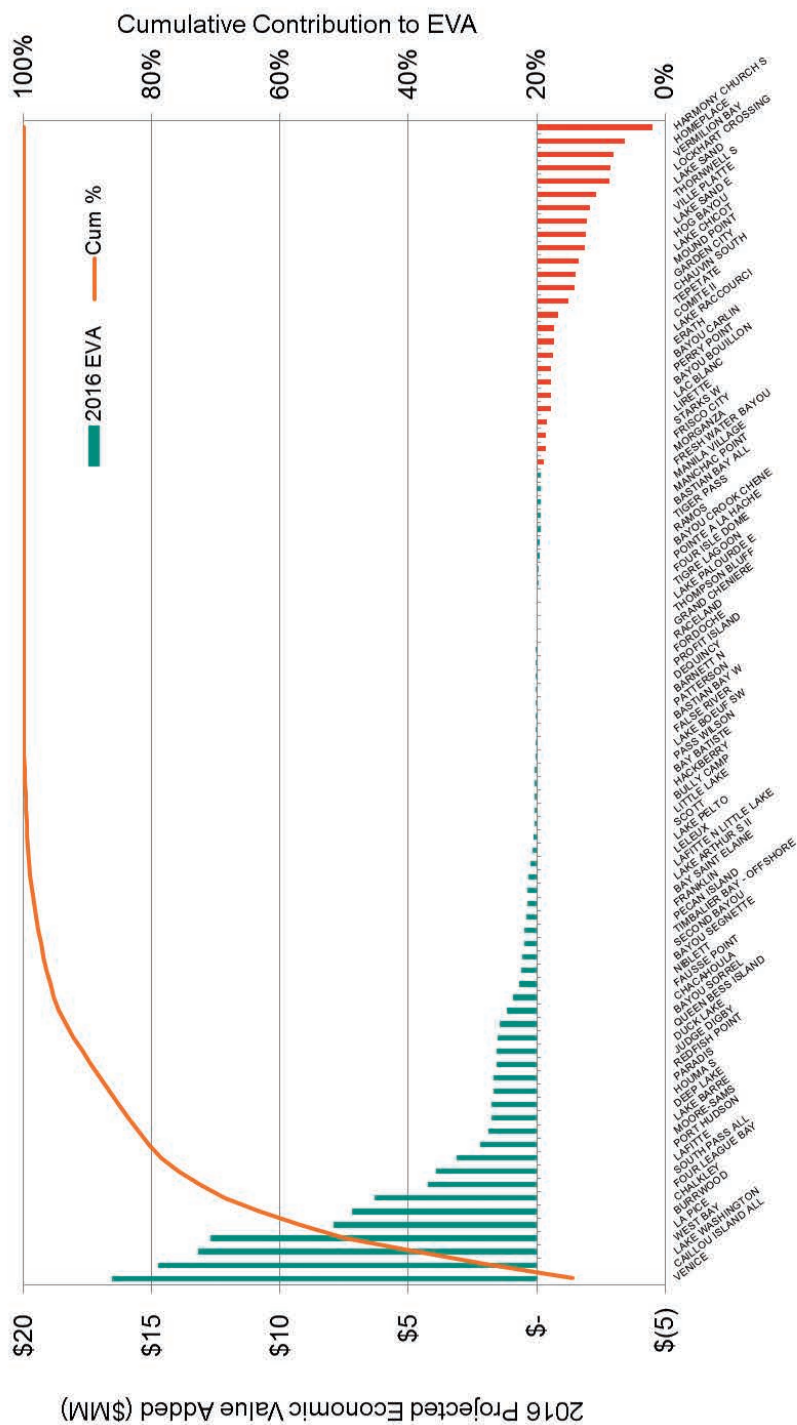
There is no limit to the aspects of portfolio performance that can be analyzed. After the basic performance data and metrics are collected and presented in aggregate and individually by field or asset, and then reviewed for overall performance, more in-depth analysis can begin. This is particularly true when performance does not meet desired or expected returns. Some useful and recommended forms of advanced portfolio performance analysis include:

- Benchmarking/Pareto Analysis
- Growth Return Analysis
- Free Cash Flow Margin Analysis
- Life Cycle Analysis
- SWOT Analysis

This list is by no means comprehensive. It may also be instructive to clearly annotate fields with special characteristics, such as deep water fields, fields undergoing significant EOR, and fields that are international or governed by a unique agreement such as a production sharing contract, as these fields will have metrics of their own which may not benchmark well against a traditional field.

### Ranking and Pareto Analysis

In many cases, key performance metrics are ranked or benchmarked against internal or external peers. This quickly determines how fields compare with one another and provides both a quantitative and qualitative assessment of the performance related to the metric that is being benchmarked. With portfolio analysis, many of the key performance metrics are ranked using standard bar charts or other graphs.

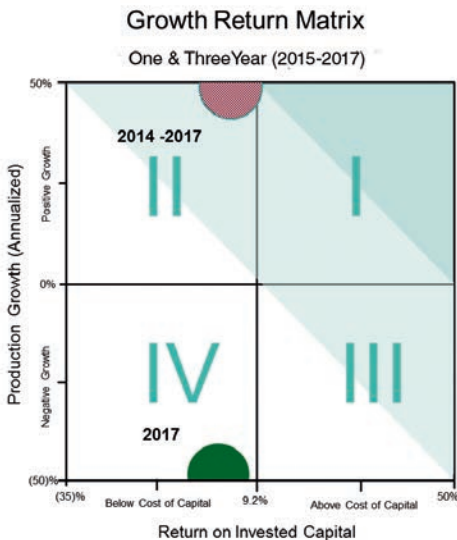


Pareto analysis takes this standard graphical analysis a step further. Pareto analysis uses charts that rank fields from high to low according to the desired metric and then adds in a second axis that graphs the cumulative percentage of the fields as a total of the portfolio. Pareto charting can be very valuable when presenting oil and gas cash flow measures, such as total operating expenses, operational cash flow, and free cash flow. This chart does not work with metrics and ratios, but only with measures that can be added cumulatively.

Figure 17-3 is an example of a Pareto chart. In this case, the chart ranks operational cash flow by field and cumulative percentage. This figure shows that two fields are responsible for 84% of the portfolio's cash flow. This example is very simple, but when a portfolio contains dozens of oil and gas assets, a Pareto chart can be remarkably beneficial.

## Growth Return Analysis

The Growth/Returns Matrix presented in Chapter 14 is a very powerful method that can quickly demonstrate which assets are creating and destroying value. When using a growth/returns matrix to analyze a portfolio, it is highly recommended that current performance be charted and presented along with historical performance. An example is provided in Figure 17-4. This approach prevents the analysis from being conducted in a “silo” and allows performance trends to be viewed over time. Finally, it is very important to account for any significant changes in oil and gas prices over time as these may have significant impacts on returns and are not captured in the graph alone.



**Fig. 17-4.** Portfolio Growth Return Matrix

### Free Cash Flow Margin Analysis

Like the growth return matrix, this form of analysis compares production growth with free cash flow margin. Free Cash Flow Margin is the percentage calculation of free cash flow over revenue and may be positive or negative. When plotted against production growth, a very telling picture can quickly be seen (Figure 17-5).

Fields with negative free cash flow margin, especially over time, can destroy value. With the exception of those in early stages of long-term development such as deepwater projects, oil sands, and forms of tertiary EOR, fields with both negative free cash flow and falling production are destroying value. By plotting individual fields on a FCFM/growth matrix, as well as plotting the portfolio as a whole, significant performance information can quickly be gleaned. However, as with the growth/returns matrix, this analysis should not be conducted using a single time slice and the price of oil and gas must be considered in the final analysis.

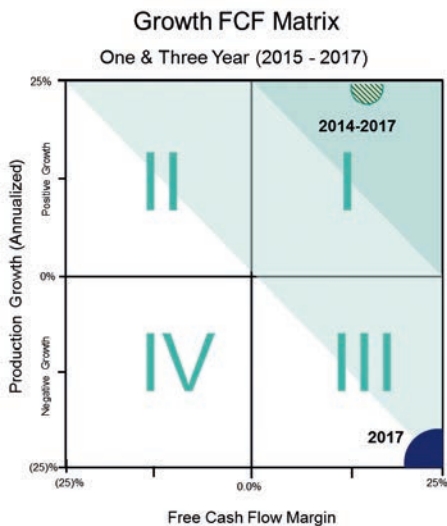


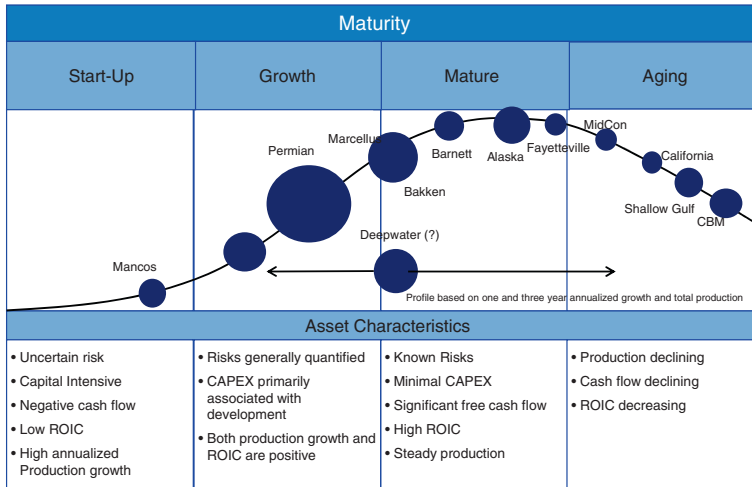
Fig. 17-5. Portfolio Growth Free Cash Flow Matrix

### Life Cycle Analysis

Although Life Cycle Analysis is qualitative in nature, it can be quite useful in a portfolio analysis. As seen in Figure 17-6, a life cycle diagram can be used to graphically determine if a portfolio is aligned with corporate objectives. A balanced company seeks a portfolio of oil and gas fields that are spread across the life cycle continuum, with mature cash-generating assets funding the growth of start-up and growth assets.

Companies with a focus on cash returns and dividends may seek a portfolio weighted towards the mature end of the scale. Other companies, such as start-ups and those backed by private equity, often load up on growth assets and use debt and other funding

to rapidly grow and increase the value of the assets contained within their portfolio. By plotting the fields within a portfolio, the life cycle diagram can be very useful in determining whether growth levels are matched to strategic goals and expectations.



**Fig. 17-6.** Portfolio Life Cycle Diagram

## SWOT Analysis

Much has been discussed in this book about SWOT Analysis and the benefits it can provide to any form of performance analysis. With portfolio analysis, SWOT analysis can be used to sum up a portfolio. In this manner, it can summarize the strengths and weaknesses of the analysis and demonstrate how these can lead to opportunities or make a portfolio more vulnerable to external threats. It also allows some qualitative aspects of performance analysis to be introduced and can be used to strengthen any recommendations or calls to action.

## Case Study

A simple case study is presented using a portfolio consisting of four oil and gas fields. The data used is representative of real producing oil and gas fields, although some production and cash flow data has been exaggerated for illustrative purposes. The four fields consist of a very profitable dry gas field, an oil field undergoing a significant capital drilling and facility expansion, a mature field in modest decline, and a smaller field with significant performance issues. For brevity's sake, the raw LOS and reserve data will not be presented and the basic performance data and metrics have been calculated and compiled in Figure 17-7.



**Table 17-7.** Portfolio Summary by Field

Performance Summary	Field #1	Field #2	Field #3	Field #4	Portfolio
<b>Operations Summary</b>					
<b>Production (BOEPD)</b>	3 812	4 658	3 275	465	12 210
<b>Oil (bopd)</b>	0	4 648	3 158	187	7 993
<b>Gas (mcf/d)</b>	22 872	0	704	1 668	25 244
<i>YOY production Growth</i>	3,6%	20,2%	-1,5%	-10,2%	7,1%
<i>Three Year CAGR</i>	9,6%	24,2%	-5,1%	-8,8%	7,7%
<b>Revenue</b>	<b>\$17 865 319</b>	<b>\$63 331 092</b>	<b>\$43 501 829</b>	<b>\$4 268 686</b>	<b>\$128 966 926</b>
<b>Operating Expenses</b>	\$10 950 161	\$31 334 133	\$15 684 740	\$2 226 792	\$60 195 826
<b>Operating Profit</b>	<b>\$6 915 159</b>	<b>\$31 996 959</b>	<b>\$27 817 089</b>	<b>\$2 041 894</b>	<b>\$68 771 100</b>
<i>WTI Price</i>	\$40,33	\$40,33	\$40,33	\$40,33	\$40,33
<i>HH Price</i>	\$2,49	\$2,49	\$2,49	\$2,49	\$2,49
<i>Revenue / BOE</i>	\$12,84	\$37,25	\$36,39	\$25,15	\$28,94
<i>OPEX (\$/BOE)</i>	\$7,87	\$18,43	\$13,12	\$13,12	\$14,36
<i>Margin (\$/BOE)</i>	\$4,97	\$18,82	\$23,27	\$12,03	\$14,58
<b>Cash Flow Analysis</b>					
<b>Operating Profit</b>	<b>\$6 915 159</b>	<b>\$31 996 959</b>	<b>\$27 817 089</b>	<b>\$2 041 894</b>	<b>\$68 771 100</b>
<b>Workovers</b>	\$543 000	\$3 245 600	\$2 687 000	\$434 000	\$6 909 600
<b>P&amp;A</b>	\$0	\$0	\$0	\$0	\$0
<b>Operating Cash Flow</b>	<b>\$6 372 159</b>	<b>\$28 751 359</b>	<b>\$25 130 089</b>	<b>\$1 607 894</b>	<b>\$61 861 500</b>
<b>Development Capital</b>	\$2 650 751	\$27 809 000	\$9 345 191	\$2 540 000	42 344 942
<b>Acquisitions</b>	\$0	\$0	\$444	\$0	444
<b>Free Cash Flow</b>	<b>\$3 721 408</b>	<b>\$942 358</b>	<b>\$15 784 454</b>	<b>(\$932 106)</b>	<b>\$19 516 114</b>
<b>ROIC Metrics</b>					
<b>Net Book Value</b>	\$51 478 000	\$397 000 000	\$245 003 200	\$245 003 200	\$938 484 400
<b>One Year (Current) ROIC</b>	12,4%	7,2%	10,3%	0,7%	6,6%
<b>One Year (Current) Category</b>	I	II	III	IV	II
<b>3 Year ROIC</b>	13,2%	12,7%	19,6%	1,3%	11,5%
<b>3 Year Category</b>	I	II	III	IV	I
<b>Reserves</b>					
<b>Reserve Adds (Million BOE)</b>	485	1 525	1 067	117	3 195
<b>YE Reserves Total (Million BOE)</b>	5 769	20 337	14 465	1 541	42 112
<b>RP Ratio</b>	4,1	12,0	12,1	9,1	9,4
<b>F&amp;D Costs</b>	\$5,46	\$18,23	\$8,76	\$21,76	\$13,26
<b>Recycle Ratio</b>	0,9	1,0	2,7	0,6	1,1