The mathematics of oil and the fundamental law of oil arbitrage

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Abstract

In this paper, I describe the mathematics of oil and the fundamental law of oil arbitrage.
The paper ends with "The End"

Introduction

The **mathematics of oil** is different from that of most commodities because oil is also an input to industry. Therefore, the **price** of oil is **neither** as good a **metric nor** as good an **indicator** as the **value** of oil. In this paper, I describe the mathematics of oil and the fundamental law of oil arbitrage.

The mathematics of oil

The mathematics of oil is given by the following five (5) (V) equations:

The oil-wells equation:

$$n(t) = p(t) + q(t) + r(t)$$

The oil quantity equation:

$$Q(t) = R(t) + \sum_{i=1}^{p(t)} T_i(t) + \sum_{j=1}^{q(t)} O_j(t) + \sum_{k=1}^{r(t)} D_k(t)$$

The oil value equation:

$$V(t) = \tilde{V}(t)R(t) + \sum_{i=1}^{p(t)} V_i(t)T_i(t) + \sum_{j=1}^{q(t)} v_j(t)O_j(t) + \sum_{k=1}^{r(t)} \nu_k(t)D_k(t)$$

The oil cost equation:

$$C(t) = \tilde{C}(t)R(t) + \sum_{i=1}^{p(t)} C_i(t)T_i(t) + \sum_{j=1}^{q(t)} c_j(t)O_j(t) + \sum_{k=1}^{r(t)} \chi_k(t)D_k(t)$$

The oil profit and oil premium equation:

$$\Pi(t) = \frac{V(t)}{1 + r_f(t) + p_o(t)} - C(t)$$

where
$n(t)$ is the **number** of oil-wells
$p(t)$ is the number of **test** oil-wells
$q(t)$ is the number of **operational** oil-wells
$r(t)$ is the number of **depleted** oil-wells
$Q(t)$ is the **quantity** of oil
$R(t)$ is the **reserve** of oil
$V(t)$ is the **value** of oil
$C(t)$ is the **cost** of oil
$\Pi(t)$ is the **profit** from oil
$\tilde{V}(t)$ is the **average value** of the oil reserve
$\tilde{C}(t)$ is the **average cost** of the oil reserve

$T_i(t)$ the **quantity of oil** from the i^{th} test oil-well
$O_j(t)$ the **quantity of oil** from the j^{th} operational oil-well
$D_k(t)$ the **quantity of oil** from the k^{th} depleted oil-well
$V_i(t)$ is the **value by quantity** of the i^{th} test oil-well
$v_j(t)$ is the **value by quantity** of the j^{th} operational oil-well
$\nu_k(t)$ is the **value by quantity** of the k^{th} depleted oil-well
$C_i(t)$ the **cost by quantity** of the i^{th} test oil-well
$c_j(t)$ the **cost by quantity** of the j^{th} operational oil-well
$\chi_k(t)$ is the **cost by quantity** of the k^{th} depleted oil-well
$r_f(t)$ is the **risk-free rate**
$p_o(t)$ is the **oil premium**

The fundamental law of oil arbitrage

The fundamental law of oil arbitrage is

$$\forall\ t,\ \ p_o(t) = \frac{V(t)}{\Pi(t) + C(t)} - 1 - r_f(t) \geq 0$$

The End