

Statistical Programming Languages (SPL): United States Oil Company Analysis

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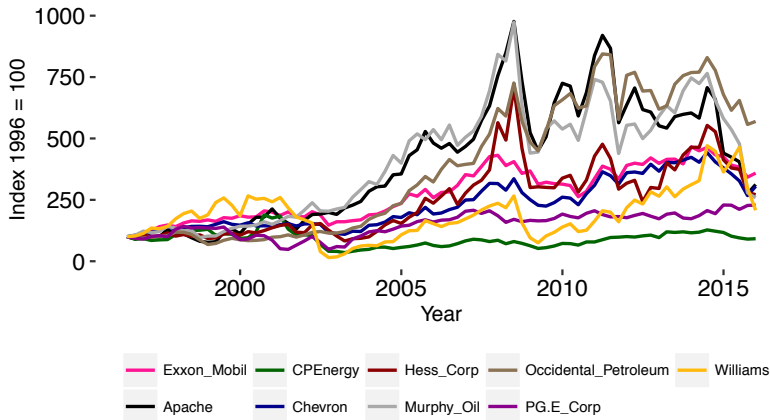


Outline

1. Introduction
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3. Exploratory Analysis: Plots & Graphics
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Stock Returns: US Oil-Companies



Companies in the Sample

Company	Remark
Chevron	
Exxon Mobil	
Apache	
Hess Corp	
Occidental Petroleum	
Murphy Oil	
CPEnergy	(*)
PGE Corp	(*)
Williams Cos, Inc.	(**)

note: (*) utility sector; (**) EDA-Case

Table 1: Sample Companies



Model Environment

- Bianconi/Yoshino (2014), Boyer/Filion (2006)
 - ▶ framework adaptation
- Theory: Capital Asset Pricing Model (CAPM)
 - ▶ assumptions include frictionless (financial) markets & symmetric information
- Model: Panel Data Regression

$$R_{it} = \beta_0^{oil} + O'_{it}\beta_1^{oil} + B'_{it}\beta_2^{oil} + M'_{it}\beta_3^{oil} + E'_{it}\beta_4^{oil} + \varepsilon_{it} \quad (1)$$

- Data source: Bloomberg



Data Source [raw]: Bloomberg

- Data source [raw]: Bloomberg
- Dataset issues addressed:
 - ▶ class of data variable-dependent (e.g. date, returns)
 - ▶ common data vary over time
 - ▶ specific data vary over both time & company



Transformations applied on Variables

Table 2: Variables by Transformation Mode

log return	z-score	log
Stock	NI	A.MCAP
Oil	BVE.MCAP	D.MCAP
Gas		
Market(*)		
EX(**)		

(*): Dow Jones Industrial Average (DJI)

(**): USD wrt. EUR, GBP, ...



Distress Case, Firm 9: Williams

Firm 9: <i>Williams</i>	μ	σ	Min	Max
Stock	23.39	12.05	1.85	58.21
A.MCAP	3.01	4.63	0.80	30.73
BVE.MCAP	0.66	0.70	0.13	4.96
D.MCAP [%]	151.40	58.77	85.06	337.28
NI	68.53	350.20	-1263.00	1678.00

Table 3: Exploratory data analysis - event detection

```
1 # Summary statistics of company-specific variables
2 SumSpecF = describeBy(data[,2:7], group = "Company",
3                       mat = TRUE, digits = 2,
4                       trim = 0, type = 1)
```



Distress Case, Firm 9: Williams

- Williams close to bankruptcy around 2002-2003

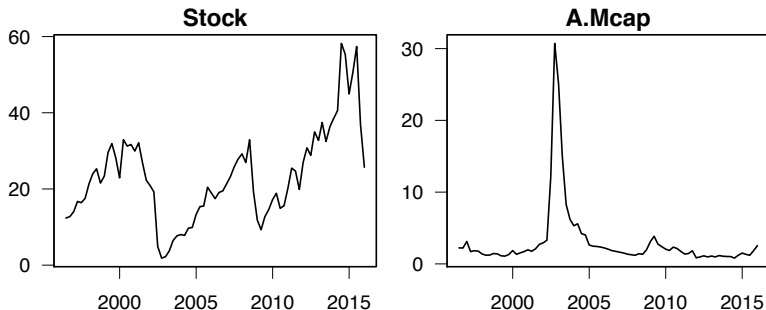


Figure 1: Financial Distress Case of C9: Williams



Panel Regression: Main Results

Table 4: Panel Data Regression: Random Effects Model

Variable	β	
(Intercept)	0.01	
NI	0.01	**
BVE.MCAP	-0.04	***
D.MCAP	0.00	
Oil	0.26	***
Gas	0.07	***
Market	0.72	***

note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

adj. $R^2 = 0.40$



Random Effects Model: Regression Output

- Oil and gas price have robust positive effect on stock prices
 - ▶ higher prices indicate presence of a profitable environment for oil companies
- Exposure of stock prices to the U.S. DJI market premium is robustly priced and positive
 - ▶ energy consumption is related to overall economic situation
- Non-systematic risk factors are robustly priced



Application Result: By Company Type

□ A comparison of the impact of common factors on:

- ▶ Oil- / Gas-producing
- ▶ Electricity-producing

$$R_{it} = \beta_0^{oil} + O'_{it}\beta_1^{oil} + B'_{it}\beta_2^{oil} + M'_{it}\beta_3^{oil} + E'_{it}\beta_4^{oil} + \varepsilon_{it} \quad (2)$$

$$R_{it} = \beta_0^{elec} + O'_{it}\beta_1^{elec} + B'_{it}\beta_2^{elec} + M'_{it}\beta_3^{elec} + E'_{it}\beta_4^{elec} + \varepsilon_{it} \quad (3)$$

$$R_{it} = \beta_0 + O'_{it}\beta_1 + [...] + D^{elec}\beta_5 + D^{elec}O'_{it}\beta_6 + [...] + D^{elec}E'_{it}\beta_9 + \varepsilon_{it} \quad (4)$$



Random Effects Models: Company Types

- $\beta^{(1)}$: Oil-based Model
- $\beta^{(2)}$: Utility-based Model

Table 5: Random Effect Model depending on Company type

Variable	$\beta^{(1)}$		$\beta^{(2)}$	
(Intercept)	0.02	***	0.01	
Oil	0.31	***	-0.10	*
Gas	0.07	***	0.10	**
Market	0.68	***	0.60	***
EURUSD	0.03		-0.02	

adj. $R^2 = 0.32$ adj. $R^2 = 0.14$

note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$



Further Applications

- Seasonality Effects
- Impact of the financial crisis around 2008
 - ▶ subsample and dummy test performed



Bibliography



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