Reserves replacement and oil and gas company shareholder returns

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Background

- Oil&gas reserves are the most important assets that oil companies own
- Represent future production and cash flow
- A major driver of company market value
- Reserves replacement is essential
- Important information for investors and analysts

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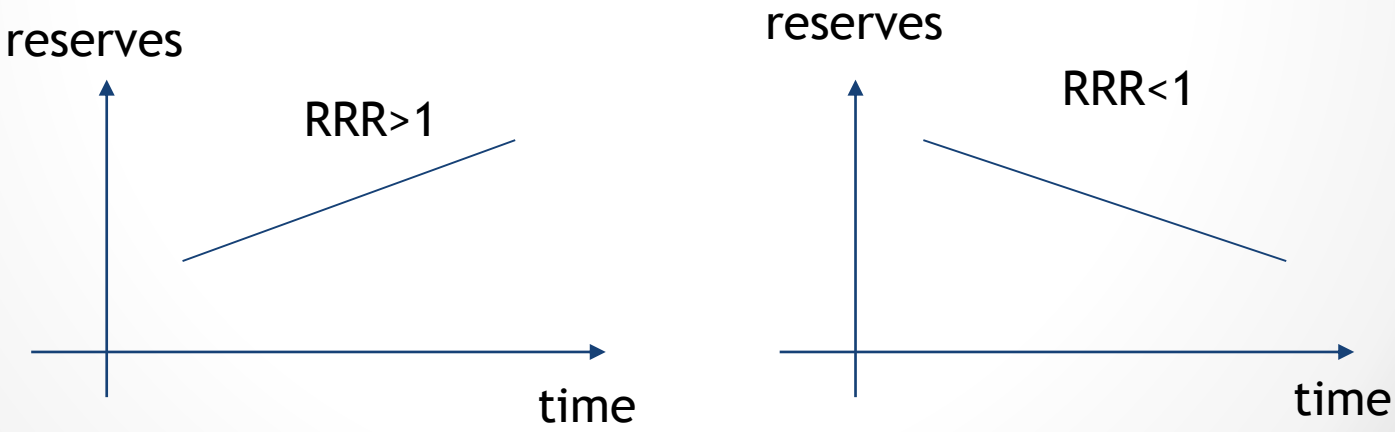
Reserves replacement ratio

$$Reserve\ replacement = \frac{Reserve\ additions}{Production}$$



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What are the sources of reserves replacement?

- Reserves beginning of year
- + Revisions
- + Improved recovery
- + Extensions and discoveries
- + Purchases
- - Sales
- - Production
- = Reserves end of year

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Research question

- Studies examining impact of reserves on value/returns
  - Aggregate reserves or aggregate changes in reserves (Clinch & Magliolo 1992; Berry et al. 1998; Scholtens & Wagenaar 2011)
  - Very few examing impact of disaggregate components (e.g. Spear 1994)
  - None examining impact of major changes in commodity prices on the relationship
    - Industry upheaval can have asubstantial impact on the information-valuation relationship (Misund, Asche & Osmundsen 2008)

- Research question
  - Impact of disaggregate changes on returns
    - Organic vs transactions (purchases)?
    - Shale gas revolution?

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Model

$$R_{it} = \alpha_1 + \beta_{1CF} CF_{it} + \beta_{1\Delta CF} \Delta CF_{it} + \beta_{1\Delta OGR} \Delta OGR_{it} + \sum_{j=1}^{6} \beta_{1jcontrol} control_t + \varepsilon_{1it}$$

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Model

$$R_{it} = \alpha_1 + \beta_{1CF} CF_{it} + \beta_{1\Delta CF} \Delta CF_{it} + \beta_{1\Delta OGR} \Delta OGR_{it} + \sum_{j=1}^{6} \beta_{1jcontrol} control_t + \varepsilon_{1it}$$

Total shareholder return
(excess returns)

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Model

Cash flow

$$R_{it} = \alpha_1 + \beta_{1CF} CF_{it} + \beta_{1\Delta CF} \Delta CF_{it} + \beta_{1\Delta OGR} \Delta OGR_{it} + \sum_{j=1}^{6} \beta_{1jcontrol} control_t + \varepsilon_{1it}$$

Total shareholder return
(excess returns)

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Model

Cash flow

Control variables (oil, gas, Fama-French-Carhart)

$$R_{it} = \alpha_1 + \beta_{1CF} CF_{it} + \beta_{1\Delta CF} \Delta CF_{it} + \beta_{1\Delta OGR} \Delta OGR_{it} + \sum_{j=1}^{6} \beta_{1jcontrol} control_t + \varepsilon_{1it}$$

Total shareholder return (excess returns)

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Model

Cash flow

Control variables (oil, gas, Fama-French-Carhart)

$$R_{it} = \alpha_1 + \beta_{1CF} CF_{it} + \beta_{1\Delta CF} \Delta CF_{it} + \beta_{1\Delta OGR} \Delta OGR_{it} + \sum_{j=1}^{6} \beta_{1jcontrol} control_t + \varepsilon_{1it}$$

Total shareholder return (excess returns)

Oil and gas reserves variable

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Oil and gas variable forms

Model 1

$$\Delta OGR_{it} = \frac{OGR_{it} - OGR_{it-1}}{OGR_{it-1}}$$

Model 2

$$\Delta OGR_{it} = \Delta OGR_{it,OIL} + \Delta OGR_{it,GAS}$$

Model 3

$$\Delta OGR_{it} = \Delta OGR_{it,IMP} + \Delta OGR_{it,REV} + \Delta OGR_{it,DISC} + \Delta OGR_{it,BUY} + \Delta OGR_{it,SALE} + \Delta OGR_{it,PROD}$$

Model 4

$$\Delta OGR_{it} = \Delta OGR_{it,OIL-IMP} + \Delta OGR_{it,OIL-REV} + \Delta OGR_{it,OIL-DISC} + \Delta OGR_{it,OIL-BUY} + \Delta OGR_{it,OIL-SALE} + \Delta OGR_{it,OIL-PROD} + \Delta OGR_{it,GAS-IMP} + \Delta OGR_{it,GAS-REV} + \Delta OGR_{it,GAS-DISC} + \Delta OGR_{it,GAS-BUY} + \Delta OGR_{it,GAS-SALE} + \Delta OGR_{it,GAS-PROD}$$

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Hypotheses

- Hypothesis 1: Organic growth vs. Acquisitions
- Hypothesis 2: Gas vs. Oil
- Hypothesis 3: Structural shift: Shale gas revolution?

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Data

- Accounting & Reserves data: Herold database (www.ihs.com/herold)
  - Data 1992 – 2013
  - 4218 firm-year observations
- Returns: Datastream
- Fama-French-Carhart: Ken French' database
- Oil and Gas: Front month prices
- All variables are yearly

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Results (1)

Coefficient	Model 1	Model 2	Model 3
ΔBOE	0.161***		
ΔBOE_{OIL}		0.083***	
ΔBOE_{GAS}		0.274***	
ΔBOE_{REV}			0.114***
ΔBOE_{IMP}			-0.113
ΔBOE_{DISC}			0.165***
ΔBOE_{BUY}			0.167***
ΔBOE_{SELL}			0.041
ΔBOE_{PROD}			0.217

Oil vs gas: Null hypothesis of same coefficient rejected

Organic vs. purchase: Null hypothesis of same coefficient not rejected

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Results (2)

Coefficient	Model 4	Shale: Pre-2008	Shale: Post-2008
$\Delta BOE_{OIL-REV}$	0.061	0.044	0.151
$\Delta BOE_{OIL-IMP}$	-0.107	-0.502	0.445
$\Delta BOE_{OIL-DISC}$	0.127*	0.101	0.104
$\Delta BOE_{OIL-BUY}$	0.065***	0.081**	-0.044
$\Delta BOE_{OIL-SALE}$	0.144	0.155	-0.022
$\Delta BOE_{OIL-PROD}$	0.691*	0.849**	-0.566
$\Delta BOE_{GAS-REV}$	0.244**	0.065	0.566***
$\Delta BOE_{GAS-IMP}$	-0.205	-0.289	0.829**
$\Delta BOE_{GAS-DISC}$	0.252***	0.268***	-0.167
$\Delta BOE_{GAS-BUY}$	0.381***	0.336***	0.412*
$\Delta BOE_{GAS-SALE}$	-0.001	0.100	-0.542
$\Delta BOE_{GAS-PROD}$	0.197	0.187	-0.024

Reject null hypothesis of no structural break

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Limitations & further work

- Only proved reserves
- Excludes events since 2014
- Interaction between reserves and commodity prices
- Effect of company size & type of oil&gas company

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References

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