

# The Effect of Oil Price on Field Production

## Evidence from the Norwegian Continental Shelf

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- ▶ Effect of Price on Drilling / Reserve Replacement
  - ▶ Mohn and Osmundsen (2008), Mohn (2008), Ringlund (2008)
- ▶ Production (Aggregate)
  - ▶ Curve-fitting/Simulation (geo-engineering)
  - ▶ Econometric
    - ▶ Kaufman (1990), Kaufman and Cleveland (2001)
    - ▶ Ramcharan (2002): Negative Price Elasticity (???)

## Generalized Additive Models

- ▶ Hastie and Tibshirani (1990)
- ▶ Wood (2006)

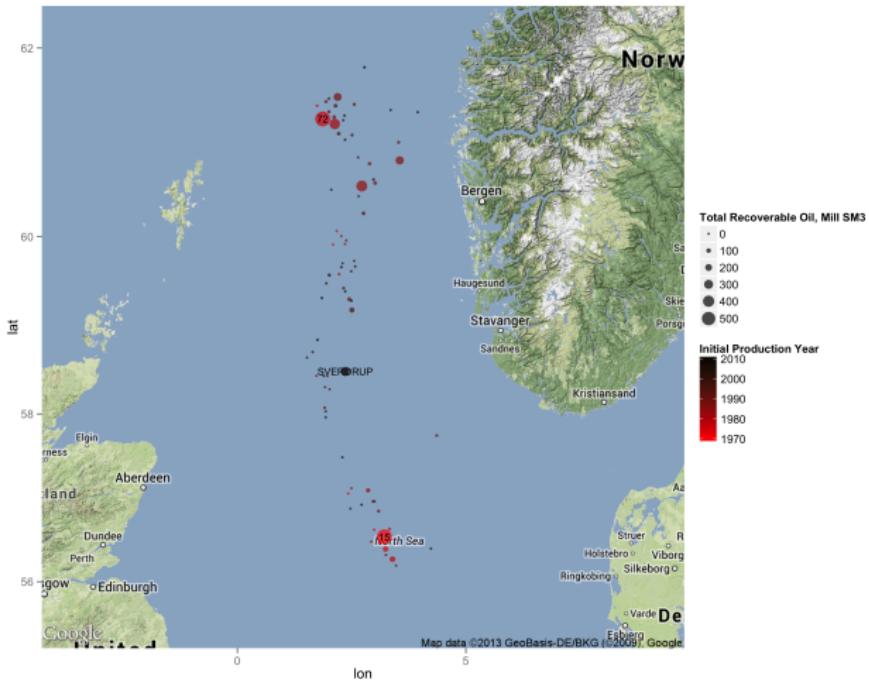


Figure :

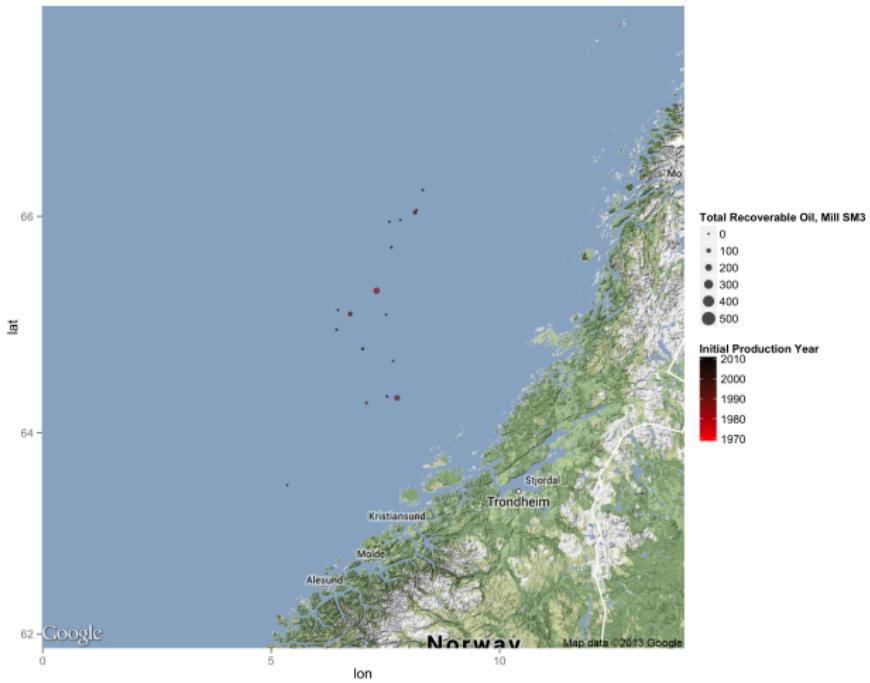


Figure :

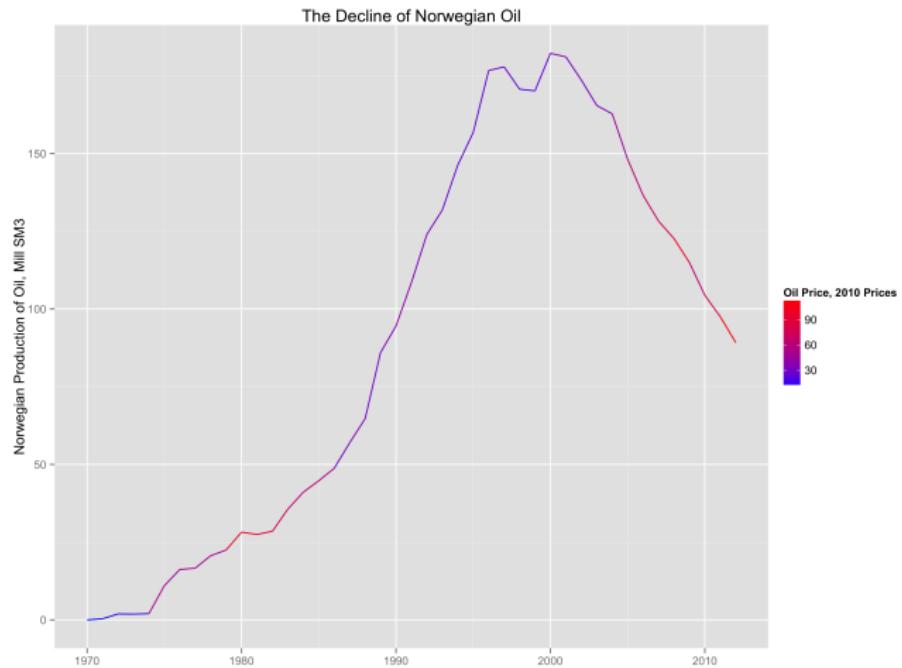


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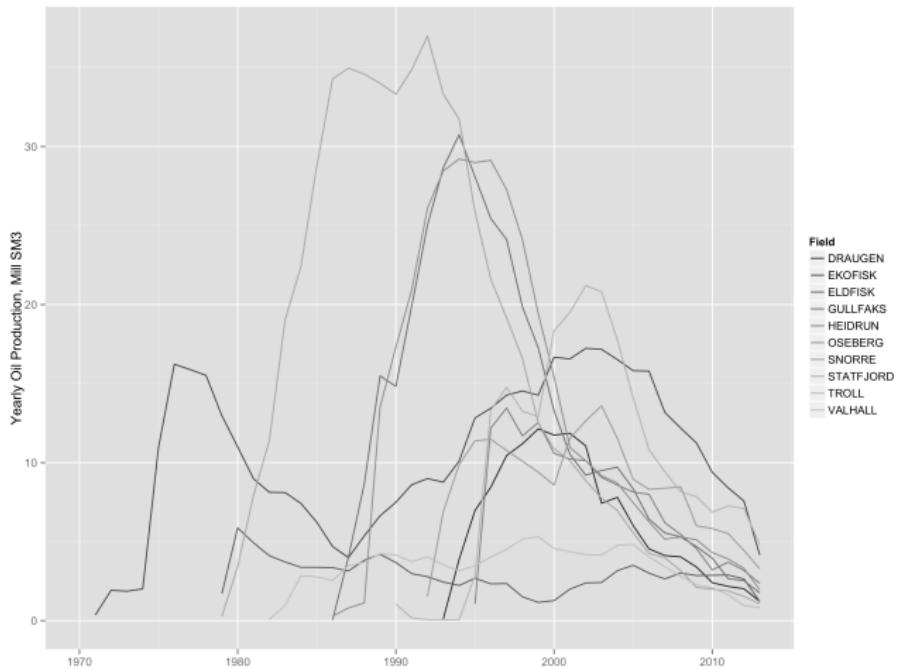


Figure :

$$\begin{aligned} \text{Log}(Production_{i,t}) = & \alpha_0 + \alpha_1 time\_to\_peak_{i,t} + \alpha_2 time\_to\_peak_{i,t}^2 \\ & + \alpha_3 time\_to\_peak_{i,t}^3 + \alpha_4 peak\_to\_end_{i,t} + \alpha_5 peak\_ \\ & + \alpha_6 peak\_to\_end_{i,t}^3 + \gamma total\_recoverable\_oil_i \\ & + \beta_1 oil\_price + \beta_2 oil\_price\_l1 + \dots + \epsilon \end{aligned} \tag{1}$$

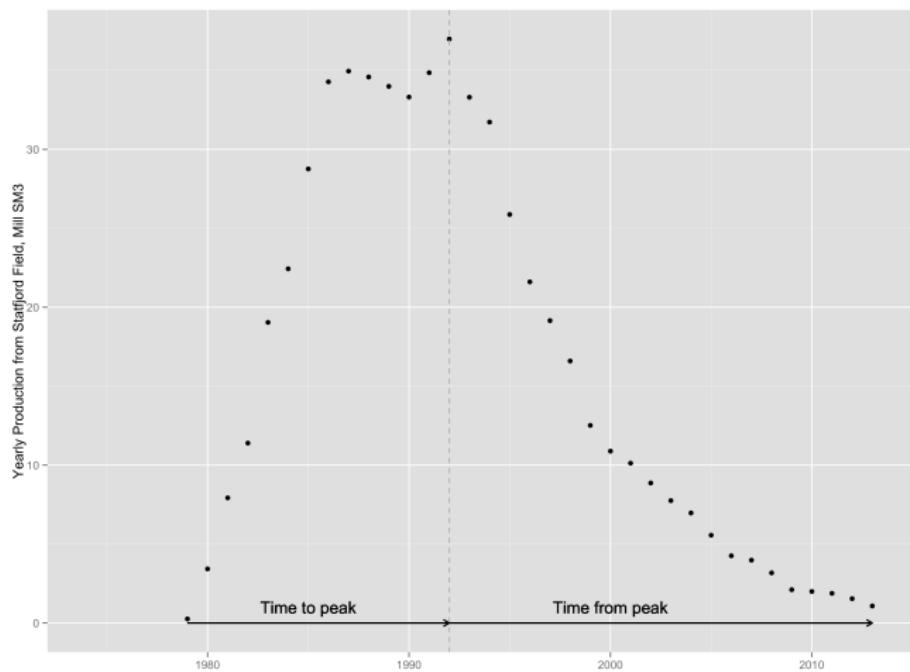


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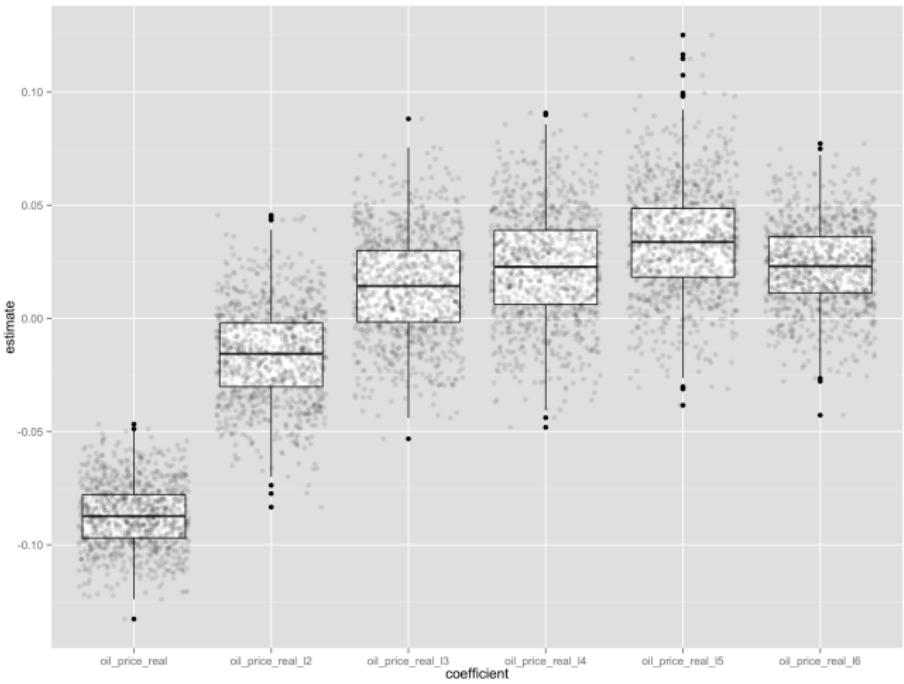


Figure :

$$Production_t = f(\text{time}) + \epsilon \quad (2)$$

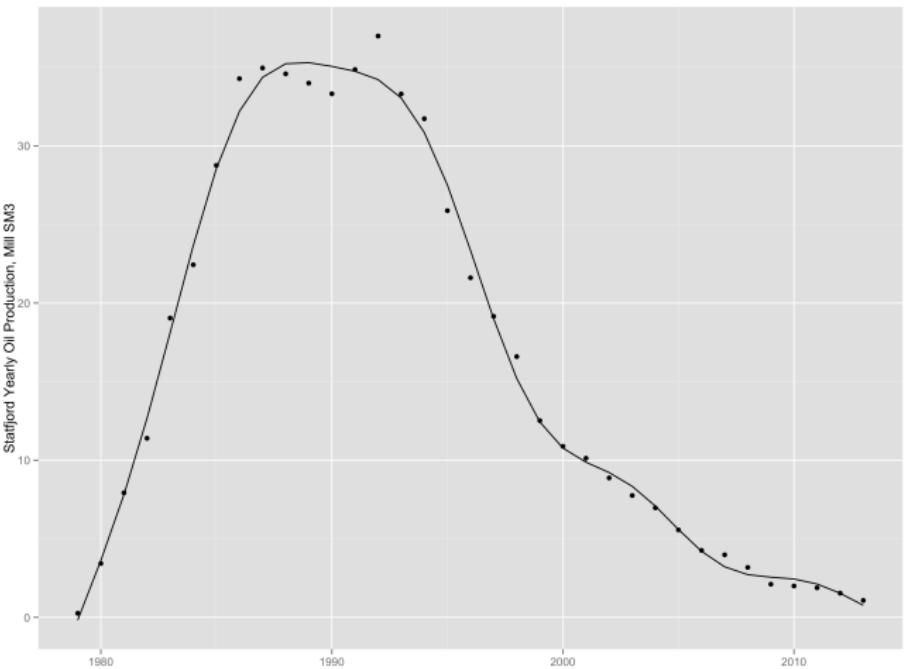


Figure :

$$\begin{aligned} \text{Log}(Production_{i,t}) = & f(\text{time\_to\_peak}_{i,t}, \text{total\_recoverable\_oil}_i) \\ & + f(\text{peak\_to\_end}_{i,t}, \text{total\_recoverable\_oil}_i) \\ & + \beta_1 \text{oil\_price} + \beta_2 \text{oil\_price\_l1} + \dots + \epsilon \end{aligned} \tag{3}$$

## Thin Plate (Regression) Splines (Duchon 1977)

$$y_i = g(x_1, x_2) \quad (4)$$

$$\min \| \mathbf{y} - \mathbf{f} \|^2 + \lambda J_{md}(f) \quad (5)$$

$$J_{22}f = \frac{\partial^2 f}{\partial x_1^2} + \frac{\partial^2 f}{\partial x_1 x_2^2} + \frac{\partial^2 f}{\partial x_2^2} dx_1 dx_2 \quad (6)$$

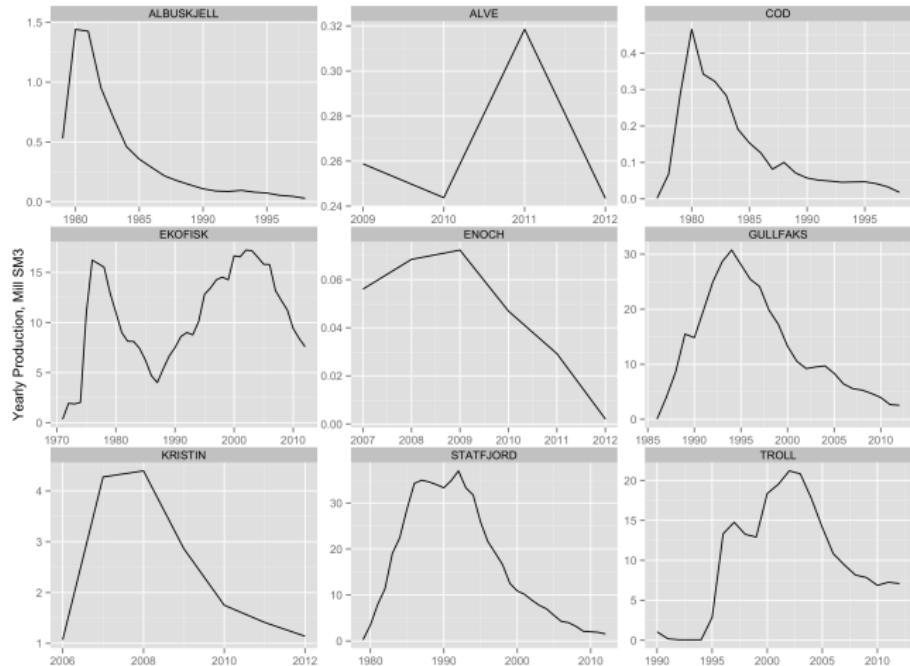
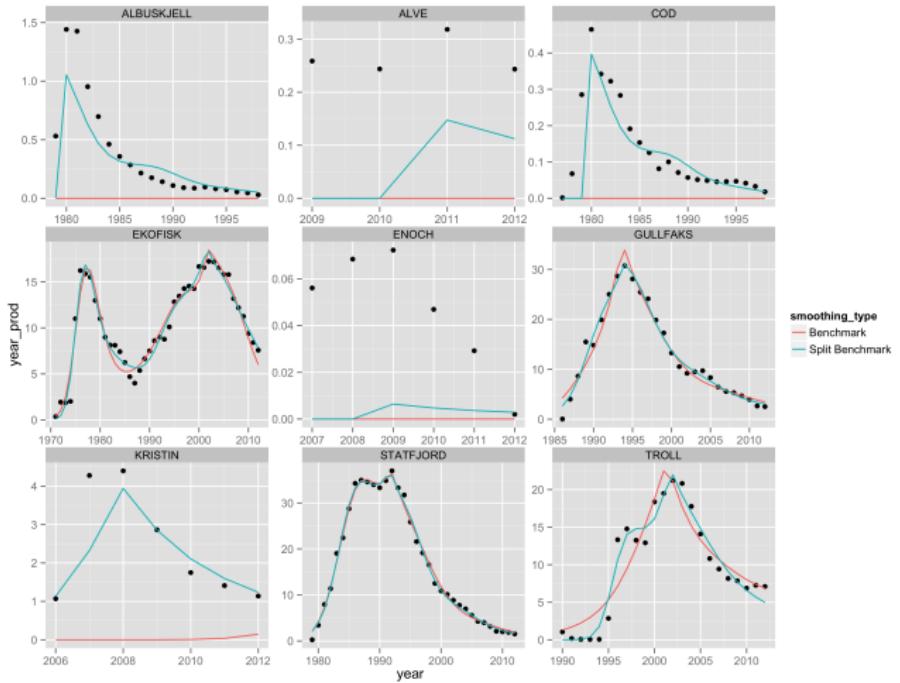


Figure :



## Figure :

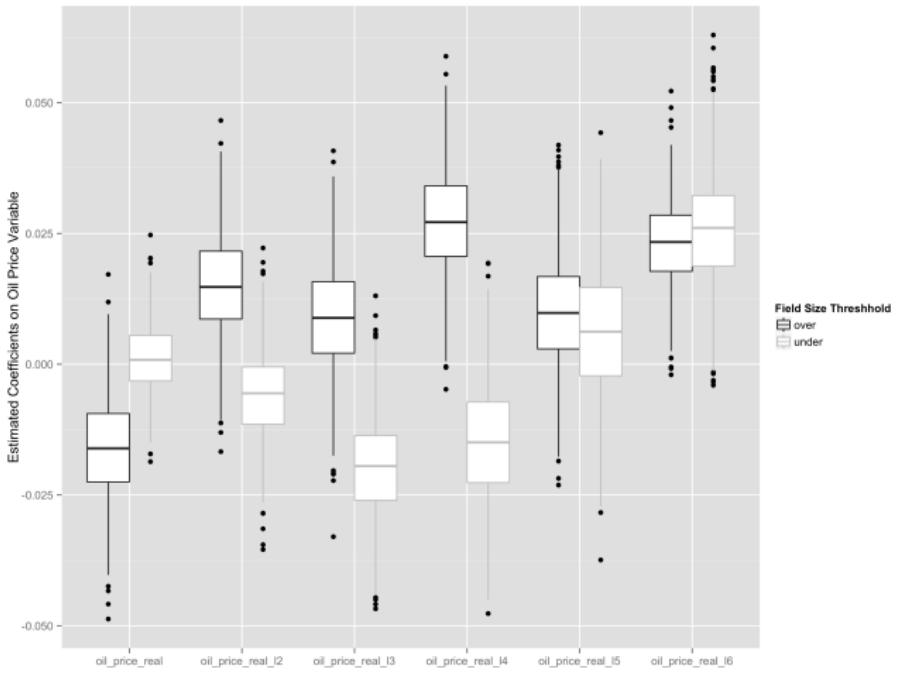


Figure :

$$\begin{aligned} \text{Log}(Investment}_{i,t}) = & f(\text{time\_to\_peak}_{i,t}, \text{total\_recoverable\_oil}_i) \\ & + f(\text{peak\_to\_end}_{i,t}, \text{total\_recoverable\_oil}_i) \\ & + \alpha \text{oil}_p \text{roduction}_{i,t} \\ & + \beta_1 \text{oil\_price} + \beta_2 \text{oil\_price\_l1} + \dots + \epsilon \end{aligned} \tag{7}$$

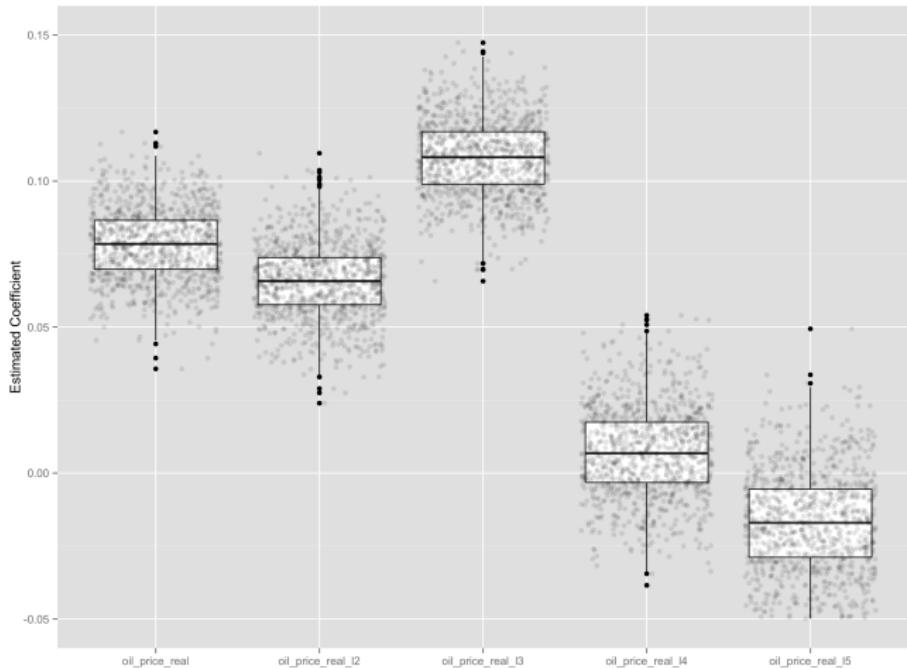


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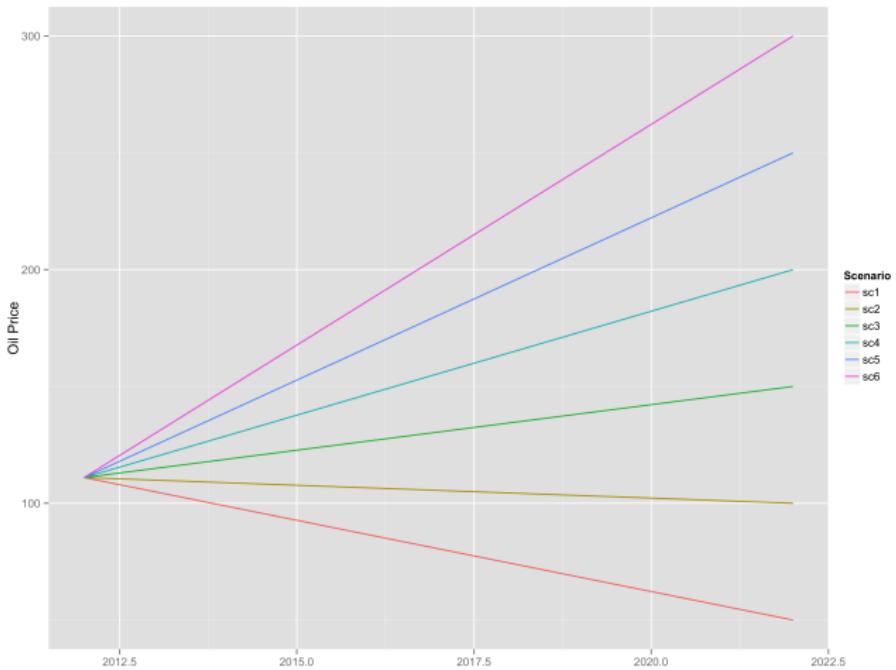


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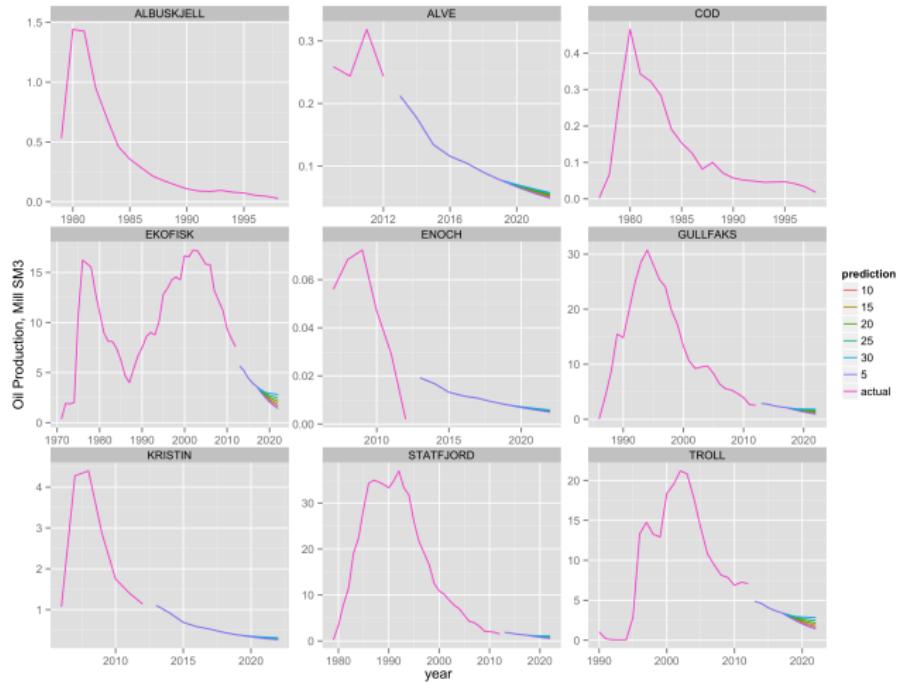


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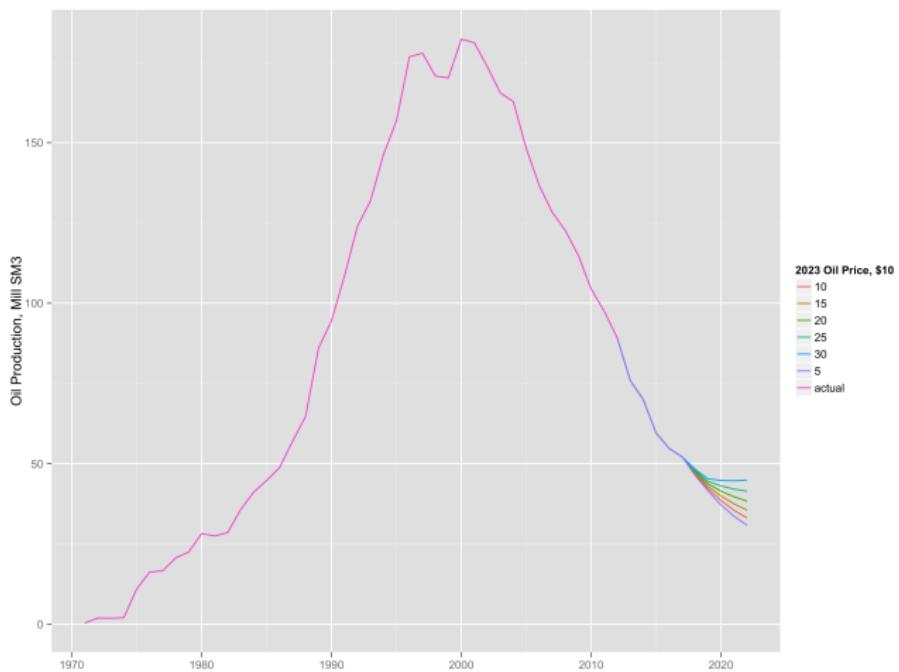
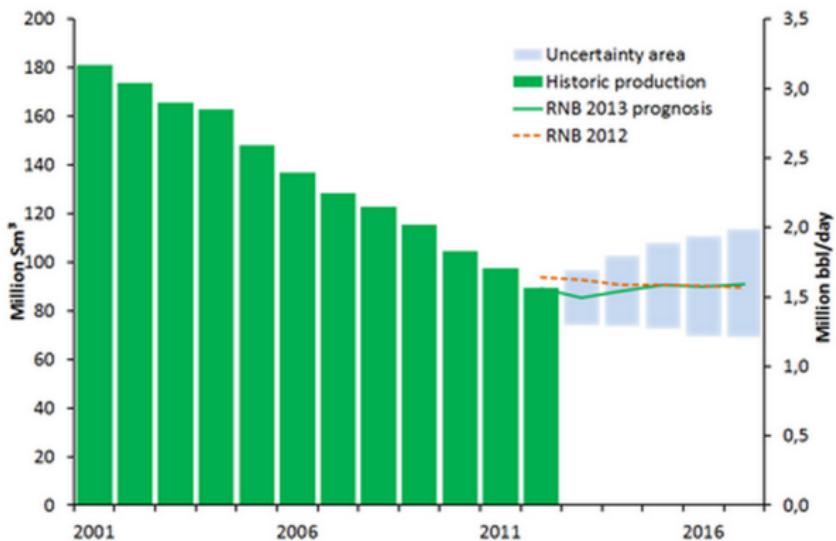


Figure :



**Figure 3.** Uncertainty in future oil production.

Figure :