Trends in fish price volatility: Icelandic whitefish

Erlendur Jonsson, Roy Endré Dahl and Frank Asche

Department of Industrial Economics
Universitetet i Stavanger
uis.no

05.04.2017

Universitetet
i Stavanger

Introduction

- Seafood production, supply chains and markets have changed substantially in recent years
- Improved management systems has allowed better control in the supply chain and more tools from other food markets are used to increase value
- In Iceland, ITQs fundamentally changed the supply chain
  - Before ITQs, fishers maximised their share of the catch and processors/exporters had to make the best out of low quality seafood. Mostly produced low quality storable products
  - Now, better control of harvest allow more valuable markets and product forms to be targeted, particularly for valuable species like cod

Introduction

- With better control of production, one can also optimize among more margins (Smith, 2012)
- One of these dimensions is price risk (or price volatility)
- The volatility is transferred throughout the value chain, affecting stability of pricing at its final destination in retail

Introduction

- Until recently there has been limited attention to price volatility
- Recent studies show that prices in seafood markets are volatile:
  - Oglend (2013)
  - Asche et al. (2015)
  - Dahl (2017)
  - Dahl and Oglend (2014)
  - Bloznelis (2016)
- In this paper we study recent trends in fish price volatility and compare findings to previous studies in aquaculture and fisheries.

Universitetet i Stavanger

Data

- Monthly weighted averages prices of gutted fish based in domestic market trade. From January 2000 to November 2015. Data gathered from the Icelandic Directorate of Fisheries. 191 observation per series.
- Daily prices from January 2002 desember. 3886 observations per series.
- Icelandic data is ISK/kg and EU data is EUR/kg

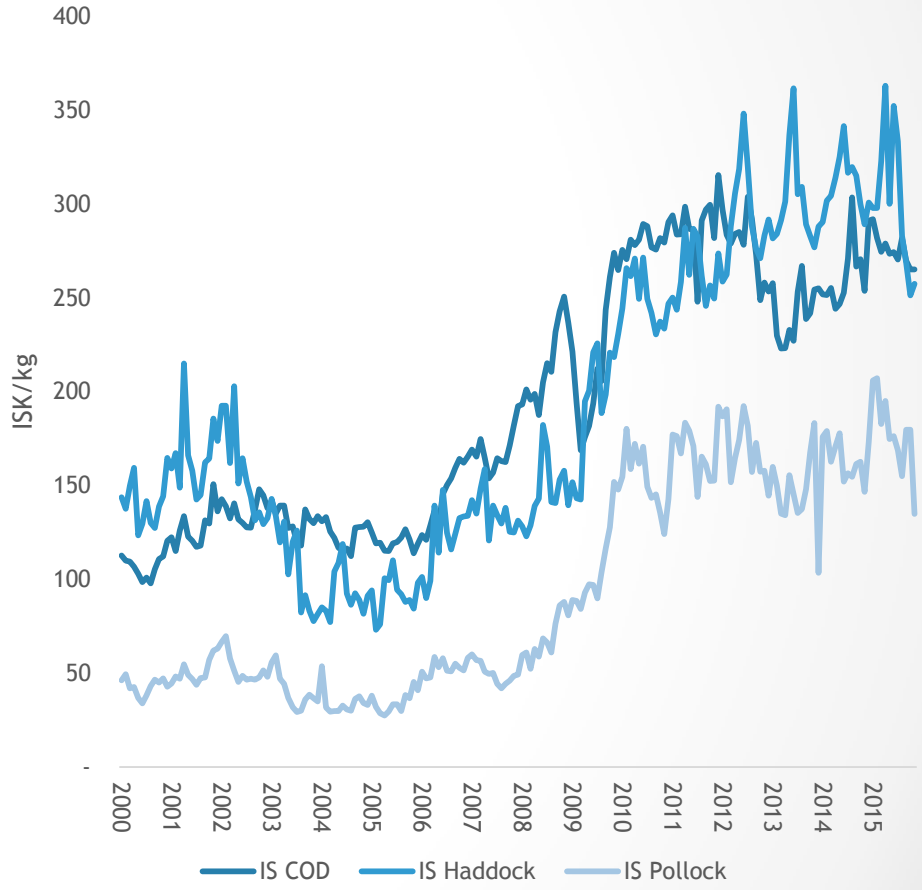


Figure 1. Monthly prices from 2000-2015

Universitetet i Stavanger

Initial Analysis of Volatility

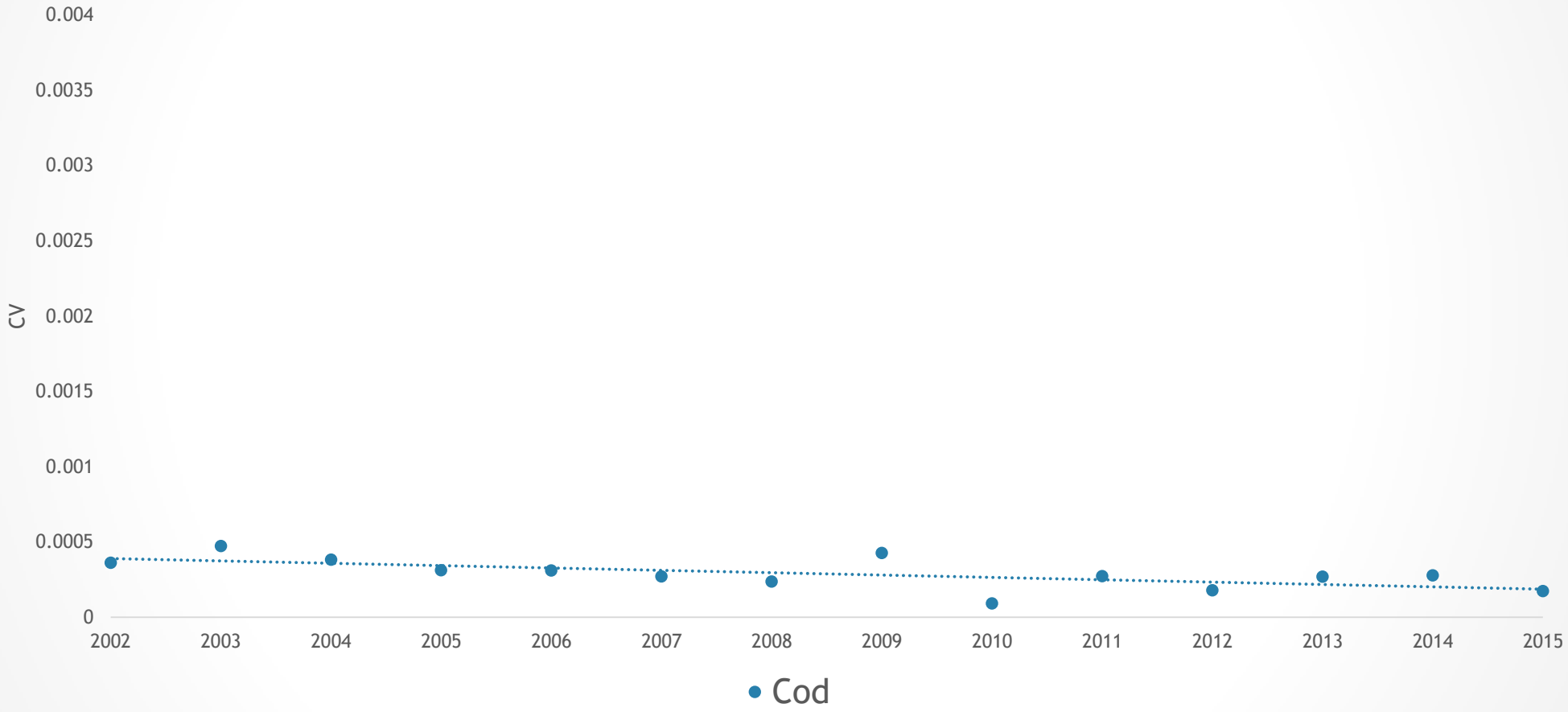


Figure 3 - Coefficient of variation of monthly price returns

Universitetet i Stavanger

Initial Analysis of Volatility

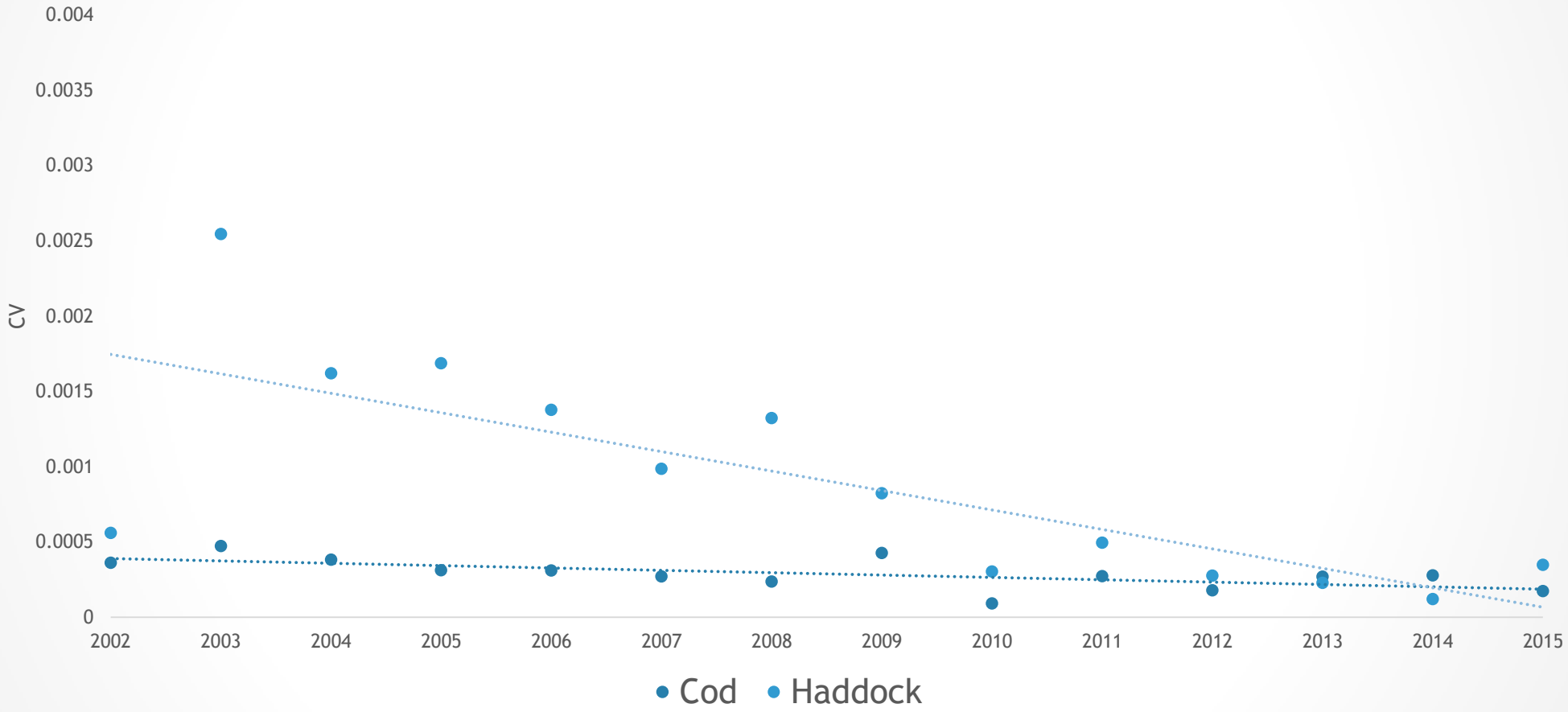


Figure 3 Coefficient of variation of monthly price returns

Universitetet i Stavanger

Initial Analysis of Volatility

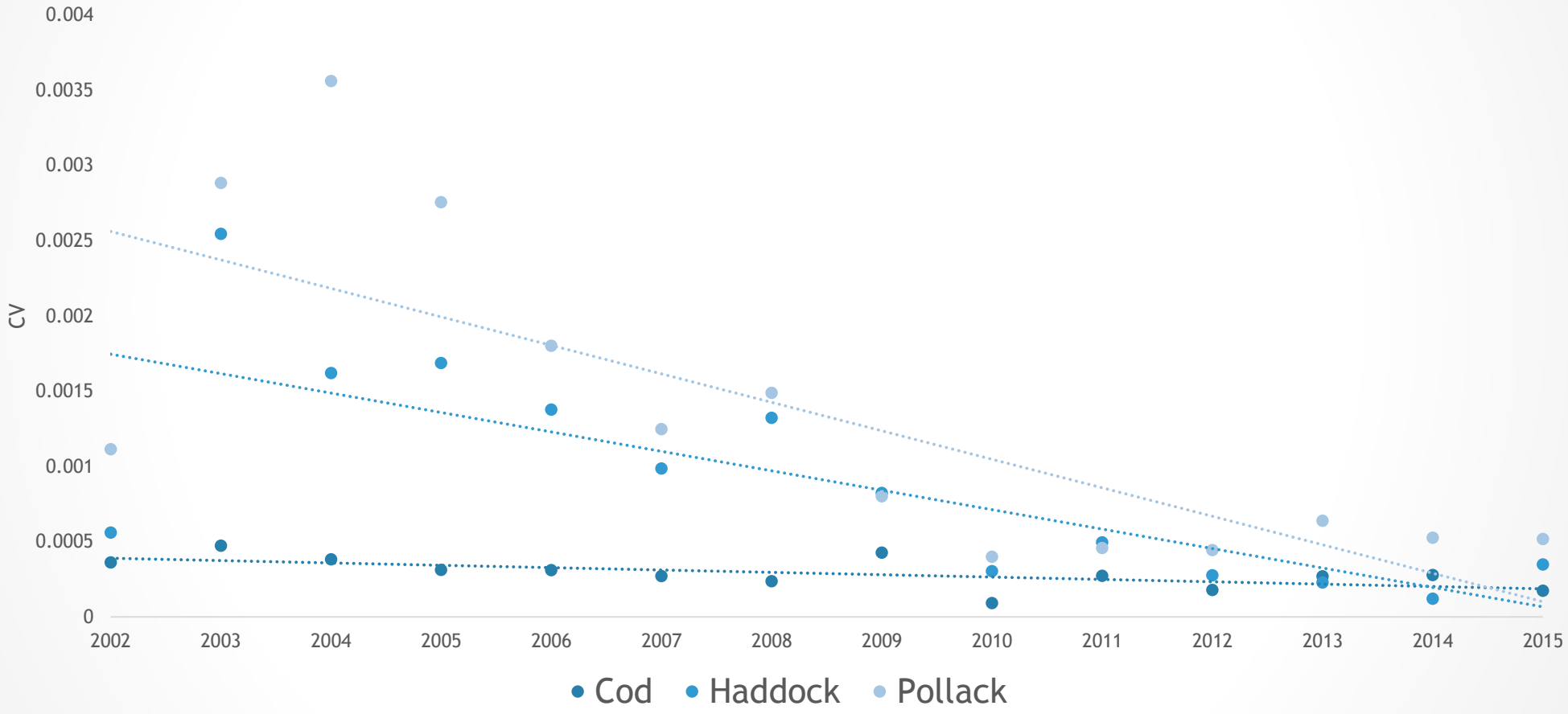


Figure 3 Coefficient of variation of monthly price returns

Universitetet i Stavanger

Initial analysis of Volatility

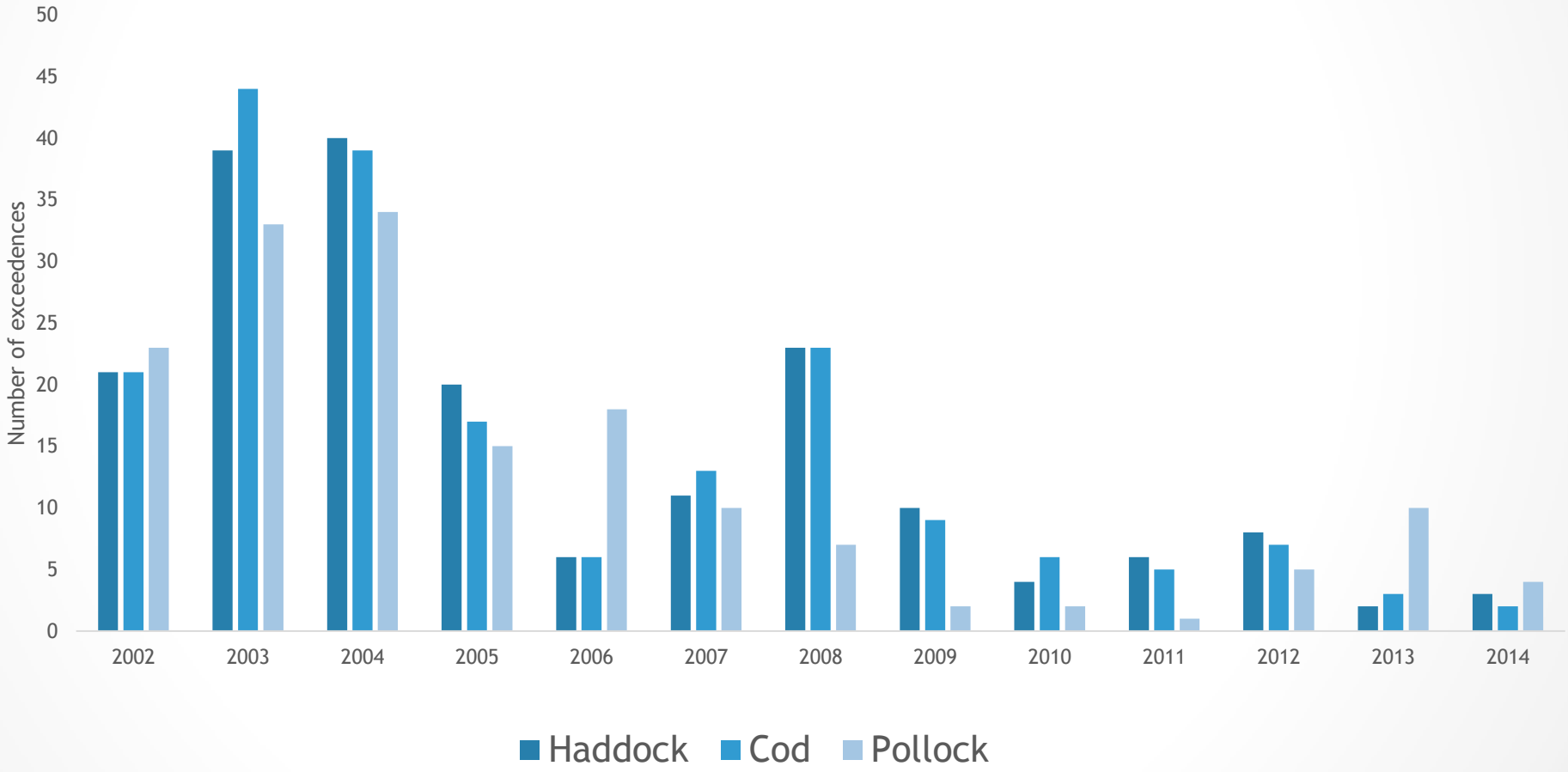


Figure 4 - Number of exceedences over average return 2x standard deviation

Universitetet i Stavanger

Initial analysis - Catch

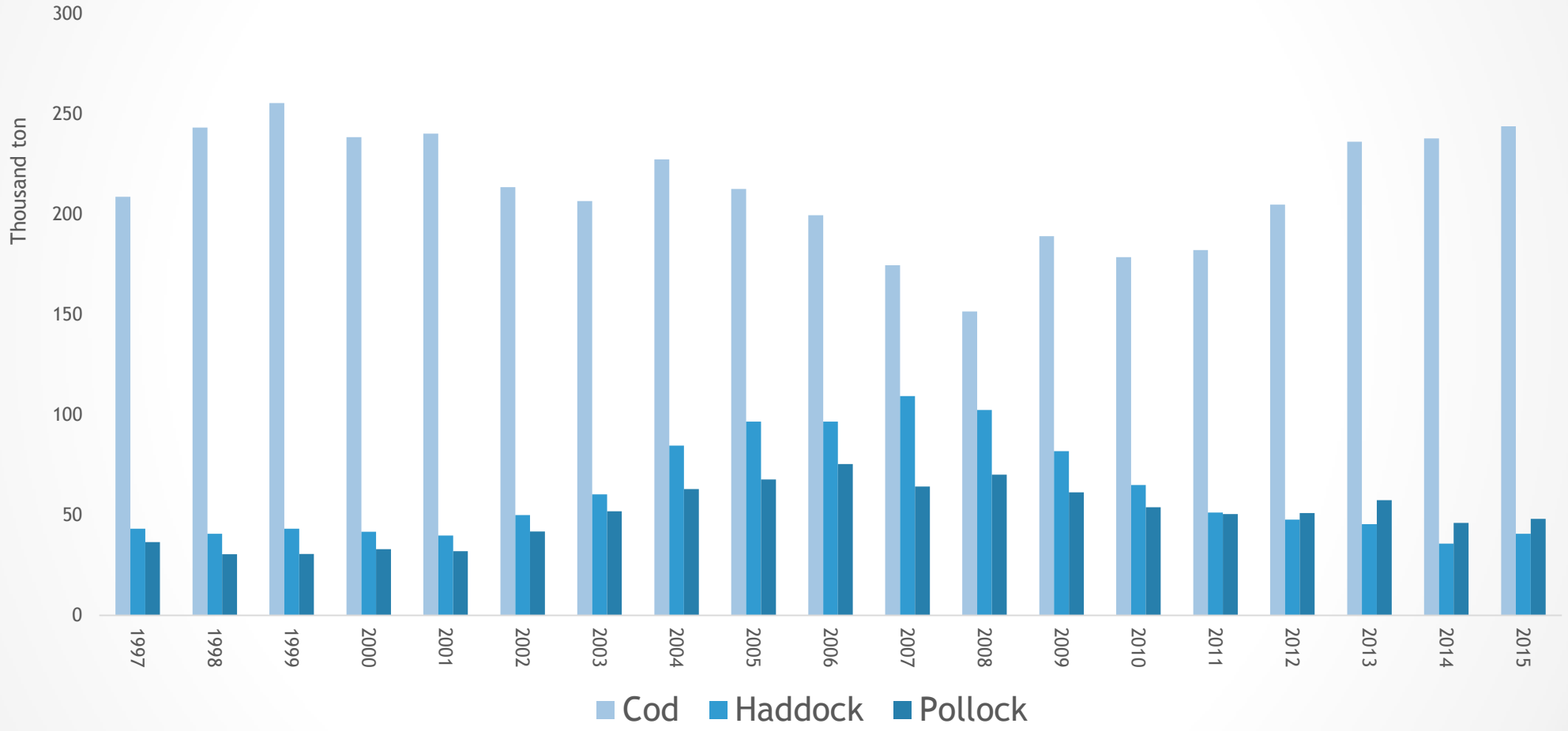


Figure 5 - Total catch in the period 1997-2015

Universitetet i Stavanger

Regime shifts in volatility

- We use a test introduced by Inclan and Tiao (2004) to test stuctural breaks in return volatility
- A regime test implies that haddock and pollock have experiences reduction in volatility over the period

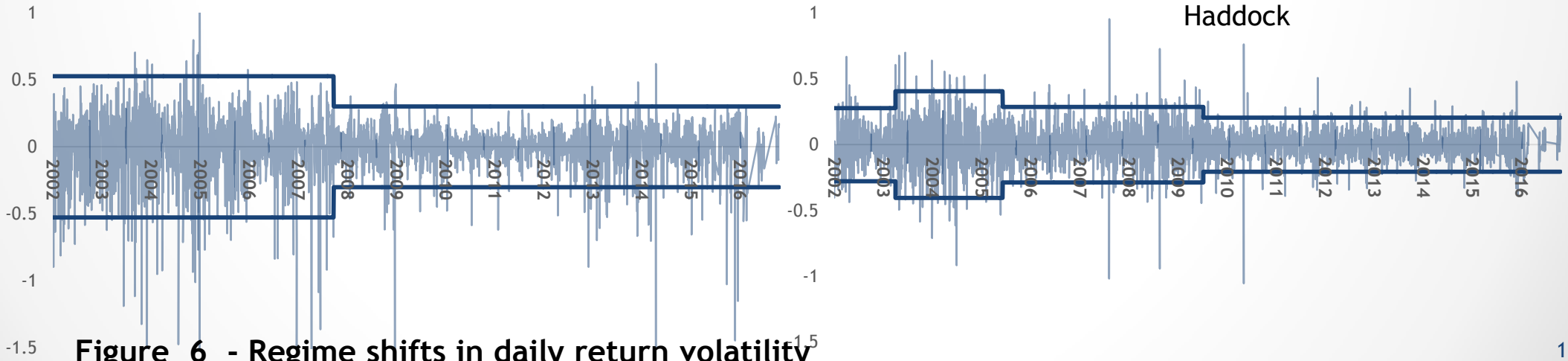


Figure 6 - Regime shifts in daily return volatility

Universitetet i Stavanger

Method to estimate volatility

- The return is calculated as $\Delta p_t = \ln\left(\frac{p_t}{p_{t-1}}\right)$

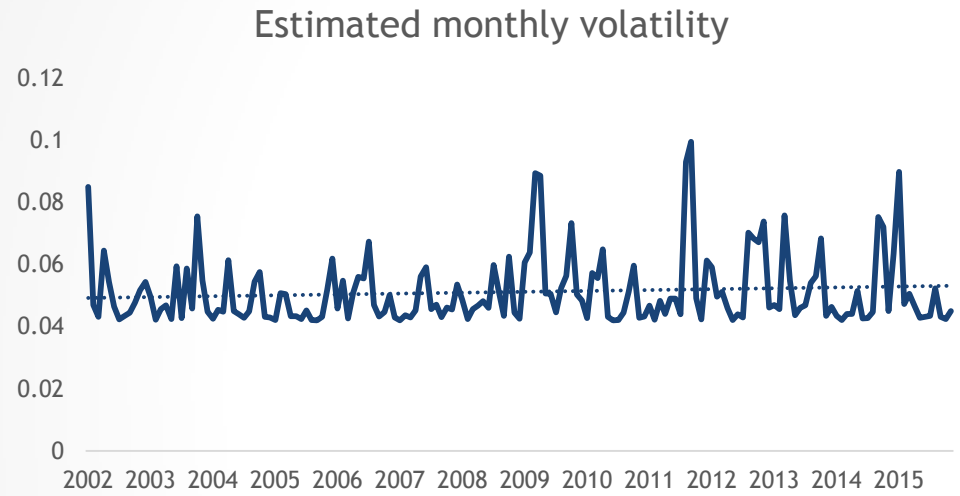
- We apply univariate GARCH(1,1) to estimate volatility and the following mean equation

$$\Delta p_t = \mu + seas_t + \gamma_0 p_{t-1} + \sum_{k=1}^{k} \gamma_n \Delta\, p_{t-i} + \sigma_t \varepsilon_t$$

$$\sigma^2 = \sum_{l=1}^{m} \alpha_l \varepsilon_{t-1}^2 + \sum_{n=1}^{p} \beta_n \sigma_{t-n}^2$$

Universitetet i Stavanger

Empirical result - COD

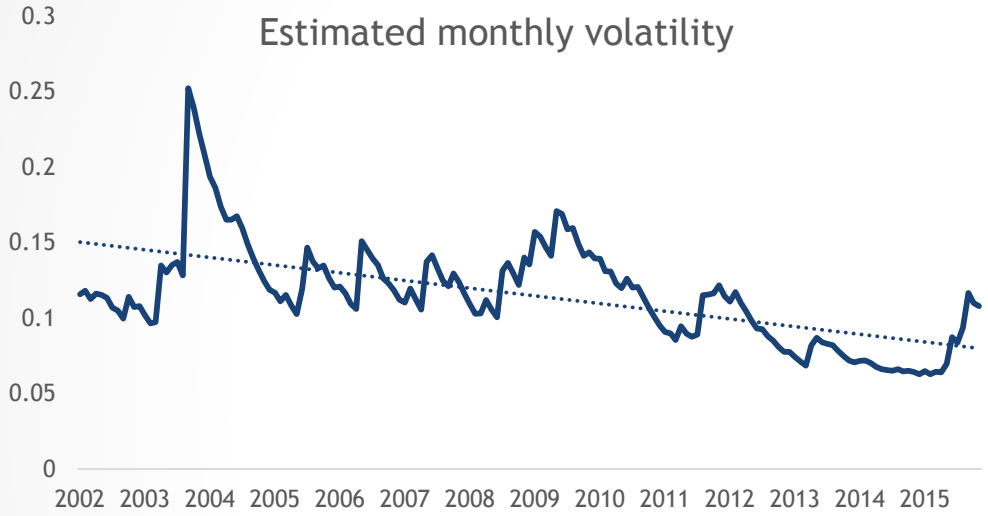


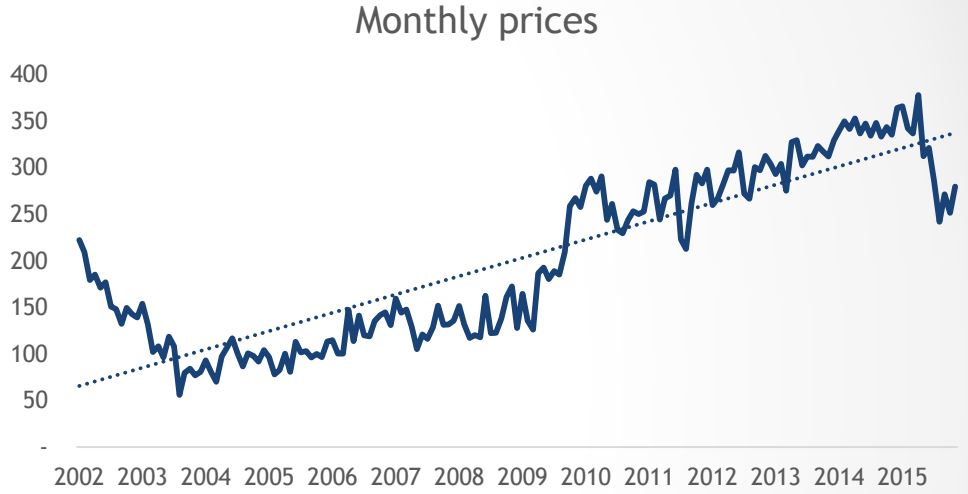
- Prices trending upwards
- Volatility stable

GARCH(1,1)	Estimate	P-value
Beta	0,34735	0.4283
Alpha	0,18331	0.0575

Universitetet i Stavanger

Empirical result - Haddock



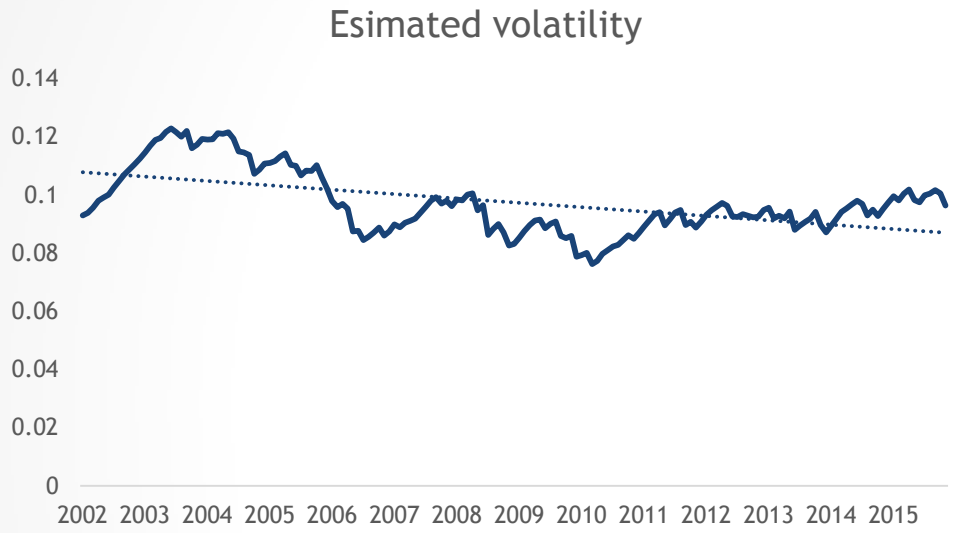


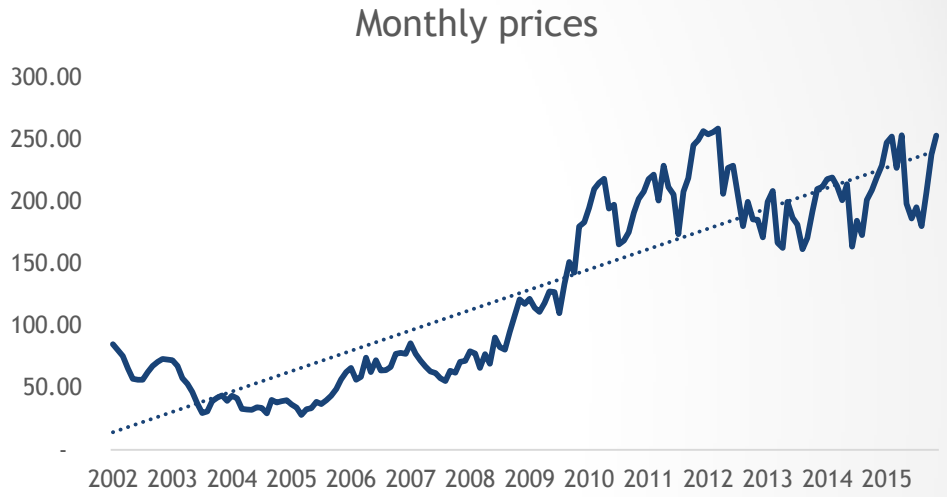
- Prices trending upwards
- Volatilty trending downwards

GARCH(1,1)	Estimate	P-value
Beta	0,8875	0.0000
Alpha	0,0928	0.0000

Universitetet i Stavanger

Empirical result - Pollock





- Prices trending upwards
- Volatility trending downwards

GARCH(1,1)	Estimate	P-value
Beta	0,46381	0.0001
Alpha	0,14174	0.5336

Universitetet i Stavanger

Possible factors contributing to volatility:

- Volatility in EU price returns
- Exchange rates
- Variation in quantities

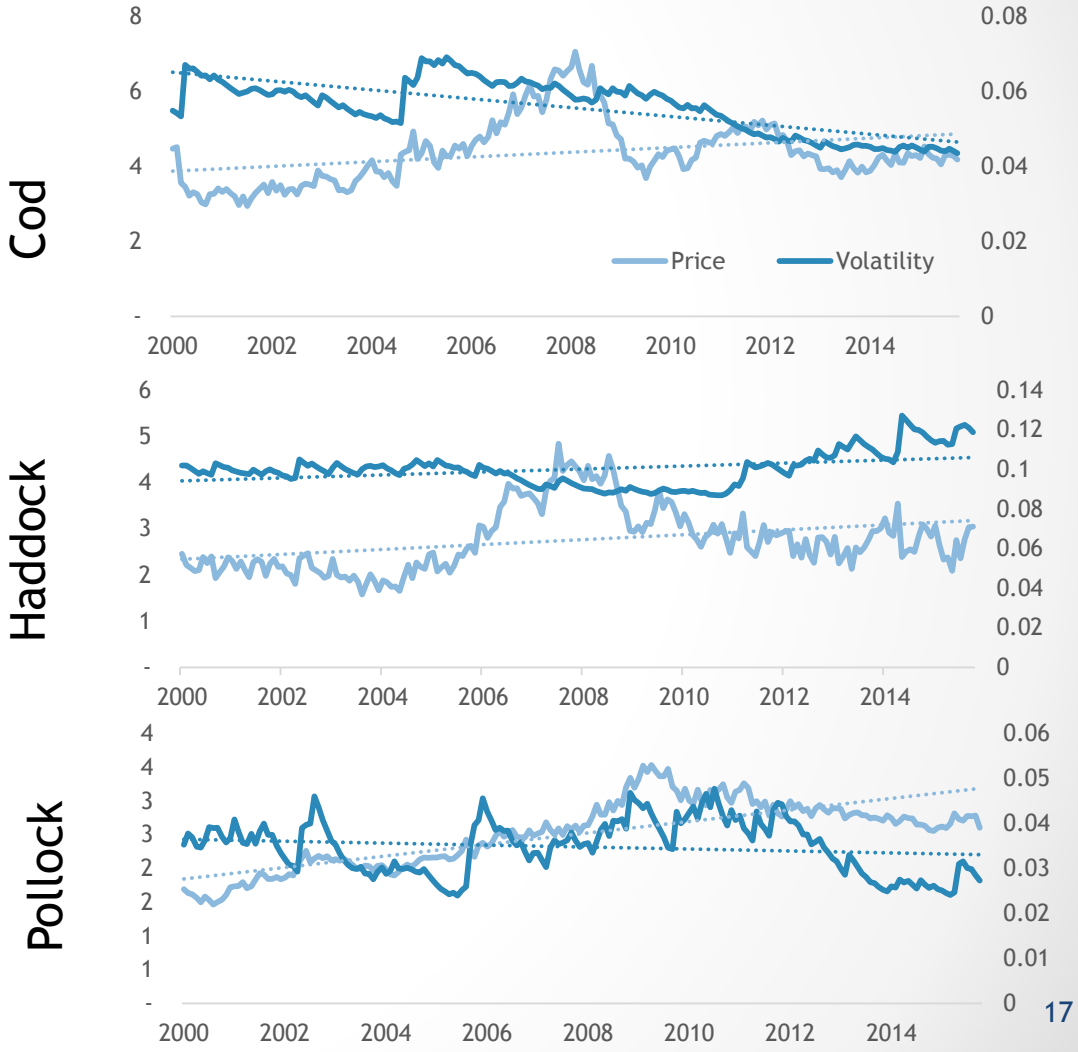
Regression model

$$\hat{\sigma}_t = \mu + \beta_0 \sigma_t^{EU} + \sum_{i=1}^{k} \beta_i \, \sigma_{t-i}^{EU} + \gamma_0 EUISK_t^{gr} + \alpha_0 \, EU.exp.r_t^{gr} + \sum_{i=1}^{k} \alpha_i EUexp \, r_{t-i}^{gr}$$

Universitetet i Stavanger

EU prices

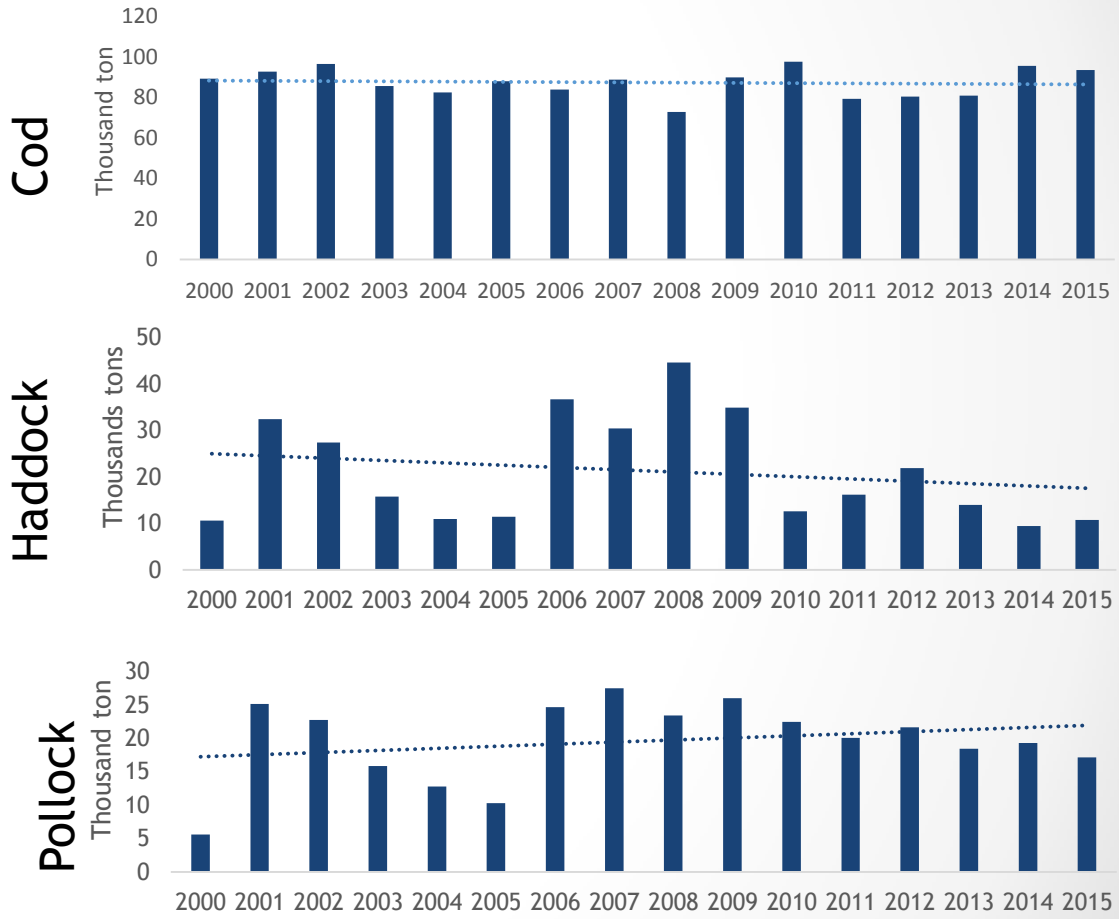
- COD – Long run price trending up while voltility trending down
- Haddock – Price trending up and volatility up
- Pollock – Price trending up and volatility down



Universitetet i Stavanger

Export quantities to EU

- Cod - experiencing stability in exports ranging from 72 - 98 thousand tons in the period
- Haddock – export a wider range of 5.6 - 27 thousand tons
- Pollock – export 9.5 - 25 thousand tons



Universitetet i Stavanger

Empirical Results - Regression analysis

$$\hat{\sigma}_t = \mu + \beta_0 \sigma_t^{EU} + \sum_{i=1}^{k} \beta_i \, \sigma_{t-i}^{EU} + \gamma_0 EUISK_t^{gr} + \alpha_0 \, EU.exp.r_t^{gr} + \sum_{i=1}^{k} \alpha_i EUexp \, r_{t-i}^{gr}$$

	COD			Haddock			Pollock	
	Estimate	P-value		Estimate	P-value		Estimate	P-value
μ	0,0005	0,8812		-0,0021	0,8105		-0,0032	0,6593
β_0	0,1719	0,0293**		0,1173	0,1806		0,2211	0,3163
β_1	0,2172	0,0044***		0,0075	0,9346		0,1228	0,5757
β_2	0,0949	0,1990		0,3397	0,0002***		-0,0281	0,8985
β_3	0,1170	0,1045		-0,0474	0,6042		-0,2789	0,2013
γ_0	0,3456	0,0049***		0,6533	0,0114**		0,4780	0,0429**
α_0	-0,041	0,0223**		-0,0366	0,1210		0,0100	0,7381
α_1	-0,0199	0,2592		-0,0349	0,1658		0,0603	0,0438**
α_2	-0,0368	0,0472**		0,0814	0,0011***		0,0254	0,3976

Signif. codes: '***' 0.01 '**' 0.05 '*' 0.1 ' ' 1

Universitetet i Stavanger

Long term effects

- Long term price volatility effect

	COD	Haddock	Pollock
$\sum_{i=0}^{k} \beta_i$	0,6011	0,4169	0,0369

- Long term export quantity effect

	COD	Haddock	Pollock
$\sum_{i=0}^{k} \alpha_i$	-0,0983	0,0103	0,0958

Universitetet i Stavanger

Conclusion

- EU price volatility has significant effect on Icelandic cod and haddock price volatility
- EU/ISK exchange rate has significant effect on price volatility on all series
- Export quantities have significant effect on price volatility on all series

Universitetet i Stavanger

Conclusion

- We find that volatility is trending downward for Icelandic haddock and pollock, while stable for cod.
- Despite that prices are trending upwards wich is in contrast to what is found in the salmon price litterature.
- We find no evidence in Icelandic price series that volatility increases with higher prices.

Monthly obs	Prices	Volatility
Iceland		
Cod	up	stable
Haddock	up	down
Pollock	up	down
EU		
Cod	up	down
Haddock	up	up
Pollock	up	down

Universitetet i Stavanger

Thank you for you attention!

Universitetet
i Stavanger