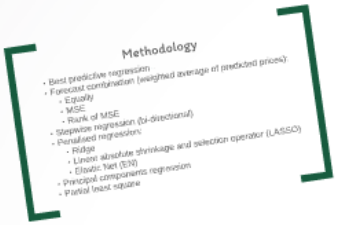
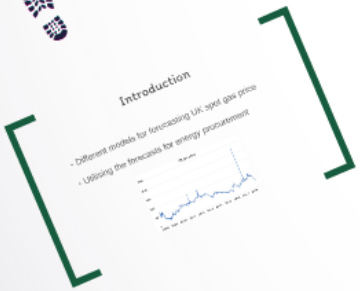
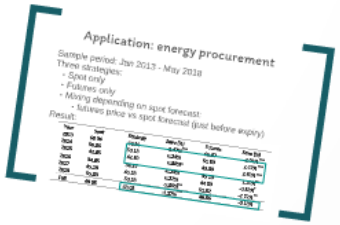
Forecasting spot price in the UK natural gas market







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co-authors: Ekaterini Panopoulou
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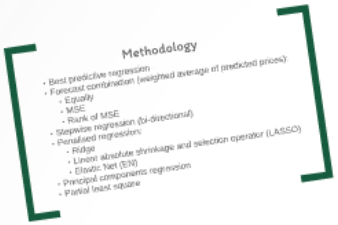

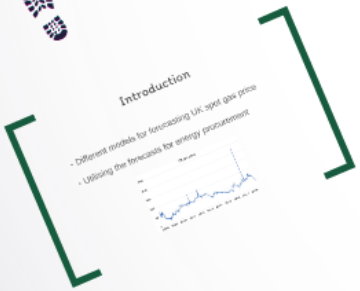

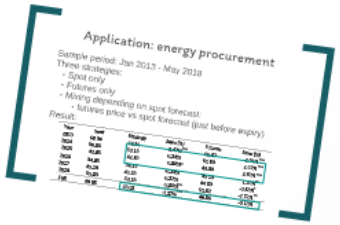

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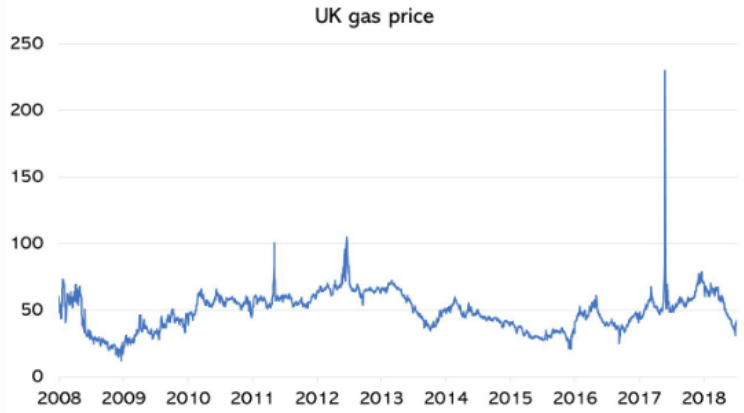
Introduction

- Different models for forecasting UK spot gas price
- Utilising the forecasts for energy procurement



Methodology

- Best predictive regression
- Forecast combination (weighted average of predicted prices):
  - Equally
  - MSE
  - Rank of MSE
- Stepwise regression (bi-directional)
- Penalised regression:
  - Ridge
  - Linear absolute shrinkage and selection operator (LASSO)
  - Elastic Net (EN)
- Principal components regression
- Partial least square

Predictors

- Brent, Carbon, Coal
- Wind generation ratio
- Stock indexes
- Interest rates and bond yields
- Technical analysis indicator
- Some other predictors cannot be disclosed due to confidential

Forecasting performance

- Sample period: Oct 2001 - May 2018
- Evaluation criteria:
  - Success ratio (directional accuracy)
  - MSE ratio (compared to **no-change**)
- Result:

Models		Success ratio	MSE ratio
Best predictive regression		**57.14%**	**87.70%**
Forecast Combination	EW	53.33%	**91.27%**
	TEW	47.62%	112.08%
	IMW	53.33%	91.33%
	DMW	53.33%	91.33%
	TW	49.52%	93.46%
	TDTW	50.48%	93.75%
Penalised regression	Ridge	52.38%	99.35%
	EN	**55.24%**	97.97%
	LASSO	52.38%	99.26%
Stepwise regression	Stepwise (F-test)	46.67%	124.65%
	Stepwise (BIC)	53.33%	106.53%
	Stepwise (adj. R^2)	48.57%	308.50%
Principal components regression		51.43%	101.69%
Partial least square		52.38%	110.62%

Models	Success ratio	MSE ratio
regression	**57.14%**	**87.70%**
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Application: energy procurement

Sample period: Jan 2013 - May 2018

Three strategies:

- Spot only
- Futures only
- Mixing depending on spot forecast:
  - futures price vs spot forecast (just before expiry)

Result:

Year	Spot	Strategy	Save (%)	Futures	Save (%)
2013	68.04	66.36	-2.47%***	66.67	-2.01%***
2014	50.06	50.18	0.24%	51.30	2.47%***
2015	42.65	42.89	0.58%**	43.80	2.69%***
2016	34.65	34.57	-0.24%	35.10	1.29%**
2017	45.18	45.28	0.22%	44.80	-0.83%*
2018	55.83	50.28	-9.95%***	51.52	-7.72% **
Full	48.65	48.03	-1.27%***	48.56	-0.18%

Strategy	Save (%)	Futures	Save (%)
66.36	-2.47%***	66.67	-2.01%***
50.18	0.24%	51.30	2.47%***
42.89	0.58%**	43.80	2.69%***
34.57	-0.24%	35.10	1.29%**
45.28	0.22%	44.80	-0.83%*
50.28	-9.95%***	51.52	-7.72% **
48.03	-1.27%***	48.56	-0.18%

g on spot forecast:
vs spot forecast (just before expiry)

Strategy	Save (%)	Futures	Save (%)
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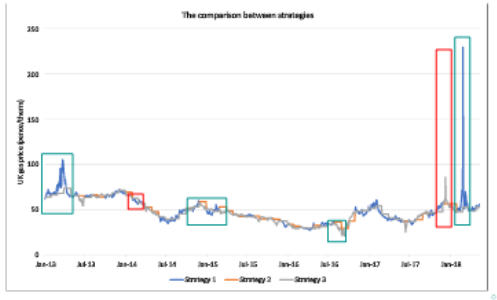
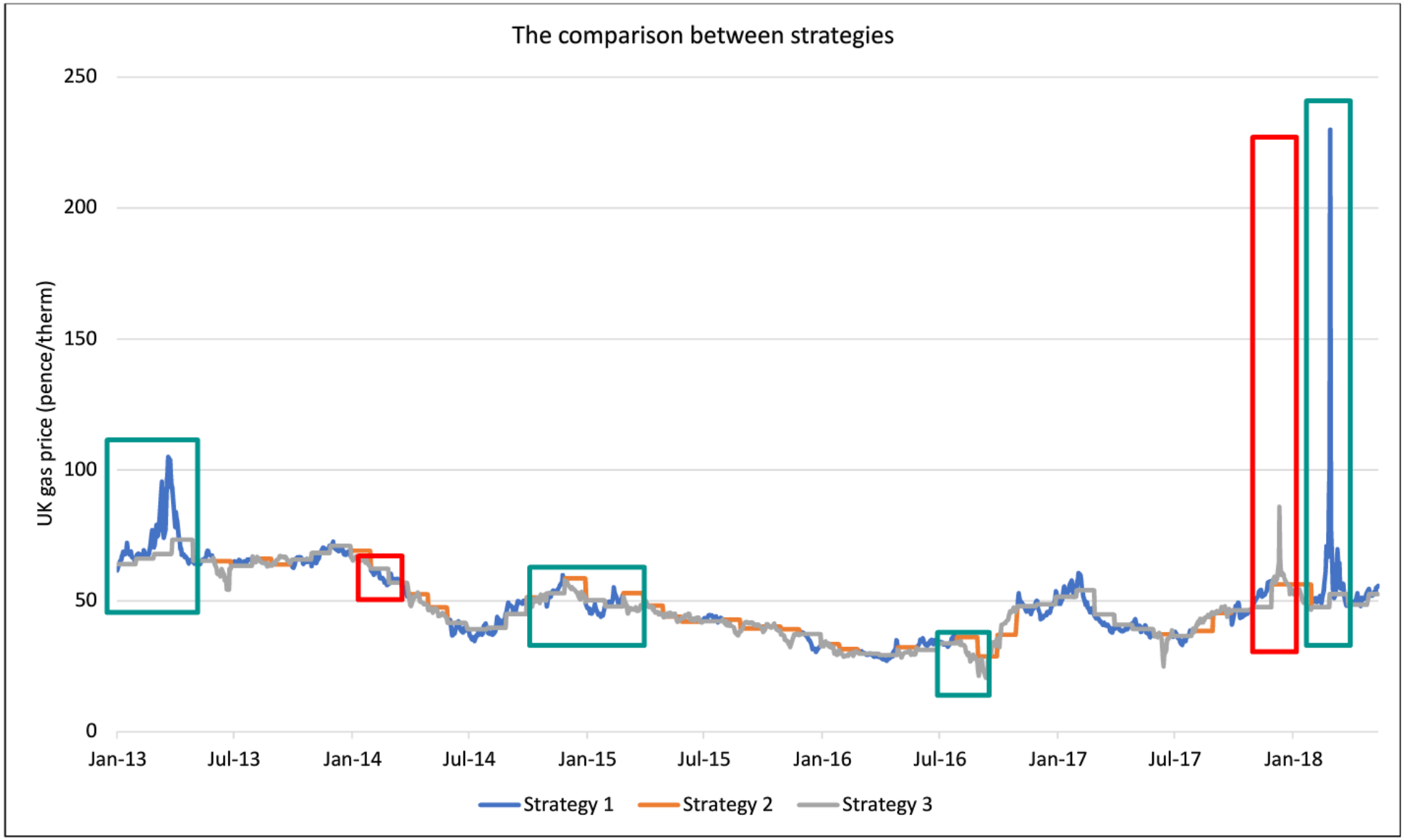
Conclusion

- The more advanced models seem not to perform better in UK spot natural gas market
- The spot forecast helps both spot and futures gas purchaser to save procurement costs by swing between two prices




The comparison between strategies
250
200
150
100
50
0
UK gas price (pence/therm)
Jan-13
Jul-13
Jan-14
Jul-14
Jan-15
Jul-15
Jan-16
Jul-16
Jan-17
Jul-17
Jan-18
Strategy 1
Strategy 2
Strategy 3

Future works

- Extend the forecasting horizons
- Extend the models -
  sparse PCA
- Different trading strategies

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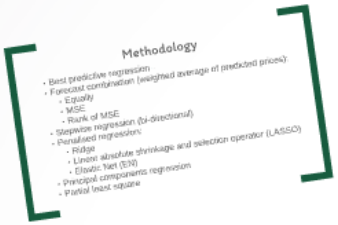

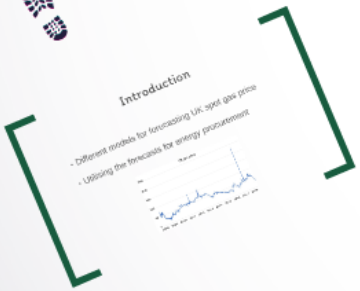

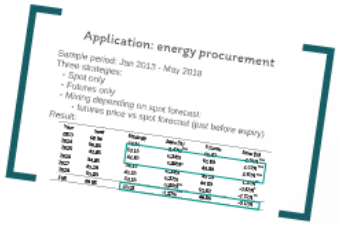

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