



# Aviation in the EU ETS: Economic and environmental impacts

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# Outline

- Objective
- Description of the model, assumptions
- Impacts of including aviation in the EU ETS
- Auctioning and CDM credits
- Impact of high oil prices vs carbon prices
- What do the airlines think?
- Future work

# Objective



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To explore the impacts of including airlines in the EU ETS on:

- **The industry as an economic sector - CO<sub>2</sub> and output**
- **The EU economy - CO<sub>2</sub> and GDP**

using a dynamic macroeconomic simulation model - **E3ME** (Energy-Environment-Economy Model for Europe of Cambridge Econometrics)



# Description of the model

- **Structural** - disaggregation of variables
- **Dynamic** - behavioural equations with effects from previous outcomes: i.e. history matters
- **Estimated on cross-section and time-series data** - identifies current year responses and long-term trends and allows sectoral and regional differences (estimations are based on data covering the period 1970-2004)
- **Forward-looking** - projections annually  
E3ME version 4 runs to 2030



# Description of the model

22 main stochastic equations

For example – fuel use equation

$$\begin{aligned} \text{FR0}_{i,j,t} = & \alpha_{i,j,0} + \alpha_{i,j,1} \text{FRY}_{i,j,t} + \alpha_{i,j,2} \text{PREN}_{j,t} + \\ & \alpha_{i,j,3} \text{FRTD}_{i,j,t} + \alpha_4 \text{ZRDM}_t + \alpha_5 \text{ZRDT}_t + \\ & \alpha_{i,j,6} \text{FRK}_{i,j,t} + u_{i,j,t} \end{aligned}$$

Input-output coefficients for industries

<http://www.camecon-e3memanual.com/>

# Description of the model



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## Main advantage:

The ability to model two-way interactions between the economy, energy demand/supply and environmental emissions

## Main disadvantage:

Analyses the industry at an aggregate level – cannot study impacts on different business models, technologies (unless the model incorporates an industry specific submodel)

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# Description of the model

The ETS in E3ME:

- allowances are treated as taxes on energy use, depending on the carbon content of fuels
- these cost increases are passed on to consumers
- free allocated allowances are used to increase profits
- market clearing is assumed
- there are no announcement effects

# Assumptions



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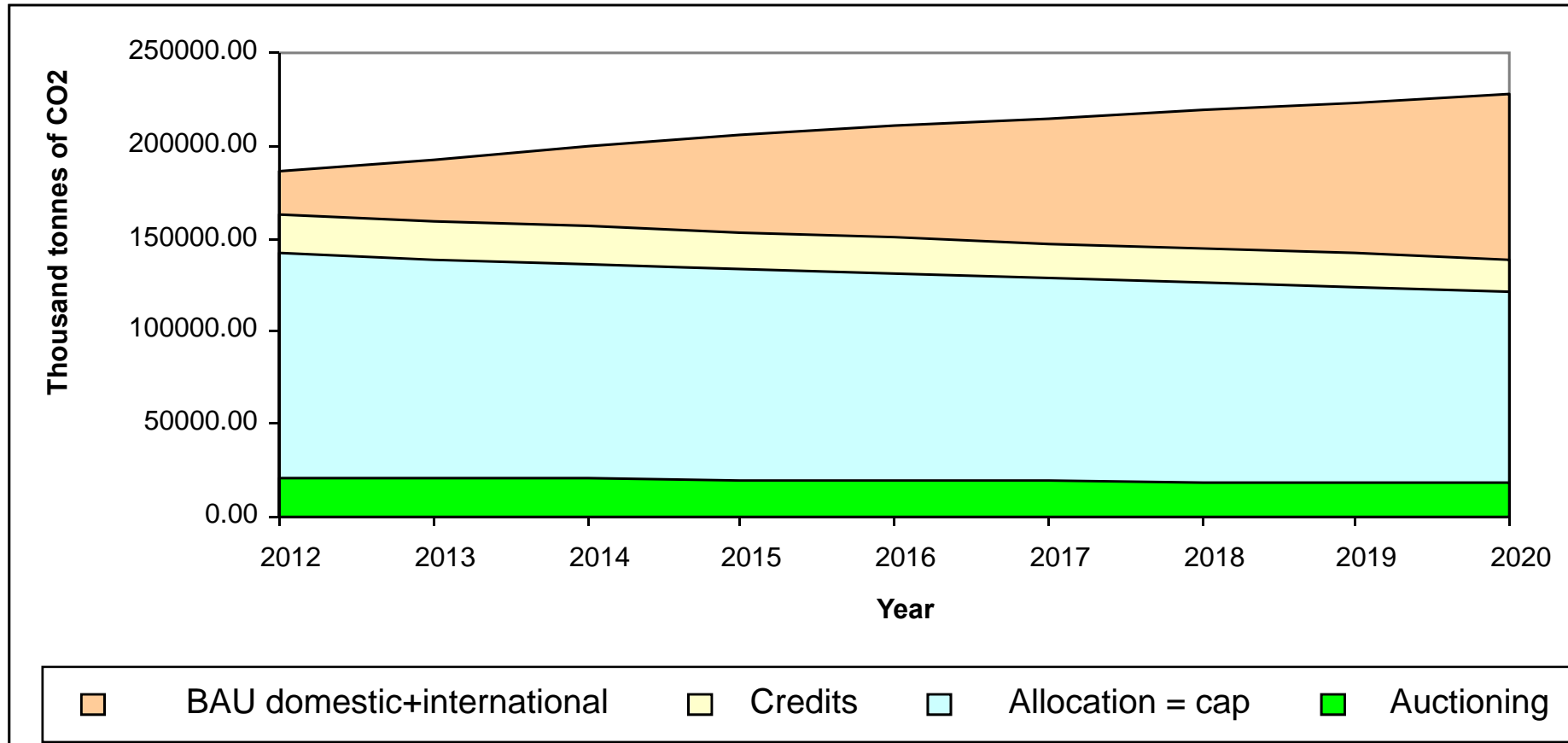
## Scenario A

- Open trading scheme
- Starting year for the air transport industry is 2012
- Credits from CDM projects will be used up to 15%
- Harmonised allocation: 2012 85% granted for free, the rest will be auctioned

# Assumptions

- Auctioning revenues are used to increase government expenditure
- In 2012 CO<sub>2</sub> emissions from the aviation sector will be capped at the 97% level of average emissions for 2004 - 2006
- In phase 3 aviation will be treated as all other trading industries except power sector in terms of a diminishing cap

# Assumptions



## Scenario A: Air transport in the EU ETS

# Assumptions

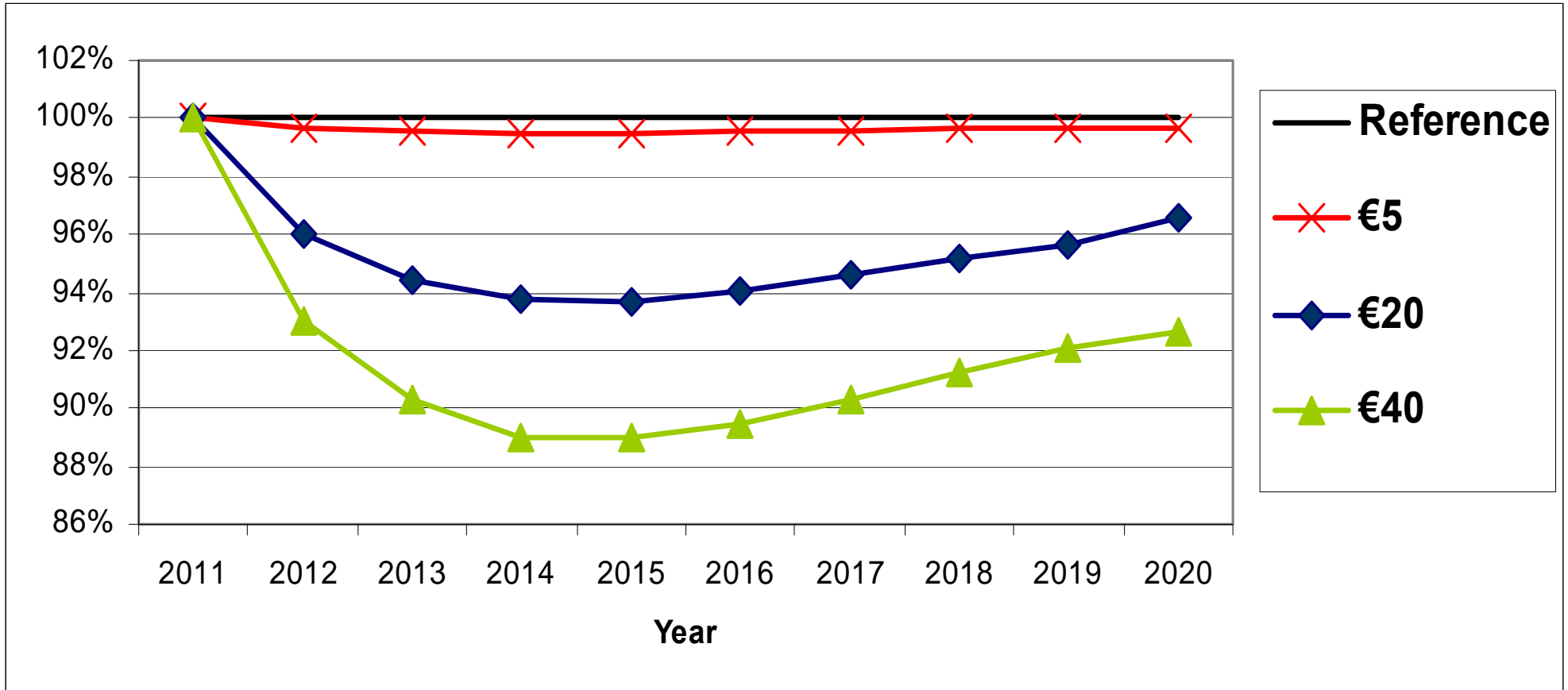
Three price scenarios were used:

- a low price scenario of **5€** per tonne of CO<sub>2</sub>,
- a medium price scenario of **20€** per tonne of CO<sub>2</sub>
- a high price scenario of **40€** per tonne of CO<sub>2</sub>.

Each of these price scenarios was run twice:

- once excluding the air transport sector – reference scenario
- once including it

# Impacts



Reductions in CO2 emissions in the EU from air transport compared to reference scenarios

Impacts on the industry in 2020 compared to no action scenarios:

- CO<sub>2</sub> emissions: - 0.3% (allowance price of 5€),  
- 3.4% (20€) and, - 7.4% (40€)
- Demand: - 0.04% (5€), - 0.54% (20€) and,  
- 0.98% (40€)

Impacts on the EU economy in 2020 compared to no action scenarios:

- GDP: no change by an allowance price of 5€ and 20€, 0.02% by an allowance price of 40€
- CO<sub>2</sub> emissions: 0.1% (5€), 0.2% (20€), -0.2% (40€)

# Impacts



## Auctioning:

- Higher levels of auctioning will impose more real costs on the industry
- Might not impact the industry level CO<sub>2</sub> reduction
- How the auctioning revenues are used is extremely important - by allocating revenues into non-ETS sectors, slight increases in carbon emissions at the EU level might be possible.

## Use of CDM credits:

- Helps aviation to reduce compliance costs, but gives less reduction in CO<sub>2</sub> emissions and a slightly negative impact on GDP

# Impacts



**The impact is relatively low because of:**

- Airlines can purchase excess allowances from the market and use cheaper credits from other Kyoto flexible mechanisms
- Airlines can pass majority of allowance costs on to consumers: price elasticities are less important than income elasticities and behavioural lock-ins
- The cap for the whole EU ETS is too generous
- Money that will not be used on flying will be used somewhere else

**But....**

- **The concept of emissions trading is to use the market to implement emission reductions at the lowest cost.**
- **Industries where emissions abatement is expensive ‘fund’ abatement in industries where it is cheaper.**
- **In effect, through engagement in the EU ETS, the aviation industry will ‘pay’ for emission reductions, for example in the power sector.**

# Oil prices

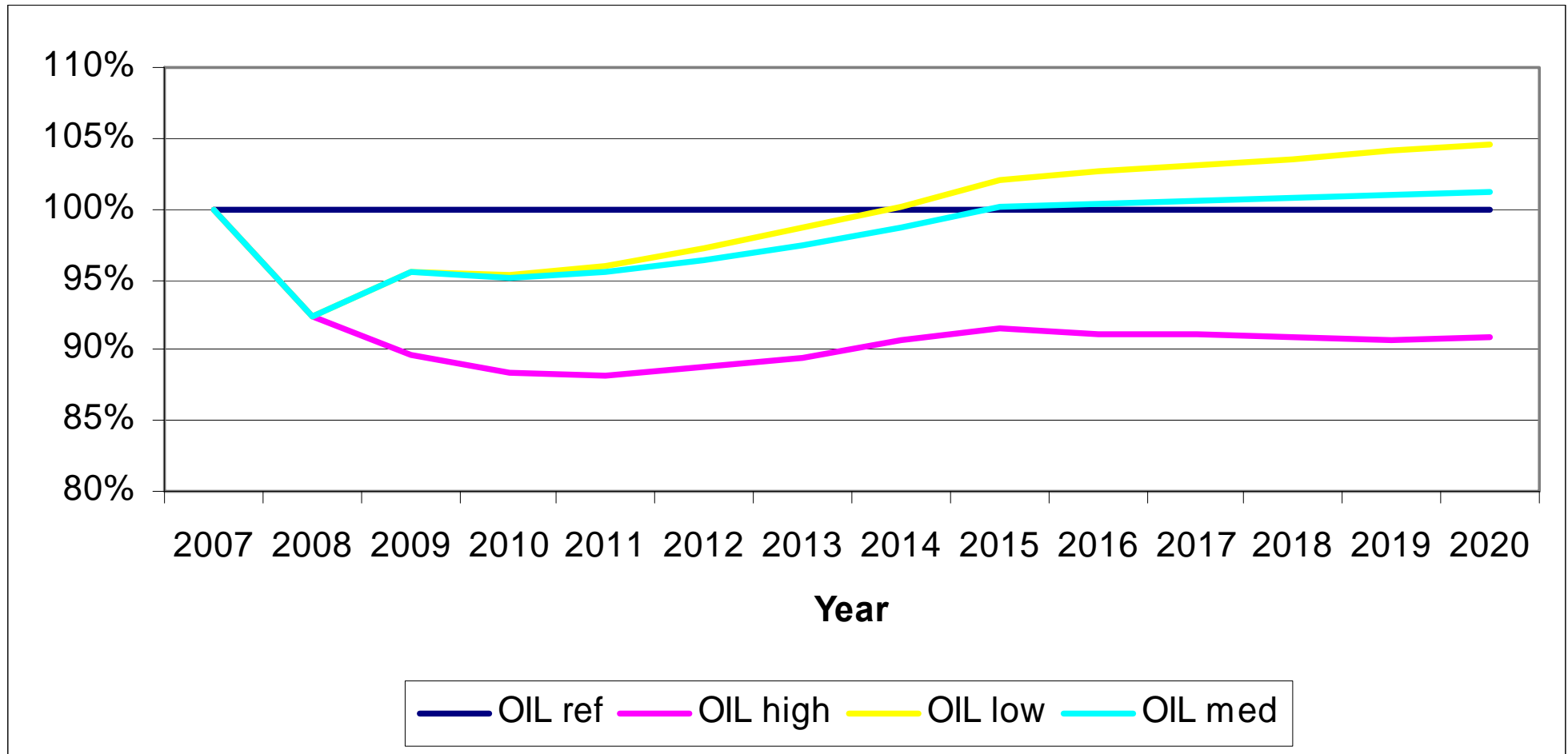


The effect of high fuel prices on CO<sub>2</sub> emissions in air transport

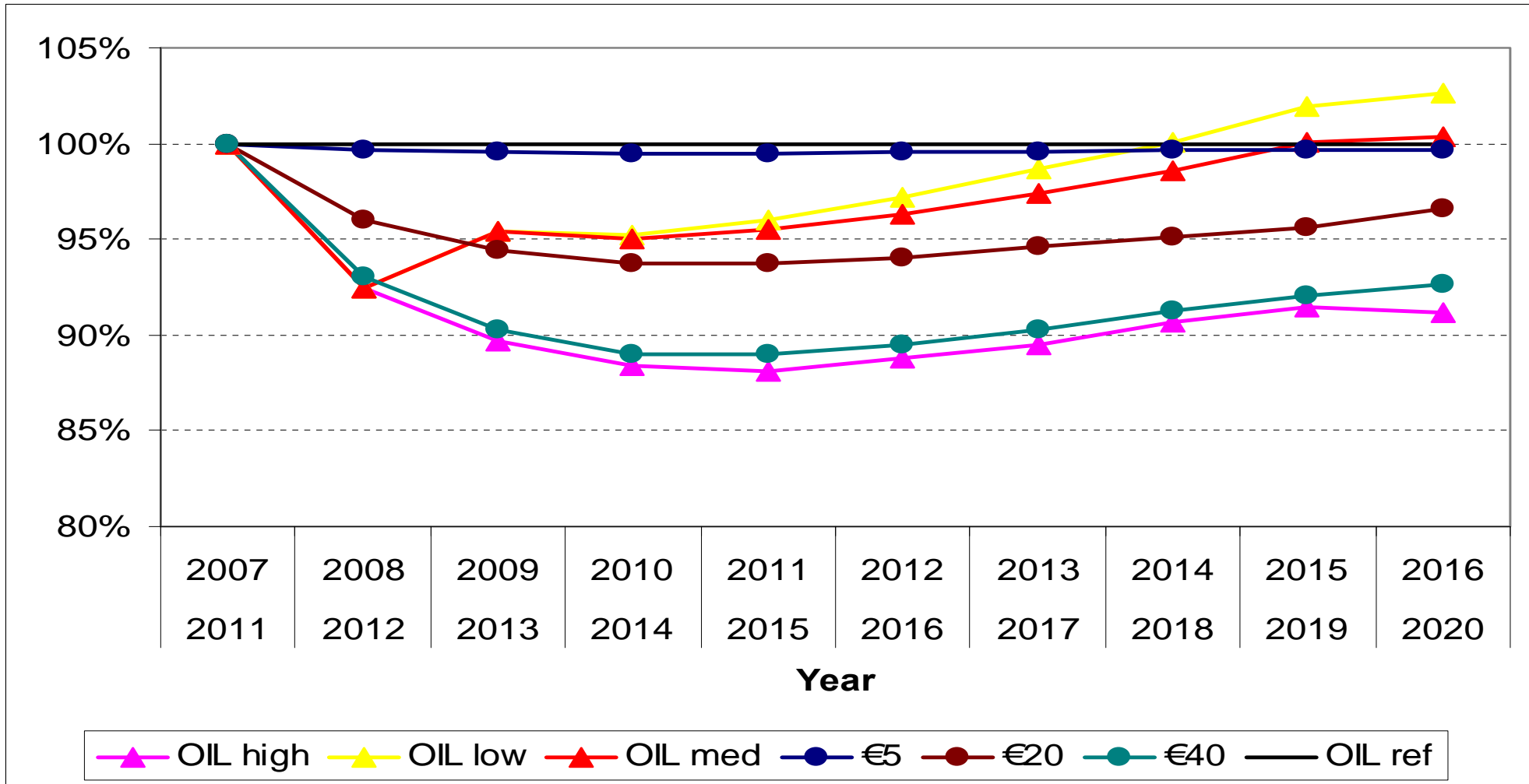
Three alternative crude oil prices were examined

<b>Scenario</b>	<b>Average oil price 2007</b>	<b>Average oil price 2008</b>	<b>Average oil price 2009</b>	<b>Annual average oil price change 2010- 2020</b>
<b>OIL high</b>	60 \$/b	95 \$/b	97 \$/b	+2.5%
<b>OIL medium</b>	60 \$/b	95 \$/b	75 \$/b	+2.5%
<b>OIL low</b>	60 \$/b	95 \$/b	75 \$/b	+1.5%
<b>OIL ref</b>	60 \$/b	61 \$/b	62 \$/b	+2.5%

# Oil prices



# Oil prices vs carbon prices



# Challenges



- High (volatile) oil prices
- European economy is entering recession - less income, less flying, - lower carbon prices
- Airlines will be included to the EU ETS from January 2012, that gives three years to adjust to increasing pressure from high fuel prices and recession
- How much additional pressure will €12(?) per tonne of CO<sub>2</sub> put on the industry in 2012?

# Future work

## To be included in the current study:

- More on the EU Member States
- Scenarios for spending auctioning revenues
- Banking/Borrowing

## New studies:

- Impacts on imports/exports - leakage
- Global Emissions Trading Scheme (GETS) for international air and maritime transport (net zero emissions by 2052)

# Project team



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**THANK YOU!**  
**Questions?**

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