Optimizing carbon tax for decentralized electricity markets with an agent-based model

Anonymized

ABSTRACT

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KEYWORDS

Energy markets, policy, carbon tax, genetic algorithm, optimization

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1 INTRODUCTION

Computer simulation allows practitioners to model real-world systems using software. These simulations allow for '*what-if*' analyses which can provide an indication as to how a system may behave under certain policies, environments and assumptions. These simulations become important in systems which have high costs, impacts or risks associated with them.

Electricity markets are an example of such a system. Disruptions to electricity supply, a substantial increase in the cost of electricity or unrestrained carbon emissions have the potential to destabilise economies. It is for reasons such as these that electricity market models are used to test hypotheses, develop strategies and gain an understanding of underlying dynamics [**?**].

2 LITERATURE REVIEW

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3 OPTIMIZATION METHODS

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4 SIMULATION ENVIRONMENT

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5 RESULTS

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6 CONCLUSION

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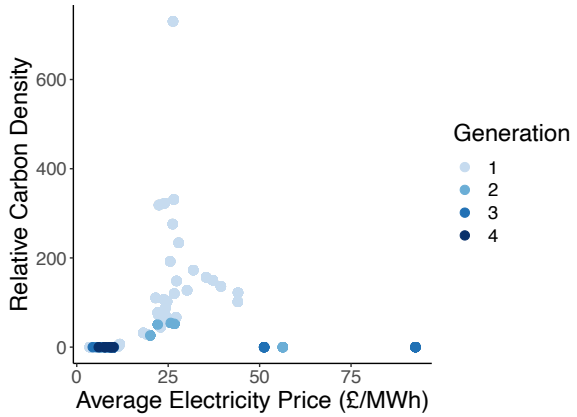

Figure 1: Development of genetic algorithm rewards of average electricity price and relative carbon density in 2035 over time for highest degrees of freedom per year.

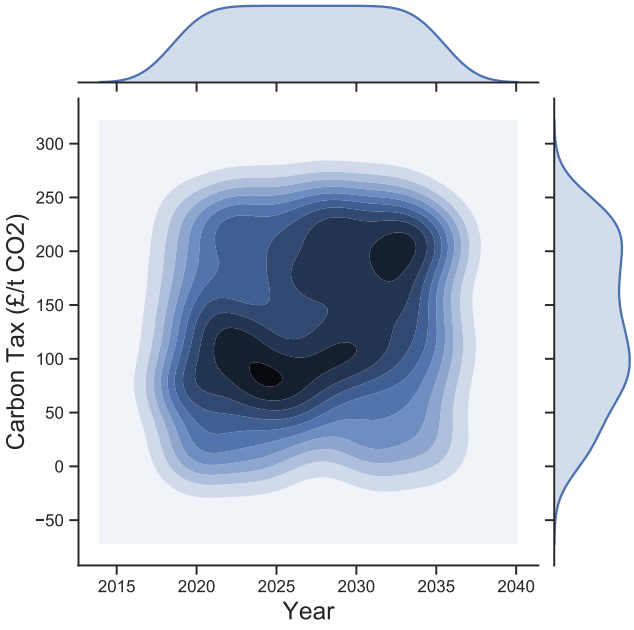

Figure 2: 2D density plot of carbon tax strategies that led to an average electricity price of below £5/MWh by 2035.

ACKNOWLEDGMENTS

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REFERENCES

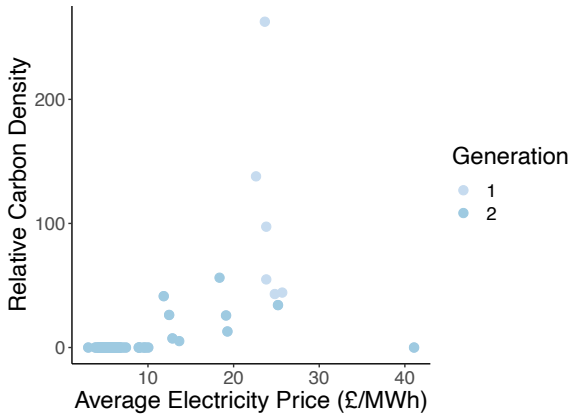

Figure 3: Development of genetic algorithm rewards of average electricity price and relative carbon density in 2035 over time for linear carbon strategy.

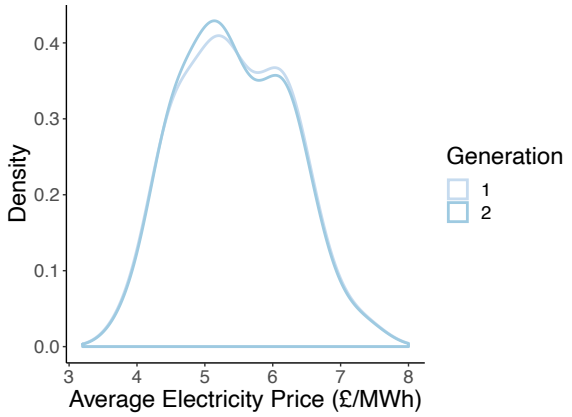

Figure 4: Density plot of average electricity price smaller than £8/MWh in 2035 over generation number of genetic algorithm.

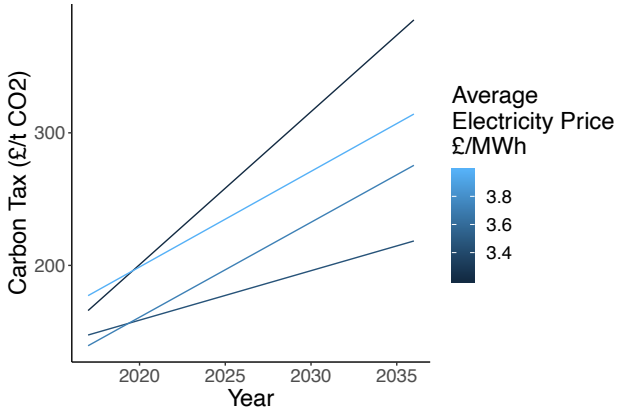

Figure 5: Linear carbon tax strategies visualised with average electricity price smaller than £5/MWh.