

# Arthur Thomas



## Informations personnelles

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## Position actuelle

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**Coordinateur des enseignements en Informatique** Depuis 09-2020  
*École Nationale de la Statistique et de l'Administration Économique (ENSAE)*

**Chercheur associé :**

*CREST* Depuis 09-2020

*Chaire Économie du Climat* Depuis 05-2021

*Chaire Économie du Gaz Naturel* Depuis 09-2017

## Domaines de spécialité

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**Econométrie théorique :** Économétrie des données massives; Économétrie non causale; Économétrie des séries temporelles

**Économétrie appliquée :** Économie de l'énergie; Finance

## Formation

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**Doctorat en Sciences Économiques** Oct 2017 - Dec 2020  
*LEMNA, Université de Nantes, EDGE, France*

*Qualifié par le CNU section 05 - 2021*

- Financement : Allocation de recherche IFPEN/ IFP School
  - Titre de la thèse : *The Econometrics of Energy Demand: Identification and Forecast*
  - Directeur de thèse : Benoît Sévi (Professeur, Université de Nantes)
  - Co-encadrant: Olivier Massol (Associate professor, City, University of London & IFP School)
- Jury de thèse :
- Karim Abadir (Professor of Financial Econometrics, Imperial College London, Rapporteur)
  - Derek Bunn (Professor of Decision Sciences, London Business School)
  - Dimitris Korobilis (Professor of Econometrics, University of Glasgow, Rapporteur)
  - Valérie Mignon (Professeure des Universités, Université Paris Nanterre, Présidente du jury)

**Diplôme d'ingénieur-statisticien** 2014-2017  
*École Nationale de la Statistique et de l'Analyse de l'Information (ENSAI), France*

**Classes préparatoires aux grandes écoles (MP)** 2012-2014  
*Lycée Henry Poincaré (Nancy)*

## **Activité de recherche**

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### **Articles publiés :**

- How are day-ahead prices informative for predicting the next day's consumption of natural gas? Evidence from France, *forthcoming in The Energy Journal* (HCERES: A, CNRS: 1), 2020, avec Olivier Massol et Benoît Sévi

### **Documents de travail :**

- Identifying oil supply news shocks and their effects on the global oil market, *submitted*, 2021, avec Zakaria Moussa
- Real-time demand in U.S. natural gas price forecasting: the role of temperature data, *under review*, 2021, avec Benoît Sévi and Zakaria Moussa
- The role of expectations in predicting the real prices of oil: a non-causal analysis, 2021
- Production intermittence in spot electricity markets: a behavioral simulations approach, 2019, avec Albert Banal-Estanol, Olivier Massol et Augusto Ruperez Micola

### **Travaux en cours :**

- Bet on a bubble asset ? An optimal portfolio allocation strategy, *Première version disponible*, 2002
- Fractional frequency domain minimum distance inference for possibly noninvertible and non causal arma models
- Machine learning approach in predicting-stable noncausal processes, avec Frédéric Logé
- Who refines oil and why: disentangling investment decision from countries and companies, avec Olivier Massol et Quentin Hoareau

### **Conférences, Séminaires**

*2021*

- 7<sup>th</sup> RCEA Times series workshop, University of Milano-Bicocca.
- 20<sup>ème</sup> Journée d'Économétrie, Développements Récents de l'Économétrie Appliquée à la Finance, EconomiX, Nanterre, France (Discussion).

*2020*

- Thé des économètres, Paris, France.

- 37<sup>th</sup> International Conference of the French Finance Association (AFFI), Nantes, France.
- 19<sup>ème</sup> Journée d'Économétrie, Développements Récents de l'Économétrie Appliquée à la Finance, EconomiX, Nanterre, France (présentation et discussion).
- 2nd International Conference Environmental Economics: A Focus on Natural Resources, University of Orleans.

#### 2019

- Discutant junior invité au Séminaire doctorant, Université Paris Nanterre, France.
- 13<sup>th</sup> International Conference on Computational and Financial Econometrics, London, UK.
- INFORMS Annual meeting 2019, Seattle, USA.
- 13<sup>th</sup> Annual Trans-Atlantic Infraday Conference, Washington, USA.
- 18<sup>ème</sup> Journée d'Économétrie, Développements Récents de l'Économétrie Appliquée à la Finance, EconomiX, Nanterre, France (présentation et discussion).
- Séminaire CREST-ENSAI 2019, Rennes, France.
- Thé des économètres, Orléans, France.
- Workshop in Financial Econometrics, Nantes, France.
- The 3<sup>rd</sup> Commodity Markets Winter Workshop-Leibniz University, Hannover, Germany.
- Workshop EDGE 2019, Rennes, France.
- The 2<sup>nd</sup> International Conference The Economics of Natural Gas, University Paris-Dauphine, Paris, France.

#### 2018

- 12<sup>th</sup> International Conference on Computational and Financial Econometrics, Pisa, Italy.
- 41<sup>st</sup> edition of the IAEE international conference, Groningen, Netherland.
- FAEE summer workshop, Mines ParisTech, Paris, France (présentation et discussion).
- 29<sup>th</sup> European Conference On Operational Research. Valencia, Spain.
- INFORMS 2018 Annual Meeting Phoenix, USA.
- 11<sup>th</sup> Annual Trans-Atlantic Infraday Conference, Washington, USA.
- Commodities and Energy Market Organization in the Energy Transition Context, IFP Energies nouvelles, Rueil-Malmaison, France.

#### **Activités de référé**

*Annals of Economics and Statistics, Energy Economics, Energy Journal, Journal of Banking and Finance*

#### **Autres responsabilités**

- Participations à l'organisation de conférence:
  - 43<sup>rd</sup> IAEE International Conference, Paris, France.
  - 37<sup>th</sup> International Conference of the French Finance Association (AFFI), Nantes, France
- Membre du groupe de travail "Les Jeunes Économètres", Les Jeunes Économètres est un groupe de travail créé en septembre 2016 par Gilles de Truchis et Elena Dumitrescu (Université Paris Nanterre) et Denisa Banulescu (Université d'Orléans) et portant sur l'économétrie des séries temporelles. Il a pour but de réunir les jeunes économètres (doctorants en fin de thèse, post-doctorants et jeunes MCF) de la région parisienne afin de favoriser les collaborations scientifiques et le montage de projets financés. Le groupe se retrouve mensuellement lors d'un séminaire intitulé "thé des jeunes économètres" pour des présentations et discussions sur des questions d'économétrie théorique et appliquée. Il comprend à ce jour 27 membres provenant des Universités Panthéon-Sorbonne, Paris Dauphine, Paris Nanterre, Paris 8, Paris 13, Orléans, Cergy, de Nantes, de l'ENSAE (CREST), de l'ESSEC Business School et de Paris School of Economics.<http://www.varenes-ecofin.com/cje.html>

## Activité d'enseignement

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### Travaux Dirigés (TD) :

**Deep Learning : Models and Optimization (6h)** Depuis 2020-2021  
*3<sup>ème</sup> année ENSAE*

### Cours Magistral (CM) :

**Économétrie des données massives (18h)** Depuis 2020-2021  
*M2-EEET Université Paris-Saclay*

**Encadrement des enseignements d'informatique (suivi et soutenance des projets pour les cours suivants, env. 20 cours)** Depuis 2020-2021  
*ENSAE*

- **L3 (env. 100 étudiants)** : Introduction à l'algorithmique et à la programmation, Projet de programmation, Introduction aux bases de données.
- **M1 (env. 200 étudiants)** : Python, C++.
- **M2-ENSAE (env. 100 étudiants)** : Éléments logiciels de traitement des données massives, Machine learning for finance, Programmation GPU, Cloud Computing, Machine learning with Python et Datavizualisation.

**Cours Magistral (CM) : Introduction to Python (6h)** 2020-2021  
*3<sup>ème</sup> année ENSAE*

**Cours Magistral (CM) : Introduction to R (6h)** 2020-2021  
*3<sup>ème</sup> année ENSAE*

**Travaux Dirigés (TD) : Econometrics (30h)** 2019-2020  
*Pantheon-Sorbonne Master In Economics*  
 Université Paris 1 Panthéon Sorbonne

**Travaux Dirigés (TD) : Séries temporelles (40h)** 2017-2018  
*Université Paris-Descartes*

## Autres responsabilités d'enseignement

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### Participation à la gestion de la scolarité de l'ENSAE :

- Participation aux jurys de stage/mémoire des étudiants de M2 (env. 12 soutenances de stage)
- Référent pédagogique de stage/mémoire (encadrement de 12 stages) M1-M2
- Participation aux conseils d'école et aux commissions des études (retours des étudiants, adaptation des évolutions des maquettes de cours)
- Participation aux conseils d'enseignement et de recherche (validation des semestres, points de jury, réflexions sur la place de l'informatique dans la formation)
- Participation à la construction des maquettes de master
- Participation au comité de sélection des étudiants du MS Data Science
- Responsabilité administrative des cours de mon portefeuille (env. 20 cours) : recrutement des vacataires, gestion de l'emploi du temps, gestion du déroulement des cours, harmonisation des notes
- Mise en place de séminaire de bonnes pratiques de code (reproductibilité)
- Accompagnement pédagogique des étudiants

### Divers

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<i>Langues</i>	Français (Langue Maternelle) Anglais - TOEIC: 890/990 Allemand- level A2
<i>Language</i>	Java, C++ and C#
<i>Logiciels Statistique</i>	Stata, SAS, R, Python, Matlab (Julia), CS sur supercalculateur

### Références

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## **Résumés des principaux travaux de recherche**

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**How are day-ahead prices informative for predicting the next day's consumption of natural gas? Evidence from France, *forthcoming in The Energy Journal* (HCERES: A, CNRS: 1)** 2020

Abstract: The purpose of this paper is to investigate, for the first time, whether the next day's consumption of natural gas can be accurately forecast using a simple model that solely incorporates the information contained in day-ahead market data. Hence, unlike standard models that use a number of meteorological variables, we only consider two predictors: the price of natural gas and the spark ratio measuring the relative price of electricity to gas. We develop a suitable modeling approach that captures the essential features of daily gas consumption and, in particular, the nonlinearities resulting from power dispatching and apply it to the case of France. Our results document the existence of along-run relation between demand and spot prices and provide estimates of the marginal impacts that these price variables have on observed demand levels. We also provide evidence of the pivotal role of the spark ratio in the short run which is found to have an asymmetric and highly nonlinear impact on demand variations. Lastly, we show that our simple model is sufficient to generate predictions that are considerably more accurate than the forecasts published by infrastructure operators.

### **Bet on a bubble asset ? An optimal portfolio allocation strategy**

Abstract: We discuss portfolio allocation when one asset exhibits phases of locally explosive behavior. We model the conditional distribution of such an asset through mixed causal-non-causal models which mimic well the speculative bubble behaviour. Relying on a Taylor-series-expansion of a CRRA utility function approach, the optimal portfolio(s) is(are) located on the mean-variance-skewness-kurtosis efficient surface. We analytically derive these four conditional moments and show in a Monte-Carlo simulations exercise that incorporating them into a two-assets portfolio optimization problem leads to substantial improvement in the asset allocation strategy. All performance evaluation metrics support the higher out-of-sample performance of our investment strategies over standard benchmarks such as the mean-variance and equally-weighted portfolio. An empirical illustration using the Brent oil price as the speculative asset confirms these findings.

### **Identifying oil supply news shocks and their effects on the global oil market**

Abstract: This paper uses a new empirical strategy to identify oil supply news shocks within a Non-Causal VAR model of standard global oil market variables. These shocks explain most of the movements in oil production over a long but finite time horizon. Our findings highlight the prominent role of expectations in propagating shocks. Negative oil supply news shocks cause abrupt and permanent reactions in global oil production, global economic activity and in oil inventory. However, an oil supply shock has only a limited effect on oil price. Finally, a news shock regarding oil supply shortfalls has macroeconomic consequences, causing a substantial decline in US industrial production.

## **Real-time demand in U.S. natural gas price forecasting: the role of temperature data**

Abstract: This paper provides evidence of the pivotal role temperature data can play in forecasting natural gas prices at the Henry Hub in real time. Considering a newly constructed temperature index as an additional exogenous variable in a Bayesian vector autoregressive (BVAR) framework significantly increases forecast accuracy at horizons of up to 12 months. Our novel approach to energy price forecasting simultaneously considers both supply and demand and incorporates temperature data as a proxy of real-time demand for natural gas.

## **The role of expectations in predicting the real prices of oil: a non-causal analysis**

2021

Abstract: This paper revisits the predictive power of convenience yield for oil by incorporating expectations into an empirical specification through the estimation of Bayesian non-causal VAR. We empirically show that expectations play a significant role in the determination of oil prices. Second, we provide empirical evidence that real-time forecasts of real oil prices can be remarkably more accurate than the no-change forecast and significantly more accurate than real-time forecasts generated by existing structural models relying on Bayesian VAR. Beyond the traditional analysis at the monthly frequency, we further investigate the forecasting accuracy of our empirical specification at the daily and weekly frequency, resulting in interesting findings for potential investment purpose.

## **Production intermittence in spot electricity markets: a behavioral simulations approach**

Abstract: This paper analyzes the influence of production intermittence on spot electricity markets. More specifically, we examine how the presence of a competitive fringe operating low-cost intermittent generation assets modifies the bidding behavior of the strategic players who own the conventional (reliable) power plants. We first use game theory to derive the market outcomes obtained with perfectly rational players. We then compare them with the ones obtained when the players behave as adaptive traders who follow the Camerer and Ho (1999) behavioral model. The simulation results show that, compared to the theoretical benchmark, intermittent technologies yield lower prices when incumbent shave individual market power, but are higher when they do not have it. We also run the simulations for a series of alternative specifications. The results indicate that this finding happens under different intermittence and ownership configurations. We also observe that replacing high-cost assets with low-cost ones results in prices that are higher than when they are left to co-exist