

# Firmin Ayivodji

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## Research Interests

Primary: Econometrics, Big Data, Machine Learning/NLP, Climate Finance.

Secondary: Causal Inference, Real Estate, Household Finance, ESG Investing.

## Education

2017-present: PhD Candidate in Economics, University of Montreal (UdeM), Canada.

2014–2017: MSc in Statistics and Economics, Ecole Nationale de la Statistique et de l'Analyse Economique (ENSAE), Senegal.

2010–2013: BSc in Statistics, Ecole Nationale d'Economie Appliquée et de Management (ENEAM), Benin.

## Research and Publications

### Working Papers

*"Identification and Estimation of Common Factors in Panel Data".*

*"Measuring Economic Activity using News-Based Sentiment Indices".*

*"Food Security and the COVID-19 Employment Shock in Nigeria: Any Ex-Ante Mitigating Effects of Past Remittances?", with Almouksit Akim, and Jeffrey Kouton (submitted).*

*"Interaction Effect of Lockdown with Economic and Fiscal Measures against COVID-19 on Social-Distancing Compliance: Evidence from Africa", with Almouksit Akim.*

### Work in Progress

*"Deep Dynamic Factor Models in a Data-Rich Environment".*

*"When Real Estate Investing Meets Climate-Transition Risk".*

*"How Media Narratives on Transition and Physical Climate Risks affect Sovereign Credit Ratings".*

*"Real-Time Inflation Expectations Forecasting using Media Reports and Social Media", with Ghislain Afavi, and Farell Waji.*

*"The Power of Text: How Media Narratives Influence Canadian Regional Housing Markets".*

## Policy Papers

- 2021      *"More Than Words: A Textual Analysis of MEFP"*, with Jochen Andritzky, and Heiko Hesse.
- 2019:      *"Fiscal Vulnerabilities and the Role of Fiscal Policy in Commodity-Exporting Countries"*, World Bank, MTI discussion paper, with Christine Richaud, Sebastian Essl, Arthur Mendes, and Samer Matta.
- 2018:      *"Regional Debt Market in the WAEMU: Curse Or Blessing?"*, with Boileau Loko, and Christine Richaud.

## Pre-Doctoral Publications

- 2019:      *"Analysis of Determinants of Export Diversification in Franc Zone: A comparative study between UEMOA and CEMAC countries"*, [Journal of Economics and Public Finance Vol. 6, No. 1, 2020], with Remy Hounsou.
- 2018:      *"Threshold Effects of Health on Economic Growth in Sub-Saharan African Countries: Evidence from a Dynamic Panel Threshold Model"*, [Journal of Economics and Development Studies, 2018, vol. 6, no 4, p. 19-37], with Jeffrey Kouton, and Coffie José N'guessan.

## Research Grants, Scholarships, & Fellowships

- 2022: First International Workshop on Interactive Causal Learning, Travel grant.
- 2022: Canadian Economics Association, Travel grant.
- 2020-2023: FRQSC - Doctoral Research Scholarships.
- 2018-2023: PhD Fellowship of CIREQ and Department of Economics, University of Montreal.
- 2014-2017: MSc. in Statistics, Excellence Scholarship.
- 2010-2013: Government of Benin Scholarship.

## Teaching and Academic experience

**Lecturer**, University of Montreal (UdeM)

- Econometrics II for undergraduate degree, Winter (2020).

**Lecturer**, Ecole Nationale de la Statistique et de l'Analyse Economique (ENSAE)

- Big Data, Machine Learning and Econometrics, Graduate, Guest speaker, Fall (2021).
- Econometrics of Panel Data and Quantile Regression, Guest speaker, Winter (2016).

**Teaching Assistant**, University of Montreal (UdeM)

- Advanced Econometrics for graduate degree, Fall (2021), Fall (2020), Fall (2019).
- Macroeconometrics for graduate degree, Winter (2021).
- Econometrics II for undergraduate degree, Winter (2022), Fall (2021), Winter (2021).
- Introduction to Macroeconomics for undergraduate degree, Fall (2019).
- Principles of Economics for undergraduate degree, Summer (2022), Summer (2021).

## Research Experience and Other Employment

October 2021 – present: **Research Assistant** for Prof. *Karim Chalak*, University of Montreal, Canada

June – August, 2021: **PhD Intern**, International Monetary Fund (IMF), Strategy, Policy, and Review Department, Washington, US

December – January 2021: **Research Assistant** for Prof. *Benoit Perron*, University of Montreal, Canada

November 2020 – January 2021: **Research Assistant** at *Observatoire de la Francophonie Économique (OFE)*, Montreal, Canada

August 2019 – September 2019: **Economic Researcher** at *Macroeconomics, Trade and Investment (MTI) Global Practice*, World Bank, Washington, USA

August 2019 – present: **Co-founder & Chairman** at *KiDs A.I. Inc.*, Canada

August 2018 – August 2019: **Research Assistant** for Prof. *Christopher Rauh*, University of Montreal, Canada

January – June 2018: **Economic Researcher** at *Macroeconomics, Trade and Investment Global Practice*, World Bank, Washington, USA

January – July 2017: **Data Scientist Intern**, *École Nationale de la Statistique et de l'Analyse Économique (ENSAE)*, Dakar, Senegal

August – October 2016: **Research Officer**, *International Monetary Fund (IMF)*, Dakar, Senegal

July 2016: **Data Scientist Intern**, *École Nationale de la Statistique et de l'Analyse Économique*, Dakar, Senegal

2013-2016: **Co-Founder STATEC**, *Lead Data Scientist*, Cotonou, Benin

May 2015: **Data Scientist Intern**, *ENSAE-United Nations Industrial Development Organization (UNIDO) Co-operation*, Dakar, Senegal

August – November 2013: **Data Scientist Intern**, *Direction of Forecasting and Business Cycle*, Cotonou, Benin

## Seminar and Conference Presentations

2022:

- IVADO Digital October, MIL campus, Montreal, Canada.
- CIREQ Montreal Econometrics Conference in Honor of Eric Renault (Montreal, poster).
- 56<sup>th</sup> Annual Meetings of the Canadian Economics Association, Carleton University.
- 61<sup>st</sup> Congress of the Canadian Society of Economic Sciences, Montreal.
- 17<sup>th</sup> CIREQ Ph.D. Students' Conference, Montreal, Canada.
- Quebec PhD workshop in Economics, Statistics and Finance.

2021:

- Econometrics and Machine Learning Reading Group, University of Montreal, Canada.
- 60<sup>th</sup> Congress - Société Canadienne de Science Économique (SCSE), Ottawa, Canada.
- Pan-African Scientific Research Council (PASR) Conference.
- 16<sup>th</sup> CIREQ Ph.D. Students' Conference, Montreal, Canada.
- Quebec PhD workshop in Economics, Statistics and Finance.

## Selected Additional Training

March 05-June 30, 2022: "*Statistical Learning*", *Stanford University*, taught by Trevor Hastie and Rob Tibshirani.

April 17- May 10, 2022: "*Macroeconomics of Climate Change: Science, Economics, and Policies*", *IMF*, taught by James Roaf, Augustus Panton, Irene Yackovlev.

October 02-December 04, 2020: "*Empirical Household Finance*", *New York University Leonard N. Stern School of Business*, taught by Theresa Kuchler and Johannes Stroebel.

August 14-December 14, 2018: "*Machine Learning*", *Georgia Tech*, taught by Charles Isbell.

August 21-December 21, 2018: "*Artificial Intelligence (AI)*", *Columbia University, Department of Computer Science*, taught by Ansaf Salieb-Aouissi.

August 15-December 18, 2018: "*Machine Learning Fundamentals*", *California-San Diego University, Computer Science and Engineering Department*, taught by Sanjoy Dasgupta.

## Memberships and Research Affiliations

Econometric Society, International Association for Applied Econometrics, American Economic Association, Canadian Economics Association, American Statistical Association, Black in AI, MILA, Waterloo AI Group, UdeM-Econometrics and ML Reading Group, Center for Interuniversity Research and Quantitative Economics, Society for Financial Econometrics.

## Skills and Languages

**Programming:** Python, MATLAB, STATA, R, SAS, Git, ArcGIS, VBA,  $\LaTeX$ .

**Statistics and Machine Learning:** Natural Language Processing, Causal Inference (Experiments, IV, DiD, RDD), Deep Learning, Predictive Modeling, Machine Learning for Causal Inference, Unsupervised Learning, Reinforcement Learning.

**Languages:** English (proficiency), French (native).

## Summary of working papers/work in progress

### **Identification and Estimation of Common Factors in Panel Data**

This paper examines the estimation of relations among factors extracted from different panel data sets. Two interesting applications are the factors contributing to economic growth and the synchronicity of business cycles. We show that the estimation of factors induces a bias in the estimated correlation between factors which disappears if the factors are estimated from panel data sets that contain a large number of cross-sectional series. We show that a modified version of the wild bootstrap algorithm proposed by Gonçalves and Perron (2014) can correct the bias and provide reliable inference on the correlation of interest. Finally, we apply our modified bootstrap method to the contributions of institutional factors to economic growth analyzed in Deniz et al. (2018) and to the degree of synchronization of business cycles among developed countries and emerging economies in Kose et al. (2013) and Aastveit et al. (2015).

### **Measuring Economic Activity using News-Based Sentiment Indices**

This paper evaluates the informational content of sentiment extracted from news articles about the state of the economy. First, I apply deep learning and lexical-based techniques to construct a new high-frequency measure of sentiment indices embodied in a vast news corpus covering economic and financial articles in Canada from January 1977 to March 2022. These sentiment indices are constructed both at the provincial and national levels. Second, I document that the sentiment indices significantly correlate with contemporaneous key economic and financial variables such as inflation and unemployment. Third, this paper provides novel evidence of how news sentiment tracks current economic and financial conditions and significantly enhances predictive power in forecasting models using shrinkage methods and non-linear machine learning techniques.

### **The Power of Text: How Media Narratives Influence Canadian Regional Housing Markets**

Housing price prediction is a big challenge. The 2008 Global Financial Crisis (GFC) showed that even the most sophisticated traditional macro-financial models failed to foresee the crisis. In this paper, I investigate whether information from Canadian local newspaper articles about housing market narratives could improve local housing price predictions. We build separate future and past topic indexes to capture prior and posterior media narratives about the housing market. I use the mixed-frequency machine learning approach to generate a sequence of nowcasts/forecasts of monthly housing prices based on a vast local newspapers corpus related to the housing market. The predictions are based on linear models estimated via the LASSO and elastic net, nonlinear models based on artificial neural networks, and ensembles of linear and nonlinear models. The results indicate that news data contain valuable information about the housing market's direction.

### **When Real Estate Investing Meets Climate-Transition Risk**

Real estate plays an important role in debates on the transition to a carbon-neutral economy. This paper investigates the relationship between climate-transition risk and real estate investing across Canadian regions. I construct the first measures of transition climate change risks at the regional level in real-time by conducting textual analysis and unsupervised machine learning of climate change news. Moreover, I assume a cross-sectional dependence from unobserved common factors between the regions. First, I find that climate-transition risk concerns by provinces are increasing over time. Second, the paper finds that houses drop in value when climate-transition risk attention rises. Third, I find differential impacts across local housing prices. These findings inform the debate over the optimal transition toward a low-carbon economy.