

# DATA 5690: Final Project

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## Introduction

Blah, blah, blah

## Question 2.

Fintech is traditionally defined as a combination of finance and technology based on big data, machine learning and artificial intelligence, and cryptocurrencies and blockchain technologies. The economist Xavier Vives as defined fintech as follows:

*“Fintech may be understood as the use of innovative information and automation technology in financial services. New digital technologies automate a wide range of financial activities and may provide new and more cost-effective products in parts of the financial sector, ranging from lending to asset management, and from portfolio advice to the payment system.”*<sup>1</sup>

We note that the data scientist Jordan (2019) ([see also](#)) has argued for a definition of data science as a new and emerging engineering discipline that rests upon three foundational pillars:

- **1.** The *inferential* from probability and statistics.
- **2.** The *algorithmic* from theoretical computer science.
- **3.** The *social-institutional* from economics.

We have argued that the third pillar should be rightly conceived of as the catallactics of the exchange paradigm from the Austrian tradition of economics. Make the strongest case you can for this latter claim for fintech as a specialization of data science in the Jordan sense with obvious ties to financial markets and institutions. Why is an economic theory that focuses on

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<sup>1</sup>[https://blog.iesee.edu/xvives/files/2018/02/EE\\_2.2017.pdf#page=99](https://blog.iesee.edu/xvives/files/2018/02/EE_2.2017.pdf#page=99)

process and which explicitly incorporates the entrepreneurial role and institutional evolution required? What are the greatest limitations for the theory of catallactics in this role? Is it possible to extend or augment catallactic theory to overcome these limitations? How?

## Question 2.

Throughout this course we have argued that the focus on *market process* and the *entrepreneur-as-arbitrageur* is the key strength of catallactic theory to serve as a fundamental theory underlying fintech. At the same time, we have noted that perhaps the greatest limitation of catallactics in serving this role is its weak foundation in probability theory. We have offered the subjective Bayesian derivation of probability due to Bruno de Finetti as a possible way to augment catallactic theory to provide the missing foundational probability theory. Ludwig von Mises - one of the founders of catallactics - emphasized the essential role of monetary calculation by the entrepreneur as the central driver of the market process. See Horwitz (2004) and Horwitz (1998).

Discuss the possibility of Mises' monetary calculation as the necessary institutional foundations for de Finetti's derivation of subjective probability. Can we properly understand de Finetti's derivation of probability as a catallactic theory? See Nau (2001). Is the Dutch Book Theorem a catallactic theory resting upon Misesian microfoundations? See also Pressacco and Ziani (2010).

## Question 3.

([CulpMiller1995a](#)?; see also [CulpMiller1995b](#)?) provide an academic defense of Metallgesellschaft Refining & Marketing's (MGRM) energy hedging strategy based upon the research of [Holbrook Working](#). Their defense of MGRM rests on an understanding of their hedging strategy as dynamic arbitrage called *synthetic storage* as an example of what Working called *carry-charge hedging*. Outline the basics of this strategy. What financial contracts were traded? How? (*Hint*: you should know the difference between a stack-and-roll hedge vs a strip hedge and why it matters).

At the heart of MGRM's strategy was the creation and maintenance of novel long-term delivery contracts for heating oil and natural gas. Propose an interpretation of this strategy as a real-world example of what Nobelist [James M. Buchanan](#) has referred to as *creative arbitrage*. How does this strategy depend upon Misesian-Hayekian-de Finettian microfoundations? Do you find this explanation compelling? Why or why not? Defend your position with logic and evidence.

The following additional resources should be helpful (all available on Canvas):

- Buchanan (1964) *What Should Economists Do?*
- Buchanan (1979) *Chapter 4 - General Implications of Subjectivism in Economics*
- Buchanan (1979) *Chapter 5 - Natural and Artifactual Man*
- Buchanan (1979) *Chapter 16 - Retrospect and Prospect*
- Buchanan (1982) *Chapter 2 - The Domain of Subjective Economics: Between Predictive Science and Moral Philosophy*

#### Question 4.

[Pirrong \(1997\)](#) strongly criticizes MGRM from the perspective of neoclassical (mainstream) finance theory. Pirrong's critique is based upon an understanding of hedging as exclusively defined as minimum-variance hedging for risk mitigation purposes only. Pirrong classifies MGRM's strategy as wildly "speculative" from this perspective.

- (a) Pirrong's argument rests on a strong econometric foundation by which an optimal minimum-variance hedge ratio is derived. His model is called *Backwardation-Adjusted GARCH* or *BAG*. Given the MLE coefficients that Pirrong reports in Table V, simulate a single time path of the BAG model and plot the resulting optimal hedge ratios. Comment on the dynamics of the hedge ratios over time.
- (b) Pirrong's critique rests upon the frequentist tradition of specifying a "correct" model for the data-generating process. Discuss this modeling philosophy. Do you find Pirrong's empirical findings compelling regarding a specification of the true model? Are there any issues such as overfit, numerical instability, unreported competing model specifications, etc that might cause you to be skeptical? Discuss.
- (c) In the conclusion of his paper Pirrong invokes Bayes' Rule (presumably via the Dutch Book Theorem) to suggest strong doubt regarding the possibility of MGRM's possession of an informational advantage to support an arbitrage view of their hedging strategy. Why do you think he does this? How does it connect to the reported (frequentist) econometric methods in the paper? Is there a Bayesian interpretation of these methods? If so, why didn't Pirrong simply provide a full Bayesian model? Do you find his argument convincing? Why or why not. Defend your answer with logic, evidence, and probability and econometric theory.

You may also find the following additional resources helpful (all available on Canvas):

- [Culp \(2004\) Chapter 14 - Hedge Ratios.](#)
- Murray (1994) *The Drunk and Her Dog: An Illustration of Cointegration and Error Correction*

## References

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- Pressacco, Flavio, and Laura Ziani. 2010. "Bruno de Finetti Forerunner of Modern Finance."