

# **Tandon School of Engineering of New York University**

Department of Finance and Risk Engineering  
Course Outline FRE-GY XXXX: Cryptocurrencies  
**Spring 2019**

**Professor Agnes Tourin**

Monday 18:00 EST ; [Building], [Room #]

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Office hours: Tuesdays 10:00am-12:00pm or by appointment

Course Pre-requisites: FRE-GY 6083

## Course Description :

This course provides a broad overview to the current state of the art in the area of cryptocurrencies, and discusses quantitative trading models based on stochastic calculus, and machine learning techniques.

## Course Objectives:

By the end of this course, the students should be able to trade cryptocurrencies.

## Course Structure :

- The instructor will deliver weekly lectures, and leave time each week for a Q&A session and a discussion.
- A quiz will be held on the fourth class.
- The last class will be dedicated to the project presentations by the students.

## Readings:

- The instructor will provide a set of notes.
- There is no mandatory textbook

## Additional references:

- An empirical study of modeling and prediction of bitcoin prices with bayesian neural networks based on blockchain information, by H. Jang and J. Lee, IEEE Access, 2017, 6, pp. 5427 – 5437; <https://doi.org/10.1109/ACCESS.2017.2779181>
- Garch modelling of cryptocurrencies, by J. Chu, S. Chan, S. Nadarajah, and J. Osterrieder, Journal and Financial Risk management, 2017, 10, 17; doi:10.3390/jrfm10040017.
- Volatility estimation for Bitcoin: A comparison of GARCH models, by P. Katsiampa, Economics Letters, 2017, 158, pp. 3-6; <https://doi.org/10.1016/j.econlet.2017.06.023>.
- Predicting short-term price fluctuations from buy and sell orders, by T. Guo and N. Antulov-Fantulin, working paper; <https://arxiv.org/pdf/1802.04065>.

- Model-based pairs trading in the bitcoin markets, by P.S. Lintilhac and A. Tourin, Quantitative Finance, 2017,17, 5; <https://doi.org/10.1080/14697688.2016.1231928>.
- Bitcoin: A Peer to Peer Electronic Cash System, by Satoshi Nakamoto, available on Bitcoin.org.
- Price manipulation in the Bitcoin ecosystem, by N. Gandal, J.T. Hamrick, T. Moore, and T. Oberman, Journal of Monetary Economics, 2018, 95, pp. 86-96.

- The bitcoin magazine <https://bitcoinmagazine.com/>
- A method for shorting bitcoins
- Cryptoasset Factor Models, by Zura Kakushadze, available on SSRN.

<https://techcrunch.com/2017/12/19/dydx-is-a-decentralized-protocol-for-cryptocurrency-derivatives/amp/>

- Crypto Currency data  
<https://bitcoincharts.com>  
<https://coinmarketcap.com>
- Futures data  
<https://quandl.com>

#### Course requirements:

- One quiz at the beginning of the fourth lecture, 30% of final grade
- Project, due at the end of the course, 70% of final grade  
The projects will be handed out on the third class and will be due on week 7. There will be an oral defense on week 7.
- The students will need to write codes in Python to implement trading strategies

#### Course Content

- Week 1: The blockchain technology.
- Week 2: Crypto currency market microstructure and asset price models for cryptocurrencies.
- Week 3: Crypto currency derivatives, regulations.
- Week 4: Investing and trading cryptocurrencies.
- Week 5: Markov Decision models for trading crypto currencies, example of cointegration.
- Week 6: Machine learning techniques for trading crypto currencies
- Week 7: Oral presentation of the projects.