

# USC Marshall

School of Business

## FBE 599

### Decentralized Finance – DeFi

Fall 2023

**1.5 units - This class meets twice a week for 8 weeks**

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#### FACULTY AND CONTACT INFORMATION

Professor:	Vincenzo Quadrini
Office:	HOH 715
Phone:	213-740-6521
E-mail:	quadrini@usc.edu
Class hours:	Tuesday-Thursday, 12:30-1:50PM (starting October 18)
Classroom:	BRI 5
Office hours:	Tuesday 2:30-4:30PM, Thursday 2:30-3:30PM

#### COURSE DESCRIPTION

The goal of this course is to introduce students to the growing phenomenon of “decentralized finance,” also known as “DeFi”. Technological advances are at the core of DeFi, as they are for the broader FinTech. However, the market structure and functioning of DeFi are fundamentally different. Simply put, traditional finance and most of today’s FinTech do not change the fundamental organizational structure of financial markets. They are still based on companies offering financial services to customers. The provision of these services with advanced technological tools increases the variety and quality of the services while reducing their cost. However, financial services are still provided by identifiable companies, whether traditional banks or Fintech companies. Companies collect a variety of information from their customers and, typically, do not share information with their competitors. By contrast, in DeFi, information is publicly accessible to all operators in the system but maintaining anonymity thanks to data encryption. Everybody can participate in the marketplace for financial services, not only as users (customers) but also as providers (suppliers of services). That said, each provider has limited control over the system, unlike the traditional marketplace in finance.

At the center of DeFi is a network system that relies upon blockchains. The course will begin with a brief description of the architecture underlying decentralized finance. An important component of the course is the financial analysis used to evaluate and assess the risk-return trade-off of cryptocurrencies and more generally of digital assets. Some of the data analysis will be performed with Python. We will use Python because it is widely used

in the finance industry. During the course we will present and discuss various applications, starting with the financial analysis of cryptocurrencies. Cryptocurrencies are just one component of DeFi. Many other applications are made operational with Smart Contracts. They include some of the most popular transactions in finance, including borrowing and lending. But the range of financial transactions that can be implemented through smart contracts is unlimited and potentially quite complex. A further topic covered in the course will be digital assets and Non-Fungible Tokens (NFT). We will study how the tokenization of nontangible and nonfungible production can revolutionize the structure of certain industries.

### COURSE OBJECTIVES

Upon successful completion of this course, students will be able to:

1. Explain how DeFi works and how it could revolutionize the market structure of finance.
2. Identify the advantages and disadvantages of DeFi compared to traditional finance.
3. Assess the role played by cryptocurrencies as mean of transaction and as store of value.
4. Describe the difference between digital currencies and cryptocurrencies.
5. Explain how smart contracts work and why they are important for finance.
6. Assess the risk that the value of digital assets diverges from the fundamental value (price bubbles)

To achieve these goals, the course will be divided in three parts. The first part will focus on the mechanics of decentralized finance. Here the goal is to introduce students to the basic architecture of DeFi. The second part would focus on financial analysis with special attention to cryptocurrencies. Since cryptocurrencies are a type of money, the course will review the basic theory of money and compares the role of cryptocurrencies to more traditional government sponsored money, whether digital or not. The third part covers other applications in decentralized finance that are implemented with smart contracts.

### COURSE MATERIALS

- **Books:** Campbell R. Harvey, Ashwin Ramachandran and Joey Santoro, *DeFi and The Future of Finance*, 2021, Wiley.  
Eswar S. Prasad, *The Future of Money*, 2021, Harvard University Press.  
Baxter Hines, *Digital Finance*, 2021, Wiley.
- **Slides:** Slides for the topic covered in each class will be posted in Blackboard before the class meets.
- **Python programming:** Python programs will be constructed together in class. Students do not need a prior knowledge of Python. Basic knowledge of programming, in any language, would be helpful but not essential. We will use Python to analyze financial data such as historical prices of cryptocurrencies. For

that purpose, we will use “yfinance” which is a python package that enables us to fetch historical market data from Yahoo Finance API.

- **Additional readings:** Additional readings for class discussion will be posted in Blackboard. Typically, readings are articles from major newspapers or blog related to the topic of decentralized finance.

## GRADING

The course grade will be based on the following weighted requirements:

- |                                                          |            |
|----------------------------------------------------------|------------|
| 1. A set of 4 homework assignments (each counting 7.50%) | <b>30%</b> |
| 2. Class participation                                   | <b>10%</b> |
| 3. Group project                                         | <b>20%</b> |
| 4. Final exam                                            | <b>40%</b> |

Class participation: Class participation is an important part of the learning process as the richness of the experience will be largely dependent upon the degree of preparation by *all* students prior to each class session.

Homework: There will be three homework assignments that must be submitted individually in Blackboard. Students are permitted to discuss with other students their ideas for completing the homework. However, once the student begins writing the deliverable, all work must be individual and independent.

Group Project: The project is completed by groups formed by a maximum of four students. Students are encouraged to form their own group. If they are unable to form a group, they will be assigned to a group by the instructor. The project develops an idea that could potentially be launched in decentralized finance. It will propose financial transactions/services that could be implemented with smart contracts and provides an analysis of its market potential. Grades for individual student contributions to group projects are assigned by the instructor, based on my observations of the team’s working dynamics, my assessment of the team’s project quality, and thoughtful consideration of the information provided through peer evaluations (see peer-evaluation form in appendix).

Final exam: The final exam is closed book/notes and will be taken in class at the official date set by the school. The only technology allowed during the exam is a calculator. Toward the end of the course, I will provide a list of topics/references and selected slides covered during the course and will be tested in the final exam.

## CLASS FORMAT

This is a residential class, and in-person attendance is expected. Unless students provide an accommodation letter from USC OSAS requiring remote attendance, there is no option to attend class via Zoom.

## COURSE EVALUATIONS

Course evaluations submitted by students are extremely valuable. The course is continuously improved based on feedback from students and instructor observations. In addition to the end-of-year evaluations, students are more than welcome to provide feedback and make suggestions for improvement directly to the instructor at any time during the course (and/or after the end of course).

## COURSE OUTLINE AND ASSIGNMENTS

	<b>Topics/ Daily Activities</b>	<b>Readings</b>	<b>Deliverables</b>
<i>Week 1</i>  (October 17, October 19)	Introduction to decentralized finance.  Problems with traditional finance that DeFi tries to solve: (i) Centralized control; (ii) Limited access; (iii) Inefficiency; (iv) Lack of interoperability; (v) Opacity.  The basic architecture of DeFi: The use of Blockchains in Finance.	<i>DeFi and The Future of Finance</i> , Wiley: Chapters 1-5.  <i>Digital Finance</i> , Wiley: Introduction and Chapter 1.  <i>The Future of Money</i> , Harvard University Press: Chapter 4.	
<i>Week 2</i>  (October 24, October 26)	The validation process for executing and storing transactions in the blockchain.  The Bitcoin platform	“Ethereum's Big Merge”, <i>Wall Street Journal</i> , August 20, 2022.	Homework 1: Ledgers, blockchains, digital signature and validation mechanisms.
<i>Week 3</i>  (October 31, November 2)	Money, payment system and cryptocurrencies. Are cryptocurrencies	<i>The Future of Money</i> , Harvard University Press: Chapter 2 and 6.	Homework 2: Assessing the country risk from the adoption of a

	<p>suitable to play the functions of money?</p> <p>Can cryptocurrencies become national currencies and acquire the status of legal tender?</p> <p>Introduction to Python for finance: financial data analysis. Using API “yfinance”.</p>	<p>“El Salvador Becomes First Country to Adopt Bitcoin as National Currency”, <i>Wall Street Journal</i>, September 7, 2021. <i>Python for Finance, Hands on, Packt</i>: Chapters 1-2.</p> <p>Additional readings distributed in Blackboard.</p>	<p>cryptocurrency: the case of El Salvador.</p>
<p><i>Week 4</i> (November 7, November 9)</p>	<p>Cryptocurrency data analysis. Assessing the risk-return of holding cryptocurrencies.</p> <p>Cryptocurrencies as an investment vehicle: diversification of a portfolio of cryptocurrencies.</p> <p>Adding cryptocurrencies to a portfolio of other investments: can they provide some hedging to the whole portfolio?</p>	<p>Material provided by the instructor in Blackboard.</p>	
<p><i>Week 5</i> (November 14, November 16)</p>	<p>Smart contracts in finance: credit/lending, decentralized exchanges, derivatives, tokenization</p>	<p><i>DeFi and The Future of Finance</i>, Wiley: Chapter 6.</p> <p><i>Digital Finance</i>, Wiley: Chapter 2-3 and 9.</p>	<p>Homework 3: Data analysis with Python using historical prices of cryptocurrencies.</p>
<p><i>Week 6</i> (November 21)</p>	<p>Non fungible token (NFT) and the market for artistic and non-artistic production</p>	<p><i>Digital Finance</i>, Wiley, Chapter 4 and 7.</p> <p>“What is a bubble?”, CNBC Explains <a href="https://youtu.be/3vDPowCDWc8">https://youtu.be/3vDPowCDWc8</a></p>	

	<p>Digitalization exuberance: rational or irrational?</p> <p>How to assess the fundamental value of an asset (either digital or physical).</p> <p>The anatomy of an asset price bubble: displacement, price boom, euphoria, profit taking stage, panic.</p>		
<p><i>Week 7</i> (November 28, November 30)</p>	<p>Group presentations</p>	<p>“What is a bubble?”, CNBC Explains <a href="https://youtu.be/3vDPowCDWc8">https://youtu.be/3vDPowCDWc8</a></p>	<p>Homework 4: Financial transactions in Decentralized Finance.</p>
<p><i>Week 8</i> (Date to be confirmed)</p>	<p>Final exam</p>		

## ADDITIONAL INFORMATION

### Add/Drop Process

Most Marshall classes are open enrollment (R-clearance) through the Add deadline. If there is an open seat, you can add the class using Web Registration. If the class is full, you will need to continue checking Web Registration or the *Schedule of Classes* (classes.usc.edu) to see if a space becomes available. Students who do not attend the first two class sessions may be dropped from the course. There are no formal wait lists for Marshall undergraduate courses, and professors cannot add students or increase the course capacity. If all sections of the course are full, you can add your name to an interest list by contacting the Office of Undergraduate Advising & Student Affairs; if new seats or sections are added, students on the interest list will be notified.

Last day to drop a class without a mark of “W” and receive a refund is Wednesday, October 25, 2023. The last day to drop a class with a mark of “W” is Thursday, November 23, 2023.

### Technology Policy

Laptop and Internet usage is necessary for this course. However, during class, laptops should be used only for the purpose of the class. If not needed for the class laptops should be turned off. The use of other personal communication devices during academic or professional sessions is considered unprofessional and is not permitted. ANY e-devices, other than the one being used for class activities (cell phones, iPads, etc.) must be completely turned off during class time. Use of any recorded or distributed material is reserved exclusively for the USC students registered in this class. Exceptions to this policy may be granted to individual students with appropriate documentation on a case-by-case basis.

### Open Expression and Respect for All

An important goal of the educational experience at USC Marshall is to be exposed to and discuss diverse, thought-provoking, and sometimes controversial ideas that challenge one’s beliefs. In this course we will support the values articulated in the USC Marshall [“Open Expression Statement.”](#)

### USC Statement on Academic Conduct and Support Systems

**Academic Conduct:** Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on [Research and Scholarship Misconduct](#).

**Students and Disability Accommodations:** USC welcomes students with disabilities into all of the University’s educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for

each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at [osas.usc.edu](https://osas.usc.edu). You may contact OSAS at (213) 740-0776 or via email at [osasfrontdesk@usc.edu](mailto:osasfrontdesk@usc.edu).

### **Support Systems:**

*Counseling and Mental Health - (213) 740-9355 – 24/7 on call*  
[studenthealth.usc.edu/counseling](https://studenthealth.usc.edu/counseling)

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

*National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call*  
[suicidepreventionlifeline.org](https://suicidepreventionlifeline.org)

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

*Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call*

[studenthealth.usc.edu/sexual-assault](https://studenthealth.usc.edu/sexual-assault)

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

*Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086*  
[eotix.usc.edu](https://eotix.usc.edu)

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

*Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298*  
[usc-advocate.symplicity.com/care\\_report](https://usc-advocate.symplicity.com/care_report)

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

*The Office of Student Accessibility Services (OSAS) - (213) 740-0776*  
[osas.usc.edu](https://osas.usc.edu)

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

*USC Campus Support and Intervention - (213) 821-4710*  
[campussupport.usc.edu](https://campussupport.usc.edu)

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

*Diversity, Equity and Inclusion - (213) 740-2101*  
[diversity.usc.edu](https://diversity.usc.edu)

Information on events, programs and training, the Provost’s Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

*USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call*  
[dps.usc.edu](https://dps.usc.edu), [emergency.usc.edu](https://emergency.usc.edu)



Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

*USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call*  
[dps.usc.edu](https://dps.usc.edu)

Non-emergency assistance or information.

*Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)*  
[ombuds.usc.edu](https://ombuds.usc.edu)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

*Occupational Therapy Faculty Practice - (323) 442-3340 or [otfp@med.usc.edu](mailto:otfp@med.usc.edu)*  
[chan.usc.edu/otfp](https://chan.usc.edu/otfp)

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

## Appendix I. MARSHALL GRADUATE PROGRAMS LEARNING GOALS

### How FBE 599 Contributes to Marshall Graduate Program Learning Goals

Marshall Graduate Program Learning Goals	FBE 599 Objectives that support this goal	Assessment Method*
<p><b><i>Learning Goal #1: Develop Personal Strengths.</i></b>  <b>Our graduates will develop a global and entrepreneurial mindset, lead with integrity, purpose and ethical perspective, and draw value from diversity and inclusion.</b></p>		
1.1 Possess personal integrity and a commitment to an organization's purpose and core values.	NA	
1.2 Expand awareness with a global and entrepreneurial mindset, drawing value from diversity and inclusion.	NA	
1.3 Exhibit awareness of ethical dimensions and professional standards in decision making.	NA	
<p><b><i>Learning Goal #2: Gain Knowledge and Skills.</i></b>  <b>Our graduates will develop a deep understanding of the key functions of business enterprises and will be able to identify and take advantage of opportunities in a complex, uncertain and dynamic business environment using critical and analytical thinking skills.</b></p>		
2.1 Gain knowledge of the key functions of business enterprises.	Moderate	Final Exam
2.2 Acquire advanced skills to understand and analyze significant business opportunities, which can be complex, uncertain and dynamic.	High	Homework, Final exam, Group project
2.3 Use critical and analytical thinking to identify viable options that can create short-term and long-term value for organizations and their stakeholders.	High	Group project
<p><b><i>Learning Goal #3: Motivate and Build High Performing Teams.</i></b>  <b>Our graduates will achieve results by fostering collaboration, communication and adaptability on individual, team, and organization levels.</b></p>		
3.1 Motivate and work with colleagues, partners, and other stakeholders to achieve organizational purposes.	Moderate	Group project
3.2 Help build and sustain high-performing teams by infusing teams with a variety of perspectives, talents, and skills and aligning individual success with team success and with overall organizational success.	NA	
3.3 Foster collaboration, communication and adaptability in helping organizations excel in a changing business landscape.	NA	

## Appendix II

<b>SAMPLE PEER EVALUATION FORM</b>
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Please identify your team and team members for the \_\_\_\_ Project(s) that you worked on. Then rate all your team members, *including yourself*, based on the **contributions** of each team member for the selected assignment according to the criteria listed below. On a scale of 0 – 2 with 0 indicating does not meet expectations, 1 meets expectations and 2 exceeds expectations, rate each person on each of the five criteria. Lastly, add up the points for each person with the maximum number of points for each person being 10. In the box below, describe the exact contributions of each team member, including yourself.

<b>Team Members/ Assessment Criteria of Team Contributions</b>	<b>Team Member 1</b>	<b>Team Member 2</b>	<b>Team Member 3</b>	<b>Yourself</b>
<b>1. Role Performance</b>				
<b>2. Assists Team Members</b>				
<b>3. Listening and Discussing</b>				
<b>4. Research and Information Sharing</b>				
<b>5. Time Management</b>				
<b>Total</b>				

Contribution details:          
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