

USC Marshall

School of Business

FBE 599

Decentralized Finance (DeFi)

Fall 2024

1.5 units - This class meets for 1h 20m twice a week for eight weeks

FACULTY AND CONTACT INFORMATION

Professor:	Vincenzo Quadrini
Office:	HOH 715
Phone:	213-740-6521
E-mail:	quadrini@usc.edu
Class hours:	TBD
Classroom:	TBD
Office hours:	TBD

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. In contrast, in DeFi, information is publicly accessible to all operators in the system but maintains 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. A part of the course will cover the financial analysis of investments in cryptocurrencies, including the assessment of the risk-return trade-off associated with these investments. 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 non-tangible and non-fungible production can revolutionize 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 of cryptocurrencies as mean of transaction and 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 technological architecture of DeFi. The second part will 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 Brightspace 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 Brightspace. 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%) | 30% |
| 2. Class participation | 10% |
| 3. Group presentation | 20% |
| 4. Final exam | 40% |

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 four homework assignments that must be submitted individually in Brightspace.

- The first two assignments consist of questions aimed at verifying students' comprehension of the material covered in the first two and half weeks.
- In the third assignment students conduct a quantitative exercise using historical trading data for cryptocurrencies by writing their own Python code.
- The fourth assignment consists, mostly, of numerical questions aimed at verifying students' understanding of financial operations conducted in various DeFi platforms such as Aave, Compound, MakerDAO, etc.

Students are permitted to discuss with other students their ideas for completing the homework. However, once students begin writing the deliverable, all work must be individual and independent. Deadline extensions will be granted if there is a valid motivation. However, motivated extensions should be requested before the deadline. Late submissions that are not justified will receive zero credits.

Group Presentation: The presentation 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 observations of the team's working dynamics, assessment of the team's project quality, and information provided through peer evaluations (see peer-evaluation form in appendix). The deliverable consists of the slides prepared for the presentation, in addition to the actual presentation. Slides should be submitted the day before the in-class presentation, by midnight. It is sufficient that one of the group members submits the presentation. Late submissions will receive 2 percent penalty (20 percent maximum credit for the presentation).

Final exam: The final exam is closed book/notes and will be taken in class in the second scheduled meeting of week 8. 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 that will be tested in the final exam.

CLASS FORMAT

This is a residential class, and in-person attendance is expected.

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

	Topics/ Daily Activities	Readings	Deliverables
Week 1	<p>Introduction to decentralized finance.</p> <p>Problems with traditional finance that DeFi tries to solve: (i) Centralized control; (ii) Limited access; (iii) Inefficiency; (iv) Lack of interoperability; (v) Opacity.</p> <p>The basic architecture of DeFi: The use of Blockchains in Finance.</p>	<p><i>DeFi and The Future of Finance</i>, Wiley: Chapters 1-5.</p> <p><i>Digital Finance</i>, Wiley: Introduction and Chapter 1.</p> <p><i>The Future of Money</i>, Harvard University Press: Chapter 4.</p>	
Week 2	<p>The validation process for executing and storing transactions in the blockchain.</p> <p>The Bitcoin platform</p>	<p>“Ethereum's Big Merge”, <i>Wall Street Journal</i>, August 20, 2022.</p>	<p>Homework 1: Ledgers, blockchains, digital signature and validation mechanisms. Due date: Friday of Week 2 by midnight.</p>
Week 3	<p>Money, payment system and cryptocurrencies. Are cryptocurrencies 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><i>The Future of Money</i>, Harvard University Press: Chapter 2 and 6.</p> <p>“El Salvador Becomes First Country to Adopt Bitcoin as National Currency”, <i>Wall Street Journal</i>, September 7, 2021.</p> <p><i>Python for Finance, Hands on</i>, Packt: Chapters 1-2.</p> <p>Additional readings distributed in Brightspace.</p>	<p>Homework 2: Assessing the country risk from the adoption of a cryptocurrency: the case of El Salvador. Due date: Friday of Week 3 by midnight.</p>

Week 4	<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>	Material provided by the instructor in Brightspace.	
Week 5	Smart contracts in finance: credit/lending, decentralized exchanges, derivatives, tokenization	<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>Due date: Friday of Week 5 by midnight.</p>
Week 6	<p>Non fungible token (NFT) and the market for artistic and non-artistic production</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</p>	<p><i>Digital Finance</i>, Wiley, Chapter 4 and 7.</p> <p>“What is a bubble?”, CNBC Explains https://youtu.be/3vDPowCDWc8</p>	

	boom, euphoria, profit taking stage, panic.		
<i>Week 7</i>	Group presentations		Homework 4: Financial transactions in Decentralized Finance. Due date: Friday of Week 7 by Midnight.
<p>Final exam per USC Final Exam Schedule if the class is scheduled during the second half of the semester. If the class is scheduled during the first half of the semester, the final exam will be taken in the second scheduled meeting of week 8.</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 30, 2024. The last day to drop a class with a mark of “W” is Thursday, November 28, 2024.

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.

Artificial Intelligence (AI) policy

While it is not always advisable to utilize AI in this course, if you find it beneficial for achieving the learning objectives, you can employ AI-powered programs to assist you with assignments. One of the primary aims of these assignments is to grasp the course material thoroughly and prepare for the exams. However, if you rely on AI to answer assignment questions, you might not adequately prepare for the exams, as AI won't be accessible during in-class examinations. Additionally, it's important to recognize that AI tools may provide incorrect information, biased responses, or incomplete analyses. Consequently, they are not yet capable of generating text or solutions that meet the standards set for this course. In alignment with our university's values, it is essential to cite any AI-generated materials (such as text, images, etc.) incorporated or referenced in your work and provide the prompts used to generate the content.

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.”](#)

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, compromises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

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. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

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

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

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

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 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) 740-0411

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

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

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) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

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) 442-2850 or otfp@med.usc.edu

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 530 Contributes to Marshall Graduate Program Learning Goals

Marshall Graduate Program Learning Goals	FBE 530 Objectives that support this goal	Assessment Method*
<p><i>Learning Goal #1: Develop Personal Strengths.</i> Our graduates will develop a global and entrepreneurial mindset, lead with integrity, purpose and ethical perspective, and draw value from diversity and inclusion.</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><i>Learning Goal #2: Gain Knowledge and Skills.</i> 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.</p>		
2.1 Gain knowledge of the key functions of business enterprises.	1, 3, 4, 5	Final Exam
2.2 Acquire advanced skills to understand and analyze significant business opportunities, which can be complex, uncertain, and dynamic.	2	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.	6	Group project
<p><i>Learning Goal #3: Motivate and Build High Performing Teams.</i> Our graduates will achieve results by fostering collaboration, communication and adaptability on individual, team, and organization levels.</p>		
3.1 Motivate and work with colleagues, partners, and other stakeholders to achieve organizational purposes.	NA	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

SAMPLE PEER EVALUATION FORM

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.

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

Contribution details:

Appendix II

SAMPLE PEER EVALUATION FORM

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.

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

Contribution details:
