

## **Cryptocurrency: Past Fraud, Present State, Future Game Theory Model**

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**In a Tortoiseshell:** *In the introduction to his interdisciplinary senior thesis merging Game Theory and Latin American Studies, José L. Pabón effectively **orients** his readers to the structure and motive of his paper. By first providing a succinct outline, which he expands on in the following paragraphs, he prepares the reader for the content of his **thesis**. Then, he pivots smoothly into a discussion of his underlying **motive** in writing this thesis, introducing the reader to the perspective he will adopt in his argument, and deftly presenting the material in such a way as to capture the reader's attention and make him or her immediately sympathetic to the arguments and analysis presented in the rest of the essay.*

### *Excerpt*

This report will center on two intertwined topics. First, we will examine the past, present and potential future usage of cryptocurrency, both legitimate and fraudulent, within Latin American and Caribbean countries. Second, we will also propose an expanded game theory model which will synthesize in theoretical terms the options and behaviour of rational players in cryptocurrency markets.

To preview our theoretical game theory exposition, our readers should keep in mind the ways that cryptocurrency interacts with humankind, which is very much akin to the way humans use fiat currency. Please see our appendix for cryptocurrency basics as need may be. For the remainder of this work, we will use the convention of the single word 'currency' as a shorthand for currency in terms of both fiat currency and cryptocurrency.

The first way humans interact with or use currency is as a barter tool in exchange for goods or services. The second is as investment vehicles, currency can be and have been used as investments by numerous people in many markets and exchanges [16]. And finally, for the purposes of this work the last way humans interact with or use currency is through the process of how these are created, minted or in the case of most legitimate cryptocurrency, mined. Our game theory model will center around participants in all three aspects of human cryptocurrency interaction. As far as spending cryptocurrency, our model will detail the scenario where a holder of cryptocurrency can choose to fraudulently spent 'forged' cryptocurrency, known as 'double spending' in cryptocurrency parlance. The double spending in our model will be limited to the scope of a participant performing what is referred to in cryptocurrency as a '51% attack', where an actor controls a majority of the peer to peer cryptocurrency transaction confirming nodes and thus gets to approve any transactions onto the blockchain ledger, including fraudulent double

spending transactions. [26] In terms of an investment vehicle, our game theory model will detail the threshold parameters at which rational participants in the cryptocurrency market are incentivized to liquidate their positions, or market value, of cryptocurrency including using the aforementioned fraudulent double spending. Lastly, the mining of cryptocurrency is central to another aspect of our game theory model, where we will detail the parameters within which rational participants in bitcoin mining are incentivized to increase their mining nodes, decrease other miners' mining nodes, or both. [18, 10, 26]

In order to preview our exposition on the past, present and potential future usage of cryptocurrency in the region of Latin America and the Caribbean, we must first examine the current socioeconomic and political state of the area. We will delve deep into the socioeconomic and political conditions of these countries to better understand the reasons both fiat and cryptocurrencies have progressed the way they have and also to gain insight on how the game theory models parallel the behaviors seen in the region and help inform the future actions of the members of the area. The socioeconomic and political conditions of countries directly influence their daily tasks and interactions, which influence their methods to acquire and barter for goods and service. In this manner, all currency types ingrain themselves into the lives of citizens of various countries in Latin America.

Our research found enormous amounts of wealth inequality in the region. This inequality brought forth a myriad of consequences, including citizens turning towards decentralized, unregulated technologies such as cryptocurrency to address their everyday needs. Thus, we will investigate the effects of this wealth inequality which leads to other types of inequality as well as related developments, including the adoption of cryptocurrency in the region as a whole. In our global human community, the pinnacle of human collaboration and transnational consensus is the global human rights movement, spearheaded by the multinational conglomerates United Nations, U.N., and the International Court of Justice among others [27]. The level of inequality in the region of Latin America and the Caribbean is so high that the international human rights community, including the U.N. [5], Oxfam [21] among others have labeled the region the most unequal place on Earth. Our work will center on providing a cogent report on the past and present state of the area and then use game theoretical analysis to attempt to predict the future actions of rational participants of the socioeconomic and political ruling class of the area. Positive moral values and human rights respect is not in the scope of this narrative. We use the scaffolding of these human rights statistics to give the correct framework to the socioeconomic political state of the region of Latin America and the Caribbean. Given that these human rights coalitions represent the highest form of human consensus, these documented data points serve as the buttresses on

which we can build the most well sourced background on the socioeconomic, geopolitical state of the region.

Many renowned human rights authors [4, 25] consider the current state of the region's inequality to be a magnanimous failure of the human rights movement. Opinions differ as to whether the reason for this failure is an intrinsic inadequacy of the ideology of the human rights movement or the lack of conviction by its proponents and participants. Regardless of which of these is the root cause, the citizens in the region who are not part of the 1% wealth holders are severely disadvantaged in most, if not all aspects of quality of life.

After defining clearly the scope of the inequality found throughout the region in general, our paper will examine the specific case study of the socioeconomic status of Venezuela, one of the most salient examples of an unequal society we found. Venezuela is a defacto dictatorship that was in the midst of a costly recession when their charismatic, popular leader Hugo Chavez died. Between the ineffective economic policies of Mr. Maduro's new regime and the downturn in global oil prices[29], Venezuela has gone from a terrible situation to an even worse one. One of the aspects of new, emergent modern economies in the country is cryptocurrency. Can this new technology paradigm help rescue a starving populace living without social protections and rule of law? Or is it too little too late?

## *Author Commentary*

José L. Pabón

My submitted paper was my senior undergraduate thesis. The work is interdisciplinary; it was submitted as partial fulfillment of the requirements not only of my A.B. in Mathematics but also for the certificate programs for the Princeton Center for Information Technology Policy as well as the Princeton Program in Latin American Studies. I'm happy to share that the work was well reviewed.

Finding material at the intersection of three distinct academic fields was quite challenging. As a math major, I started my literature review with published works within the academic mathematical journals. I read through a couple of dozen papers and had two or three 'false starts' including ideas about neural networks, A.I., machine reinforcement learning, and more.

Once I stumbled onto the work of various post-docs on Game Theoretical applications to real life, real time cryptocurrency markets, I knew I had found a winner. Pivoting onto the Technology, Society and Latin American socioeconomic background was tough, but I also, again, was fortunate to unearth press releases about Latin American cryptocurrencies, including the infamous *Petro* in downtrodden Venezuela.

A writing muse or perhaps Our Lord sent me inspiration in the middle of my writing because my original outlines, present during meetings with the Princeton Writing Center experts, had no mention of the final 'past, present and future' structure which served the work so well. The past and present could focus on the certificate program content for Technology, Society and Latin American Socioeconomic as these are understandably parts of the past and present, and then the Game Theory mathematics can inform the future of the situation via the game theory models delineated.

I believe that the hardest part of orienting and deciding how much information to include is pruning a work to be succinct yet complete. Although I had about fifty references and 25k words, the work could have easily had double or triple this amount. Deciding which content to leave on the editing floor was tough; I went with the material I thought was most robust in presenting the extreme levels of wealth inequality that research turned in Latin America and the resulting disheartening situation for the innocent citizens of Latin America. I added some graphics and signage from the myriad of sources available on these topics. If I had the chance, I would continue this research as part of a graduate program and provide even more depth of detail to this situation.

I realize as a father describing a child, I am inherently biased when discussing my research paper. I stand behind the work. It shows true empathy and compassion for all of us who are not fortunate enough to be part of the 1% ruling wealthy class of the world.

I am a native Puerto Rican born, raised, and living there. My family and children live with the oppression, neglect, and despair that I describe in my research. Thus, my point of view and honest, genuine point of view give the writing an undeniable legitimacy that empowers the work.

Most academics, including yours truly, expect a research paper in Mathematics to be a stoic, emotionless discourse on some logically presented facts and derived theorems, corollary and related results. I did not set out to write a work that proposed new game theoretical models but also detailed the dreary state of Latin America; I honestly was not even sure I would be admitted to the certificate programs going into my last semester.

I am a student that for reasons omitted in this writing had a twenty-four-year gap between my junior and senior year. I am a man out of time, a father of college students who is himself a college student. My thesis research was a fitting bookend to my academic career: it let me meld theoretical mathematics with a cogent report on the oppressed socioeconomic situation of my homeland, Latin America.

*Editor Commentary*

Isabella Khan

The introduction is the only point during an essay when the author can count on a truly fresh reader—one who is entirely unfamiliar with his or her argument—and as such, it is both an opportunity and a potential stumbling block. If done poorly, it leaves the reader uncomfortable and confused, uncertain about what to expect from the rest of the work. If done well, however, the introduction draws the reader into the main work, so that the reader arrives at the beginning of the analysis already half willing to believe the author's argument.

In a longer paper such as a senior thesis, the introductory section serves several purposes. First, it specifies the scope of the work to come, delineating the aspects of the subject that will and will not be discussed. Second, it provides the reader with a brief précis of the material to be discussed. Finally, the introductory section provides the author with an opportunity to establish his or her unique perspective, as well as the broader tone and tenor of the work.

In the introduction of his senior thesis on cryptocurrency in Latin American countries, José succeeds on all three counts, effectively orienting his reader to the interdisciplinary approach of his paper. Thanks to the brief outline José provides in his first paragraph, the reader immediately knows what to expect from both the rest of the introduction and the rest of the thesis. With his carefully articulated topic sentences in the second and third paragraphs, José parallels the structure he has just introduced in his first paragraph, further describing the analysis he will carry out in the body of his paper. Finally, in his fourth through sixth paragraphs, José orients the reader to the emotional heart of his paper—the motive, both personal and scholarly, for his work. In these later paragraphs, José is able not only to orient his reader to the content he will discuss, but also to the perspective with which he will discuss it, conveying his purpose in writing this thesis, and leaving the reader very willing to be convinced by the arguments that follow.

Through his concise and well-balanced introductory paragraphs, José is able to effectively prepare his reader for the paper to come. We are left with a sense of the structure of José's thesis, a basic familiarity with the topics he will discuss, and—because of the clarity with which he presents his ideas—a readiness to believe the argument he sets forth in the rest of his excellent thesis.

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**Bios**

**José L. Pabón '19 '97** is from Puerto Rico, natively born, raised, and living there until the recent hurricane disasters. He is majoring in Mathematics with certificates in Center for Information Technology Policy's Technology and Society as well as Latin American Studies. He is active with the Math Club, PUMAC, Aquinas Institute and plays in the pit orchestra with the Triangle Club on campus. Aside from academic work, his priority is his wife Yahyra and his children, Carmen and Naiana. He wrote this essay as a senior.

**Isabella Khan '21** is a math major who likes to pretend she is from Oregon but is actually from cold and windy Chicago. In her spare time, she can be found playing her violin and running on the towpath (not usually at the same time) or working with students at the Writing Center. She is excited to join the *Tortoise* staff this year and looks forward to reading many more equally wonderful essays in the future. She wrote this as a sophomore.