

ARBITRAGE: A CRITIQUE OF THE POLITICAL ECONOMY OF FINANCE

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## ABSTRACT

Carolyn Frances Richter Hardin, *Arbitrage: A Critique of the Political Economy of Finance*  
(Under the direction of Lawrence Grossberg)

In the wake of the 2007-09 financial crisis and growing economic inequality fueled by financial activity, it cannot be left to mainstream economists to define and explain finance. This dissertation reexamines finance and the political, social and cultural foundations ignored by economists. In the first chapter, I argue for the importance of arbitrage, a trading strategy defined by buying low priced securities and selling the same securities for higher prices in two different markets. Arbitrage is the conceptual linchpin of modern financial economics but that discipline fails to explain the source of arbitrage profit. In the second chapter, I explore whether Marxist economics can offer a theorization of arbitrage profit. While much of Marxist scholarship too quickly dismisses the significance of finance, there is room for considering arbitrage to be a form of exploitation. In line with innovative Marxist work on finance, I apply a new framework for understanding value to arbitrage in the third chapter. I suggest that arbitrage can be understood as an apparatus of capture in which value founded on social mattering is captured in uneven relations of power.

In the fourth chapter, I review the history of arbitrage and suggest that arbitrage is most successful when arbitrageurs can use advantageous differentials in communication networks and/or price stabilizing derivatives contracts to simulate

instantaneous trading. A special form of arbitrage I call money machine arbitrage takes place when structural inequalities of price allow for continuous profit making.

In the fifth chapter, I offer a final concept necessary for understanding arbitrage as an apparatus of capture: the axiomatic. The axiomatic is the complex system of regulative statements and social relations that enable capture. In the final substantive chapter, I detail the arbitrage in subprime mortgage backed securities in the run up to the 2007-09 financial crisis and sketch some aspects of the axiomatic that can be gleaned from that story. I conclude that the taken-for-granted notion of “risk,” as a necessary way of making wealth and the correlate of return in financial economics, is central to the axiomatic of finance and thus financial profit making.

To my husband Ted, for your love, support, and endurance.

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## LIST OF ABBREVIATIONS

ABS	Asset-backed securities
BSM	Black-Scholes-Merton
CAPM	Capital Asset Pricing Model
CBOT	Chicago Board of Trade
CDO	Collateralized debt obligations
CDS	Credit default swaps
CME	Chicago Mercantile Exchange
DOT	Designated Order Turnaround
FCIC	Financial Crisis Inquiry Commission
FHA	Federal Housing Authority
GSE	Government-sponsored enterprise
HFT	High-frequency trading
HUD	Housing and Urban Development
MBS	Mortgage-backed securities
NASDAQ	National Association of Securities Dealers Automated Quotation
NAV	Net Asset Value
NINA	No income no asset
NYSE	New York Stock Exchange
SEC	Securities and Exchange Commission
SSF	Social studies of finance

## INTRODUCTION

In 2012, as the resonances of the global financial crisis that unfolded between 2007 and 2009 were beginning to fade, Richard Gere starred in *Arbitrage*, a film about the morally ambiguous decisions of a hedge fund manager whose mistakes harm his investors and his family and friends.<sup>1</sup> Although the plot includes fraud, infidelity and death, there is not a single mention, much less depiction, of the financial strategy for which the film is named.

This omission mirrors the attention given to arbitrage by outside observers of finance. Particularly, work on finance in the critical humanities and social sciences, which was reinvigorated by the financial crisis, scarcely mentions the term. Important critiques of finance such as David Harvey's *A Brief History of Neoliberalism*, Christian Marazzi's *The Violence of Financial Capitalism*, and Karen Ho's *Liquidated: An Ethnography of Wall Street* leave out the term altogether.<sup>2</sup> I began my own investigations of finance with this literature, and so was bewildered by the pervasive use of the term when I took a number of graduate finance courses between 2010 and 2012.

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<sup>1</sup> *Arbitrage*, directed by Nicholas Jarecki (2012; Santa Monica, CA: Lionsgate, 2012), DVD.

<sup>2</sup> David Harvey, *A Brief History of Neoliberalism* (New York: Oxford University Press, 2005). Christian Marazzi, *The Violence of Financial Capitalism*, trans. Kristina Lebedeva and Jason Francis McGimsey (Los Angeles, CA: Semiotext(e), 2011). Karen Ho, *Liquidated: An Ethnography of Wall Street* (Durham: Duke University Press, 2009).

It became immediately clear that, at least within financial economics, arbitrage was a very important concept; its absence in the critical literature on finance appeared a considerable oversight.

Arbitrage is not completely neglected outside of financial economics. In the early-to-mid 2000s, a handful of scholars in anthropology and the subfield of sociology termed social studies of finance (SSF) began to pay special attention to arbitrage.<sup>3</sup> Beunza et al. acknowledged that arbitrage was a “form of trading crucial both to the modern theory of finance and to market practice.”<sup>4</sup> However, in accordance with much of SSF, these investigations did not submit arbitrage to critical scrutiny by, for example, radically questioning the financial economic definition of the term. Instead, this work sought to amend that definition by paying attention to the material and social aspects of arbitrage practice. Beunza et al. hoped that “the study of arbitrage could be a productive area of collaboration [with] financial economics.”<sup>5</sup>

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<sup>3</sup> Daniel Beunza, Iain Hardie and Donald MacKenzie, “A Price is a Social Thing: Towards a Material Sociology of Arbitrage,” *Organization Studies* 27, no. 5 (2006): 721-745. Daniel Beunza and David Stark, “Tools of the Trade: The Socio-technology of Arbitrage in a Wall Street Trading Room,” *Industrial and Corporate Change* 13, no. 2 (2004): 369-400. Iain Hardie, “‘The Sociology of Arbitrage’: A Comment on MacKenzie,” *Economy and Society* 33, no. 2 (2004): 239-254. Donald MacKenzie, “Long-Term Capital Management and the Sociology of Arbitrage,” *Economy and Society* 32, no. 3 (2003): 349-380. Hirokazu Miyazaki, “Between Arbitrage and Speculation: An Economy of Belief and Doubt,” *Economy and Society* 36, no. 3 (2007): 396-415. Caitlin Zaloom, *Out of the Pits: Traders and Technology From Chicago to London* (Chicago: University of Chicago Press, 2006).

<sup>4</sup> Beunza et al., “A Price,” 721.

<sup>5</sup> *Ibid.*, 741.

Anthropologist Hirokazu Miyazaki contributed to the arbitrage moment in the 2000s and has since published a full-length book on his study of arbitrageurs in Japan.<sup>6</sup> He also notes that arbitrage is “a central category of financial economics and a widely deployed trading strategy.”<sup>7</sup> His study gives important indications of just how central arbitrage is when he claims that, “For the arbitrageurs I knew, arbitrage was both their individual action and the market mechanism itself.”<sup>8</sup> Miyazaki pushes past the SSF capitulation to financial economics by questioning the strict financial economic distinction between speculation and arbitrage.<sup>9</sup> However, rather than examine the broad political and economic effects of arbitrage trading, his study focuses on reframing financial market professionals as philosophers rather than rational or irrational actors. For Miyazaki, arbitrage is a metaphor for the “daily comparative work of Japanese financial professionals” in seeking arbitrage opportunities and also defining their own identities and personal goals.<sup>10</sup>

This dissertation began as an examination of the term that was obviously of serious import to financial economics but neglected by those who would submit finance to critical scrutiny. It quickly became evident that arbitrage was a difficult research subject. Arbitrage, as it is discussed in financial economics texts and courses, involves

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<sup>6</sup> Hirokazu Miyazaki, *Arbitraging Japan: Dreams of Capitalism at the End of Finance* (Berkeley: University of California Press, 2013).

<sup>7</sup> *Ibid.*, 8.

<sup>8</sup> *Ibid.*, 21.

<sup>9</sup> See, in particular, Miyazaki, “Between Arbitrage and Speculation.”

<sup>10</sup> *Ibid.*, 13.

buying and selling two sets of securities that are judged to be similar in some way, often in terms of their riskiness according to some model of financial risk, but that are trading at two different prices. In the act of buying the low priced security and selling the high priced security, a profit is gained. But the official definitions of arbitrage offered by financial textbooks—consider, e.g., “A trading strategy that takes advantage of two or more securities being mispriced relative to each other”—do nothing to explain its importance within finance.<sup>11</sup> Additionally, the etymology of the term doesn’t give much insight. According to finance professor and economic historian Geoffrey Poitras, the word “arbitrage” derives from the Latin *arbitrari*, “to give judgment,” and may have been used in the Italian, *arbitrio*, as early as the 12<sup>th</sup> century to describe “arbitration of exchange rates” at medieval fairs in Europe.<sup>12</sup> Traders from multiple regions attended. Edited body of merchant bankers at each fair would calculate and set the exchange rates that would be used for transactions. According to Poitras, the term *arbitrio* may have been used to describe the act of judging what the rates should be and not the act of trading upon them to make a profit.<sup>13</sup>

Although arbitrage is now a common topic in financial economic journals and the financial press, these treatments are largely theoretical.<sup>14</sup> The “no-arbitrage” condition—

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<sup>11</sup> John C. Hull, *Fundamentals of Futures and Options Markets*, 6<sup>th</sup> ed. (Upper Saddle River, N.J.: Prentice Hall, 2008), 521.

<sup>12</sup> Geoffrey Poitras, “Arbitrage: Historical Perspectives,” July 23, 2009, 20, [http://www.sfu.ca/~poitras/EQF\\_ARB\\$\\$\\$.pdf](http://www.sfu.ca/~poitras/EQF_ARB$$$.pdf).

<sup>13</sup> Ibid.

<sup>14</sup> Interestingly, the term has crept out of finance obliquely into other disciplines where it is taken up uncritically and applied to non-financial contexts. For example, in a

in which financial securities are said to be at their correct prices if and when no arbitrage is possible—is used as a theoretical proof of financial pricing models, a topic I take up in chapter one, but actually occurring arbitrage trades are rarely discussed. No one reports arbitrage profit statistics for banks or hedge funds and the specific mechanism of arbitrage trading only comes out when something goes wrong, as in the case of the failed Long Term Capital Management fund<sup>15</sup>, or in the rare ethnographic studies of sociologists and anthropologists.<sup>16</sup> There is a vague sense that arbitrage matters, but no one is going to tell you why.<sup>17</sup>

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“Personal History” feature in the *New Yorker*, André Aciman discusses Wordsworth’s penchant for “mnemonic arbitrage” as he moves back and forth between Time and Place. André Aciman, “Arbitrage,” Personal History, *The New Yorker*, July 10, 2000, <http://www.newyorker.com/magazine/2000/07/10/arbitrage>. Amitai Aviram’s article “Bias Arbitrage” claims that politicians engage in bias arbitrage by “identifying a risk that is either over- or under-estimated by a segment of the public and reaping a private profit from an action that mitigates the discrepancy between the actual and the perceived risk.” Amitai Aviram, “Bias Arbitrage,” *Washington and Lee Law Review* 64, no. 3 (Summer 2007): 792. He gives the example of enacting a law to increase airport security in order to gain political favor, despite the extremely low probability of hijacking. Robert J. Rhee’s article “Tort Arbitrage” applies the term to the context of the legal standard of negligence, arguing that corporate defendants benefit from arbitrage between tort law and civil litigation. Robert J. Rhee, “Tort Arbitrage,” *Florida Law Review* 60, no. 1 (2008): 125.

<sup>15</sup> Donald MacKenzie, *An Engine Not a Camera: How Financial Models Shape Markets* (Cambridge, MA: MIT Press, 2006).

<sup>16</sup> Beunza and Stark, “Tools of the Trade.” Miyazaki, *Arbitraging Japan*.

<sup>17</sup> In 1931, a student of arbitrage wrote: “There was a time when the word ‘arbitrage’ brought to my mind a picture of a mysterious realm in finance which few people seemed to be inclined or at least to have the knowledge to discuss.” Although those within finance may now discuss arbitrage freely, those outside of it still regard it as a mysterious realm, if they regard it at all. Meyer H. Weinstein, *Arbitrage in Securities* (New York: Harper & Brothers, 1931).



My investigations soon led me to understand that this derived in part from the way arbitrage profit is secured. Arbitrage is a self-limiting trading strategy. In most cases, putting on an arbitrage trade eventually causes the apparent mispricing between two securities to disappear through the mechanism of supply and demand. If financial firms shared the details of their arbitrage activities, they wouldn't be able to profit from them as much if at all, as other firms would immediately put on the same trades and cause the potential profit to dry up. In addition, as I discuss in chapter four, arbitrage has often been viewed as unfair or gaming the system. Keeping arbitrage activities quiet is thus a logical way to avoid criticism.

However, rarely someone does let slip the prevalence of arbitrage in financial markets, and it is clear that it has been important for a long time. An 1892 article in the *New York Times* declared, "it is alleged that probably three-fourths of all the business done at the Exchange is transacted through arbitrage houses."<sup>18</sup> In 2014, Mark Blyth, a professor of political economy at Brown University, quoted an eerily similar statistic to a reporter, "A funny thing about these very big banks... they make 70% of their profits through trading, basically swapping bits of paper with each other for arbitrage gains, none of which arguably adds to anything except global liquidity and doesn't really do much for real investment."<sup>19</sup> These claims, vague though they may be, point to the significance of arbitrage and its possibly dubious role within finance.

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<sup>18</sup> "Arbitrage Business," *New York Times* (1857-1922), Sep 20, 1892, <http://search.proquest.com/docview/94916898?accountid=14244>.

<sup>19</sup> "Credit Suisse Pleads Guilty to Tax Crime Charges. But Is Anyone Going to Jail?," produced by Christopher Woolf, *PRI's The World*, May 20, 2014, radio,

The research presented in this dissertation uncovers the importance of arbitrage. Two hypotheses guide the project: first, that finance plays a its central role in contemporary capitalism and has contributed significantly to the economic and political inequality that has been increasing in the U.S. and the world for decades; and second, that arbitrage is of central importance to the functioning of finance. I take up the task of investigating arbitrage by drawing on three traditions of scholarly inquiry. First, the study of communication, particularly of the way that communication processes and technologies condition the possibilities of knowledge and sociality, offers a frame for redefining arbitrage. In chapters three and four, I argue against the vague and unhelpful economic definitions of arbitrage and suggest instead that arbitrage is a creative process in which communication networks often provide the basis of success or failure. In addition, historical changes in arbitrage trading have been largely determined by transformations of communication technologies.

Second, cultural studies, exemplified in the work of Stuart Hall, Lawrence Grossberg, Angela McRobbie and others, is defined by its commitment to contextualism, to using theory as a “contingent strategic resource,” and to producing knowledge with the potential not only to describe but to change the articulations that make up a context.<sup>20</sup> Cultural studies has a long history of engaging political economy, particularly through Marxism. As Stuart Hall explains, the engagement with political

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<http://www.pri.org/stories/2014-05-20/credit-suisse-pleads-guilty-tax-crime-charges-anyone-going-jail>.

<sup>20</sup> Lawrence Grossberg, *Cultural Studies in the Future Tense* (Durham: Duke University Press, 2010), 27.

economy was one of the primary theoretical legacies of cultural studies; cultural studies was “from the beginning, profoundly influenced by the questions that Marxism as a theoretical project put on the agenda.”<sup>21</sup> As I discuss in more detail in chapter one, cultural studies is well suited to developing a critique of finance through an examination of arbitrage. I also draw on cultural studies when, in chapter five I suggest a way to critique the political economy of finance. Finally, the cultural studies commitment to contextualism is a constant feature of this work.

Finally, the relatively new interdisciplinary discussion between scholars in multiple disciplines gathered under the label “cultural economy” provides the greatest source of interlocutors for the current study. Cultural economy scholars from sociology,<sup>22</sup> communication studies, anthropology, geography, business, economics and history pay careful attention to the day-to-day practices and motivations of financial markets, and investigate taken-for-granted aspects of finance. Importantly, many within cultural economy argue against the separation of economy and culture that is assumed by financial economics. Unlike financial economics, cultural economy of finance does not rely on economic models to draw conclusions about the function of financial markets, but instead critiques these models and engages in empirical investigation of the social, technical, and discursive practice of finance. I draw upon this work for my own investigations, and also hope that this dissertation will be an important contribution

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<sup>21</sup> Stuart Hall, "Cultural Studies and Its Theoretical Legacies," in *Cultural Studies*, eds. Lawrence Grossberg, Cary Nelson, and Paula A. Treichler (New York: Routledge, 1992), 279.

<sup>22</sup> Cultural economy broadens the project of SSF and the two subfields now overlap to a great degree.

to cultural economy by demonstrating that arbitrage is only possible as an articulation of social relations, technological infrastructures and taken-for-granted notions of what constitutes economic calculation.

The following study of arbitrage is divided into six chapters. The first five each examine arbitrage from a different perspective and progressively build a framework for understanding arbitrage that is quite distinct from the financial economic definition. The sixth chapter offers a case study of an actual arbitrage trade and interprets it within that framework.

In chapter one, I explain the role of the concept of arbitrage within financial economics. Just as it appeared to be in the finance courses I took, arbitrage is central to the edifice of theoretical finance. In particular, the “no-arbitrage” condition is the conceptual linchpin of the economist’s vision of finance as a closed and consistent mathematical system of prices. However, economists acknowledge that arbitrage does occur. They square the importance of the no-arbitrage condition with the existence of arbitrage by claiming that arbitrage is the practice that pushes markets towards efficiency, framing it as a sort of public service. However, since the no-arbitrage condition is the basis of contemporary pricing models, financial economics cannot account for the profit gained by arbitrageurs, i.e. it contains no theory of arbitrage profit.

In the second chapter, I ask whether Marxian economics can provide such a theory within its own theory of profit as surplus value. Although many Marxists characterize finance as unproductive of value and the realm of fictitious capital, some leave open the possibility that arbitrage can be viewed as a form of exploitation and that

the productive/unproductive and real/fictitious distinctions are no longer useful in the context of contemporary finance. Based on this work, I offer the first central claim of this dissertation: Arbitrage is the form of surplus value appropriation unique to finance.

To support this claim, I draw on the work of Grossberg et al., and Deleuze and Guattari in chapter three to propose an alternative framework for understanding surplus value.<sup>23</sup> The Marxist definition of surplus value as that which is produced by labor in industrial capitalism is too narrow. Instead, industrial capitalist appropriation of surplus value must be understood as one of many possible apparatuses of capture. Just as surplus labor time appropriation is the apparatus of capture in industrial capitalism, arbitrage is the apparatus of capture that defines financial capitalism. Using this alternative framework, I challenge financial economic definitions of arbitrage. Rather than a trading strategy based on discovering mispricings, arbitrage is a creative process that proceeds in three steps: proposing equivalence, calculating profit and actualizing capture. This reformulation foregrounds profit rather than efficiency as the driving force of arbitrage. It also challenges the notion that “true” arbitrage is riskless.

In the fourth chapter, I focus on the issue of risklessness with regard to arbitrage. I argue that, rather than being riskless, arbitrage is a strategy that can succeed or fail. The likelihood of its success is best understood not with reference to risk, but to the notion of time contingency. Successful arbitrage is that which best manages the uncertainty of unfolding time by simulating instantaneity. I discuss the two main ways

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<sup>23</sup> Lawrence Grossberg, Carolyn Hardin and Michael Palm, “Contributions to a Conjunctural Theory of Valuation,” *Rethinking Marxism* 26, no. 3 (2014): 306-35. Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. Brian Massumi (Minneapolis, M.N.: Minnesota Press, 2007).

that arbitrageurs simulate instantaneity: by configuring advantageous communication networks and by artificially stabilizing prices. The latter is often achieved with derivatives contracts but in some cases, price stabilization is structural and lasting, leading to what I term money machines. Money machine arbitrage continually pumps out profits because the disparity in prices does not close as the arbitrage is performed. This chapter begins to demonstrate some of the social relations that are necessary for capture to take place through arbitrage. Specifically, arbitrage differentially delivers profits to some and not others and is often characterized as cheating or gaming the system.

In the fifth chapter, I revisit the notion that arbitrage is exploitative in the Marxist sense by explaining another aspect of Grossberg et al.'s framework: the axiomatic. The axiomatic refers to the organization of finance as a set of social relations and taken-for-granted rules or axioms that allow capture to take place. The notion of the axiomatic prompts the second central claim of this dissertation: arbitrage profit is the result of the organization of the system of finance, not the activities of individual arbitrageurs. Understanding arbitrage as capture, therefore, requires more than a calculation of surplus value. Instead, one must examine the axiomatic.

In chapter six, I offer a case study that illustrates the functioning of arbitrage as an apparatus of capture. The arbitrage trade that I examine was at the center of the subprime mortgage securitization machine that failed spectacularly in the 2007-09 financial crisis. I explain that a particular kind of financial security derived from subprime mortgages known as collateralized debt obligations (CDOs) allowed a massive money machine arbitrage that netted billions in the run up to the crisis. After describing the

trade, I lay out the historical context in which it developed and find two axioms evident in that context. I reach the surprising conclusion that the relationship of risk and return, a fundamental tenet of finance that is built into all the major theories of financial economics, is actually one of the axioms that enables arbitrage capture. Risk as a correlate of financial return is an utterly taken-for-granted notion, one that is unproblematically taken up by critics of finance. Reframing this notion as an axiom of the financial apparatus of capture leaves open the possibility that confronting and deconstructing the notion of risk could provide new avenues for understanding and challenging finance.

## CHAPTER 1: ARBITRAGE AND THE EMBEDDED DISEMBEDDEDNESS OF FINANCE

The goal of this dissertation is to rethink contemporary finance in order to account for its political and economic significance in the contemporary conjuncture and to explain the importance of arbitrage within finance. Lawrence Grossberg has called for a cultural studies of economics in general, of which cultural studies of finance must necessarily be a part.<sup>24</sup> Grossberg argues that a cultural studies of economics will require a very specific form of conjunctural analysis that moves between the poles of the “embeddedness” and “disembeddedness” of the economy, terms he derives from the work of Karl Polanyi and Fernand Braudel.<sup>25</sup> Unlike other economic historians who carry their categories with them back into history, each of these authors carefully traces social history and explains the constitution of the economic “per se” only within that history. Emerging from this history is a tension between the rootedness of economies in and their impact upon social context (its embeddedness) and the seeming autonomy of the economic from its basis in social context (its disembeddedness). For Grossberg, this tension is precisely what cultural studies of economics must unpack.

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<sup>24</sup> Grossberg, *Cultural Studies*.

<sup>25</sup> *Ibid.*, 146.



Grossberg explains that some critics attempt to disprove the autonomy of the economic by “denaturalizing” or “socializing” economic phenomena, for example showing the cultural basis for certain economic behaviors or the historical and social construction of economic practices.<sup>26</sup> However, these critiques of the disembodiedness of the economic discount or gloss over the importance of the autonomous functioning of economic processes, which “is not illusory, since it has real effects.”<sup>27</sup> Grossberg calls for a different kind of analysis; he writes, “The paradox of the economic is precisely that it is continuously produced as self-producing, or if one prefers, the nature of its relational existence is such that it is made to operate... independently of that relationality.”<sup>28</sup> Thus, the challenge for a cultural studies of economics “is to consider the different and changing forms of both the embeddedness and the disembodiedness of the economic, as well as the forms of the articulations between the two “modes of being” which actually constitute the economic.”<sup>29</sup>

Using the embedded disembodiedness frame to analyze contemporary finance reveals important new insights about the functioning of finance. Financial markets appear to be disembodied in two, connected ways; they appear to be based on certain universal and ahistorical imperatives and laws that deny the contingent social and cultural construction of markets (profit maximization, the remuneration of greater risk

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<sup>26</sup> Ibid., 107.

<sup>27</sup> Ibid., 149.

<sup>28</sup> Ibid.

<sup>29</sup> Ibid., 150.

with greater return, market self-regulation, etc.); and they also seem to operate on a plane removed from the productive activities of the broader economy. In the latter condition, financial markets seem to be self-contained. For example, in response to possible regulation of over-the-counter derivatives, then Federal Reserve Chairman Alan Greenspan argued in 1999 that derivatives markets were self-regulating and that “diversity within the financial sector provides insurance against a financial problem turning into economy-wide distress.”<sup>30</sup> Greenspan implied that finance is something separate from the “economy” and won’t impact that economy even if it becomes embroiled in crisis. He turned out to be spectacularly wrong, as the recession that followed the financial crisis of 2007-9 showed. However, even in the aftermath of that crisis, the disembeddedness of finance from the broader economy seems evident in, for example, the rise of the stock market during the depths of the recession. Finance can be understood as experiencing a sort of double disembeddedness in some ways more substantial than that of the economic, since it seems to function apart from social context on the one hand and the machinations of the banal, productive economy on the other.

Some scholarly critiques of finance can be read as attempting to reembed it, that is, to show the ways that financial markets and practices are in fact embedded in and constructed by social context and the broader economy. The sub-discipline of social

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<sup>30</sup> Alan Greenspan, “Financial Derivatives” (remarks before the Futures Industry Association, Boca Raton, Florida, March 19, 1999) quoted in Taylor Lincoln, “Forgotten Lessons of Deregulation,” *Public Citizen*, May 2012, <http://www.citizen.org/documents/forgotten-lessons-of-deregulation-derivatives-report.pdf>.

studies of finance (SSF) approaches this project by describing “the role played in [financial] markets by technologies and by systematic forms of knowledge, the concrete material practices of trading, risk management and regulation.”<sup>31</sup> It examines, for example, the way the ticker tape and financial visualization software shape financial trading, the way the spatial organization of trading spaces influences the deals that can be made, and the role of financial theory in shaping financial practice.<sup>32</sup> This work tends to critique claims of the disembodiedness of finance from its physical, technological and social context but does not address the relationship of finance to the broader political and economic context, instead often accepting mainstream financial economic explanations of what financial markets do. Social studies of finance has recently been criticized for overlooking issues of power and profit in their accounts of financial markets. According to Philip Mirowski, sociologists of finance all too often repeat and recapitulate “economists own stories... never challenging their accounts. They don’t report exactly what they do; they report what they say they do.”<sup>33</sup> As a result, social studies of finance, according to Erturk et al., “reinforce[s] the separation of the economic and political spheres latent in the neoclassical economic tradition, and so downplay the

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<sup>31</sup> Beunza et al., “A Price,” 721.

<sup>32</sup> Karin Knorr Cetina and Alex Preda, “The Temporalization of Financial Markets: From Network to Flow,” *Theory, Culture and Society* 24, no. 7-8 (2007): 116-138. Zaloom, *Out of the Pits*. MacKenzie, *An Engine*.

<sup>33</sup> Philip Mirowski, interview by Tomás Undurraga, *Estudios de la Economía*, 2013, <https://estudiosdelaeconomia.wordpress.com/2013/07/22/facebook-teaches-you-how-to-be-a-neoliberal-agent-an-interview-with-philip-mirowski/>.

important political connections that support the financial interests that lie within particular assemblages.”<sup>34</sup>

Some Marxist analyses can also be framed as seeking to reembed finance by describing its embeddedness in a broader political economic context but neglect the social and cultural context. For example, Foster and Magdoff claim that what they call “monopoly-finance-capitalism,” characterized by increasing debt and speculative bubbles, is a response to the stagnation of the previous iteration of monopoly capitalism. Finance-monopoly-capitalism is merely the addition of financial market activities designed to prolong capitalist accumulation.<sup>35</sup> Similarly, David Harvey suggests that finance is the new center of redistributive activity through “accumulation by dispossession.”<sup>36</sup> According to these critiques, finance is not autonomous but actually a handmaiden to the industrial capitalist accumulation process. Christian Marazzi makes a parallel but different claim, that “financialization is... the form of capital accumulation symmetrical with new processes of value production.”<sup>37</sup> For Marazzi, value production is an autonomous activity that encompasses, in the contemporary moment, all of life. Finance, then extracts “surplus-value by pursuing citizen-laborers in

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<sup>34</sup> Ismail Erturk, Julie Froud, Sukhdev Johal, Adam Leaver and Karel Williams, “(How) Do Devices Matter in Finance?,” *Journal of Cultural Economy* 6, no. 3 (2013): 339.

<sup>35</sup> John Bellamy Foster and Fred Magdoff, *The Great Financial Crisis: Causes and Consequences* (New York: Monthly Review Press, 2009).

<sup>36</sup> Harvey, *Brief History*, 178.

<sup>37</sup> Marazzi, *Violence*, 48.

every moment of their lives.”<sup>38</sup> This reversal, characteristic of autonomous Marxism, subjugates finance to the autonomous value production of citizen-laborers, but suffers the consequence of then rendering all the activities of citizen-laborers as value producing and thus collapsing what could be social and cultural domains into the economic. Despite its apparent difference from other Marxist critiques, in the end, Marazzi’s argument also suggests that finance is the handmaiden of the dominant capitalist economic process. Thus, many Marxist critiques of finance focus solely on the economic construction of finance.

Finally, cultural economy of finance, a relatively new subfield closely aligned with social studies of finance, at its best describes the embeddedness of finance in its cultural and economic context and goes some distance towards critiquing the politics of finance as well. Paul Langley’s work on financial subjectivity connects the everyday financial practices of individuals, such as borrowing and investing, to broader cultural changes.<sup>39</sup> For example, Langley dates the shift from personal saving to everyday investing in the 1980s when the rise of neoliberal government was privileging personal responsibility. In his work with Adam Leaver, Langley also describes the way that behavioral economists depoliticize the crisis of retirement investing by constructing individual investors as problems to be solved and thereby erasing the political problem

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<sup>38</sup> Ibid., 55.

<sup>39</sup> Paul Langley, *The Everyday Life of Global Finance: Saving and Borrowing in Anglo-America* (New York: Oxford University Press, 2008).

of declining public welfare provisions.<sup>40</sup> Karen Ho's ethnography *Liquidated* describes the institutional culture of Wall Street and shows how recruitment practices, narratives surrounding the identity of financial workers, and the discourse of shareholder value combine to promote a particular kind of investment practice with devastating effects on the broader economy.<sup>41</sup> For example, Ho connects the discourse of shareholder value to the leveraged buyout movement of the 1980s, showing the way layoffs, downsizing and outsourcing in the productive economy were tied to a historically specific cultural shift among financial traders and analysts during this period. Ho thus begins to describe the way that finance as a rational (disembedded) system, i.e. one that appears to follow a consistent internal logic free from outside influences, is produced precisely from its cultural construction, although she focuses only on the culture of Wall Street itself.

However, showing that finance is constructed is not enough. Bryan and Rafferty have decried the "name and shame" approach to analyzing finance.<sup>42</sup> They claim that critiques focused on "outing" the social and technological construction of finance neglect questions of what financial tools actually do.<sup>43</sup> While financial economics denies the social conditions of the making of markets, simply reasserting that context or "outing" its social construction doesn't tell us what finance does. Finance works; traders, analysts,

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<sup>40</sup> Paul Langley and Adam Leaver, "Remaking Retirement Investors: Behavioral Economics and Defined-Contribution Occupational Pensions," *Journal of Cultural Economy* 5, no. 4 (November 2012): 475.

<sup>41</sup> Ho, *Liquidated*.

<sup>42</sup> Dick Bryan and Michael Rafferty, "Fundamental Value: A Category in Transformation," *Economy and Society* 42, no. 1 (2013): 135.

<sup>43</sup> *Ibid.*

salespeople, managers, ratings agencies and regulators carry out their tasks everyday in the production and continuation of what we understand to be financial practices, but to what end? Profit? Certainly not for everyone. Then for whom? Who profits? Do they profit at the expense of others? Cultural economists and sociologists of finance describe the social and cultural conditions of this work, but financial economics is the discipline that supposedly describes the rationality of system itself, how and what this work accomplishes. To fully understand the embedded disembeddedness of finance, then, requires, as Grossberg puts it “the project of reinventing [financial] economics.”<sup>44</sup> The goal of cultural studies of finance is not just to remind those who view it as autonomous that it is embedded, but to reconstruct financial descriptions and theories that connect its embeddedness to what it actually does. Accepting the injunction of Grossberg to not “take at face value ‘their’ stories”<sup>45</sup> and of Philip Mirowski to “compare what they say they do with what they really do,”<sup>46</sup> this chapter examines what financial economics says finance does and argues that despite its mathematical elegance and rhetorical force, these descriptions of finance contain a paradox.

The supposed autonomy of finance, its existence as a closed and consistent system, is premised on the impossibility of a particular form of profit making known as arbitrage. A standard definition of arbitrage reads as follows: “Arbitrage is the process of buying assets in one market and selling them in another to profit from unjustifiable price

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<sup>44</sup> Grossberg, *Cultural Studies*, 117.

<sup>45</sup> *Ibid.*, 107.

<sup>46</sup> Mirowski, interview.

differences. ‘True’ arbitrage is both riskless and self-financing.”<sup>47</sup> The second clause means that the transaction must be perfectly hedged, can’t end up costing the arbitrageur money, and must be performed using only borrowed funds. Financial pricing models only work in a theoretical world where arbitrage is not possible. In that theoretical world, financial markets can be framed as a closed and consistent system of prices.

But arbitrage does occur, and is, in fact, an enormous source of profit for financial firms. Financial economics manages this contradiction by suggesting that when arbitrage does occur, it functions to eliminate inefficiencies in markets, pushing them towards ultimate rationality. This notion that financial efficiency is produced by arbitrage is the apotheosis of the invisible hand—pure self-interest producing a fair, rational financial system for all. And yet, economists only informally acknowledge it. Thus, arbitrage is, paradoxically, impossible within the formal pricing models that frame finance as a closed and consistent system, and yet the very thing that makes real markets conform to those models and become efficient. Therefore, *financial economics has no theory of arbitrage profit*; it offers no account of where that profit comes from and who might lose when arbitrageurs gain.

Financial economics suggests that arbitrage is impossible in fully efficient, rational markets. In other words, the impossibility of arbitrage is cited as proof of the disembeddedness of finance. Therefore, the existence of arbitrage proves that that disembeddedness is not complete, that the economist’s vision of a fully rational market

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<sup>47</sup> Randall S. Billingsley, *Understanding Arbitrage: An Intuitive Approach to Investment Analysis* (Upper Saddle River, NJ: Wharton School Pub., 2006), 2.



contains a logical flaw. What's more, actually occurring arbitrage, since it is cited by economists as the mechanism that actually creates markets in the image of efficient models, may be the very form of its embeddedness, the thing that roots finance most firmly in its economic and social context. But this is only possible if arbitrage is acknowledged outside the narrow and idealized world of economic models.

Deconstructing and reinventing financial economics from a cultural studies perspective should begin by examining arbitrage as the linchpin of finance's embedded disembeddedness and formally acknowledging and theorizing arbitrage profit.

This chapter begins the project of interrogating arbitrage by examining the role of the no-arbitrage argument in financial economics. It proceeds in three parts. The first section frames economics as the study of the context of prices. The second section traces the history of contemporary financial economics in terms of the evolution of pricing formulae. The final section describes the paradox of no-arbitrage and its consequences for understanding what finance does.

### Economics and the Context of Prices

Before addressing the history of financial economics, I want to suggest that economics broadly and financial economics specifically must be understood as disciplines concerned with defining the context that influences prices. Economists say that economics is concerned with the allocation of scarce resources. This narrative, like much in the dismal science, says something simple in a complex and misleading way. Economics is actually concerned with the prices that resources have (which happen to influence their allocation). As a descriptive science, economics could do no more than

collect price data and attempt to make some kind of sense of it. However, economics is also a normative science that deals with what things are worth and thus with the true prices or values at which they should be fairly exchanged.

It is my claim, to be developed throughout this dissertation, that price is a crystallization of a larger context. A single price reflects not only the relationships between many commodities, but is also over-determined by the multiple and complex forces at work around it. The apparent simplicity or univocality of prices derives from their expression in the symbolic medium of numbers, not from the conditions of their making. Economics, like some other social sciences, has historically been concerned with circumscribing the complex contexts that produce phenomena in order to make judgments and predictions about them. So, economics has been characterized by changing definitions of the contexts that determine correct prices. Classical political economists struggled over the determination of the “value” or true price of commodities, alternately citing labor and costs of production as the sole contextual determinants. Adam Smith suggested that labor determined natural prices in primitive societies, while costs of production determined them in advanced society. David Ricardo and Karl Marx held more steadfastly to a labor theory of value. J. S. Mills advocated the cost of production value theory.<sup>48</sup>

The introduction of the concepts of marginal utility and equilibrium by writers in the 19<sup>th</sup> century shifted the ground of classical value theory, redefining the context of

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<sup>48</sup> Harry Landreth and David C. Colander, *History of Economic Thought* (Boston: Houghton Mifflin, 2002).

right prices (reconfigured as equilibrium prices) as supply and demand.<sup>49</sup> This neoclassical price theory viewed supply and demand each as the inevitable result of assumed natural human strivings towards the rational maximization of utility. Utility was conceived as satisfaction, such that demand was determined by the utility received from preferred commodities and supply was determined by productive abilities and the utility received from profit.<sup>50</sup> Right prices were thus produced by a context limited to the interplay of supply and demand determined by subjective but reliably consistent human nature.

Financial economics follows a similar imperative to political economy and neoclassical economics of attempting to determine right prices by circumscribing the context that produces prices to a calculable set of phenomena. The prices that financial economics examines arguably emanate from a more complex context than ordinary commodities. Financial securities, after all, represent claims on other entities, such as firms but also governments, commodities or income streams, and are traded usually, though not always, in absentia, as stocks, bonds, futures, and more recently, a mushrooming number of other kinds of contracts and derivatives. Financial securities are thus produced out of the contexts of those represented entities as well as financial markets for the securities themselves. In other words, the context that financial

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<sup>49</sup> Ibid.

<sup>50</sup> David Besanko and Ronald Braeutigam, *Microeconomics*, 3<sup>rd</sup> ed. (Hoboken, N.J.: John Wiley & Sons, 2008). Richard D. Wolff and Stephen A. Resnick, *Economics: Marxian versus Neoclassical* (Baltimore: Johns Hopkins University Press, 1987).

economics must examine to understand financial prices is double; it is both economic and financial.

### A Topical History of Financial Economics

Histories of financial economics locate its emergence as a coherent discipline around the middle of the 20<sup>th</sup> century. Donald MacKenzie notes that prior to the 1950s, finance was studied from an “institutionalist” perspective.<sup>51</sup> Justin Fox likewise claims that prior to the late 1950s, the discipline of finance taught “a mix of common sense, judgment, and tradition that had strikingly little to do with economics;” only in the middle of the 20<sup>th</sup> century did financial economics start to emerge as a rigorous, mathematical discipline.<sup>52</sup> Mark Rubenstein’s annotated bibliography of the history of investments follows a similar timeline: he designates “The Ancient Period” as pre-1950, “The Classical Period” as 1950-1980 and “The Modern Period” as post-1980.<sup>53</sup>

These histories of finance share not only this timeline, but also a narrative about the mathematization and rationalization of the study of financial markets. Over the course of the 20<sup>th</sup> century, the study of finance produced models of increasing mathematical complexity. However, this generalization offers little in the way of analytical force, other than the conclusion that finance went the way of the other social sciences, towards abstraction and sophisticated mathematical modeling, garnering the

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<sup>51</sup> MacKenzie, *An Engine*, 38.

<sup>52</sup> Justin Fox, *The Myth of the Rational Market: A History of Risk, Reward, and Delusion on Wall Street* (New York: Harper Business, 2009), 78.

<sup>53</sup> Mark Rubenstein, *A History of the Theory of Investments: My Annotated Bibliography* (Hoboken, N.J.: John Wiley & Sons, 2006).

prestige and objective knowledge attributed to science in the post-war period. However, there is another way to tell this story.

In this section I provide a concise topical history of modern financial economics from the perspective of a critique of the embedded disembeddedness of finance. In contrast to the biographical histories more commonly told, this history illustrates the role that financial economics has played in producing the disembeddedness of finance.<sup>54</sup>

In the last 60 years, financial economics has progressively redefined the way financial prices are determined, from a process that relies on multiple complex economic factors to a process that relies only on the prices of other financial assets in the closed and consistent mathematical system of finance. I argue that the transformation relied upon the use of the no-arbitrage condition. The following analysis periodizes financial economics according to the way it determines right prices for financial securities. The three periods are each dominated by a different form of pricing: fundamental analysis; mean-variance valuation; and relative valuation.

The earliest form of systematic financial pricing, called fundamental analysis, examines certain measures of a firm's profitability in order to shed light on the appropriate price for its stock. Although fundamental analysis is still practiced today, the

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<sup>54</sup> Financial economics is not the sole producer of this autonomy but is joined by cultural processes such as the shareholder value revolution described by Karen Ho, political economic processes that might be brought under the label of neoliberalism, political processes such as the alignment of pro-business capitalists with social conservatives, and the economic interests of powerful financial market participants who profit from the current configuration of markets. However, financial economics is particularly important because it has progressively framed financial markets as a closed and consistent mathematical system of prices with efficiency arguments centered on the no-arbitrage condition.

emergence of mathematical financial economics in the early 1950s can be located in the academic project of producing techniques and models of financial pricing that were more rigorous (read mathematical) than fundamental analysis. These new techniques can be collected under the label of mean-variance valuation because, although they do not make a complete break with fundamental analysis, they assume that the context that produces financial prices can be reduced to the expected return and risk of a given security. The historical mean and variance of a stock's prices were used to approximate expected return and risk, thus circumscribing the context of financial prices to historical price data. Like fundamental analysis, mean-variance valuation is still an important part of financial theory and practice; however in the 1970s and particularly in the area of derivatives pricing, a new form of valuation called relative valuation emerged. Today, relative valuation has become the pervasive mode of thinking in financial economics, so much so that it is read back into mean-variance analysis and has been applied to the pricing of nearly all kinds of financial securities.

### *Fundamental analysis*

Fundamental analysis is the oldest form of financial pricing. Financial economist and historian Geoffrey Poitras finds evidence of its foundations in the writings of 17<sup>th</sup> and 18<sup>th</sup> century commentators.<sup>55</sup> Justin Fox suggests that something like modern fundamental analysis was already practiced in the early 1900s and advocated by Irving

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<sup>55</sup> Geoffrey Poitras, *The Early History of Financial Economics, 1478-1776: From Commercial Arithmetic to Life Annuities and Joint Stocks* (Northampton, MA: Edward Elgar, 2000).

Fisher.<sup>56</sup> Fisher suggested as early as 1906 that investors should estimate the future income from a stock and discount that amount by an interest rate.<sup>57</sup>

What became recognizable as fundamental analysis is a set of formulas or procedures for determining the future income stream of a share of stock. The definitive texts on fundamental analysis, *Security Analysis* and *The Theory of Investment Value* were published in the 1930s.<sup>58</sup> *Security Analysis*, written by Benjamin Graham and David Dodd, was a guide to finding underpriced stocks by determining their fundamental value and comparing it to their prices in the stock market.<sup>59</sup> Dick Bryan and Bryan Rafferty explain that *Security Analysis* offered an “intrinsic value formula” that was the antithesis of the “speculative fantasy” of value revealed by 1929 stock market crash.<sup>60</sup>

Fundamental analysis has evolved since *Security Analysis* was first published, though the aim has stayed the same: analyze the metrics of a firm and its place in an industry to determine its fundamental value. A common finance textbook defines fundamental analysis as “Research to predict stock value that focuses on such determinants as earnings and dividends prospects, expectations for future interest

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<sup>56</sup> Fox, *Myth*.

<sup>57</sup> This discounted cash flow valuation was already the basis for pricing bonds but unlike stocks, bonds came with a set number of coupon payments and maturity date.

<sup>58</sup> Benjamin Graham and David Dodd, *Security Analysis* (New York: McGraw Hill, 1951). John Burr Williams, *The Theory of Investment Value* (Cambridge, Mass.: Harvard University Press, 1938).

<sup>59</sup> Ibid.

<sup>60</sup> Bryan and Rafferty, “Fundamental Value,” 10.

rates, and risk evaluation of the firm.”<sup>61</sup> This research can include evaluations of macroeconomic factors, industry trends and a set of financial measures of the firm itself, all aimed at discovering what future cash payments an investor can expect from investing in a stock. Some metrics supposedly represent a “floor” below which a stock’s price should not fall. “Book value” or “accounting value,” i.e., the amount of money a business would have leftover if it sold its assets and paid its debt as listed on its balance sheet is one such measure.<sup>62</sup> Liquidation value and replacement cost are other metrics of a theoretical floor. Earnings retention ratios, price-to-earnings ratios and dividend payout ratios are also examined in fundamental analysis.

Fundamental analysis is the approach to determining right prices of financial securities, specifically of stocks, that defines the context in which prices are determined in the broadest manner. It requires the study of the firm and industry as the context in which the price of stock is produced. Further, fundamental analysis doesn’t establish exactly what the right price of a stock is, but only finds indications that its current price might be too high or too low. This process was far too inefficient and subjective for the mathematicians and economists who began to build simpler and more mathematically elegant models of financial pricing at the inception of financial economics as a proper discipline in the 1940s and 50s.

### *Mean-variance valuation*

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<sup>61</sup> Zvi Bodie, Alex Kane and Alan J. Marcus, *Investments*, 8<sup>th</sup> ed. (New York: McGraw-Hill, 2009), G-6.

<sup>62</sup> Stephen Ross, Randolph Westerfield and Bradford Jordan, *Fundamentals of Corporate Finance*, 2<sup>nd</sup> ed. (New York: McGraw Hill, 2009), 22.



Prior to the 1940s, the idea of risk and the possibility that risk could be attenuated through diversification (holding a group of different stocks rather than just one) was acknowledged in investment guides but not explicitly modeled or calculated.<sup>63</sup> For example, Frank Knight famously defined risk as uncertainty that could be “reduced... by grouping cases.”<sup>64</sup> A formal mathematical explanation of the relationship between risk and investment return and the importance of diversification didn’t come until the notion of expected utility was established. The concept is of central importance in von Neumann and Morgenstern’s book introducing game theory.<sup>65</sup> von Neumann and Morgenstern produced a set of rules that showed that individuals will make choices by maximizing the utility they expect to receive from a given gamble. They proposed that individuals make decisions by assigning subjective probabilities to potential outcomes. The concept of expected utility adjusts the utility function of equilibrium pricing models by including those subjective probabilities.<sup>66</sup>

Harry Markowitz extended this notion of expected utility to investment decisions in his Ph.D. dissertation in economics completed in 1955.<sup>67</sup> Markowitz fatefully decided

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<sup>63</sup> Fox, *Myth*.

<sup>64</sup> Frank Knight, *Risk, Uncertainty, and Profit* (Boston, MA: Hart, Schaffner & Marx; Houghton Mifflin Co., 1921), quoted in Rubenstein, *A History*, 50.

<sup>65</sup> John von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior* (Princeton: Princeton University Press, 1944). Daniel Bernoulli had a similar idea two centuries earlier but it didn’t become influential until von Neumann and Morgenstern produced their more mathematically sophisticated version. Rubenstein, *A History*.

<sup>66</sup> Fox, *Myth*. Rubenstein, *A History*.

<sup>67</sup> Fox, *Myth*.

to approximate expected utility by defining expected return as the historical mean (average) of a stock's return and expected probability or risk as the historical variance of the stock's price.<sup>68</sup> Markowitz used these assumptions to produce what might be considered the first financial economic theory of how to select an efficient portfolio of stocks.

Markowitz began his work in response to fundamental analysis. In reading *Security Analysis* and other guides to fundamental valuation, Markowitz noted a logical inconsistency between, on the one hand, the idea that one could find underpriced securities through fundamental analysis and, on the other hand, the suggestion to hold a diversified portfolio. If fundamental valuation really worked, investors wouldn't need to diversify, they would hold only the most underpriced securities.<sup>69</sup> Markowitz proposed instead that it was the expected utility of investing in an entire portfolio that mattered. Markowitz demonstrated that picking the securities to be held in a portfolio was not only about the return one might expect from the individual stocks, but the risk of each stock and especially the relationship between those stocks. Markowitz claimed that an optimal portfolio could be constructed knowing only the expected return (mean) and risk (variance) of each security available for selection. With this information the portfolios that offered the best return for any given level of risk could be calculated.<sup>70</sup>

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<sup>68</sup> Rubenstein, *A History*.

<sup>69</sup> Fox, *Myth*.

<sup>70</sup> Bodie et al., *Investments*.

This was actually a significant simplification of the messy work of fundamental valuation. Portfolio theory suggested that determining which stocks to buy did not depend on the elusive fundamental value of those stocks but on calculations made with the set of historical returns and variances of those stocks. Defining expected return as mean and risk as variance substantially changed the context in which a stock's price could be evaluated. Instead of measuring any number of possible indications of a company's fundamental value as fundamental analysis did, one could simply analyze the historical record of a stock's price and dividends. The assumption that past performance was an adequate measure of the expected utility of a stock is remarkably unrealistic, but was a necessary move to subject what amounted to an incalculable multiplicity of subjective judgments of individual investors to mathematical and statistical analysis. Using mean and variance to approximate expected utility didn't rule out making adjustments based on contextual analysis, such as lowering expected return figures if a company reduces output; but Markowitz's simplifying assumptions enabled financial economics to find its mathematical legs and have endured for decades as appropriate starting places for estimating expected return and risk.

The redefinition of the context of financial prices was carried through and further entrenched with the Capital Assets Pricing Model (CAPM). It is widely accepted that William Sharpe, Jack Treynor and John Lintner all developed relatively independent derivations of the CAPM around the same time, in the mid-1960s.<sup>71</sup> The CAPM assumes that the optimal portfolio selection suggested by Markowitz is undertaken by

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<sup>71</sup> Rubenstein, *A History*.

all investors and specifies the equilibrium prices of financial assets in such an ideal, rational world, i.e. it is the equilibrium model of mean-variance valuation. According to the CAPM, the return that can be expected on any stock is equal to the return of the entire market (or representative index such as the S&P 500) multiplied by a systematic risk factor known as beta. Beta is calculated again using historical variance as the measure of risk. If prices are at equilibrium, the CAPM will hold. If the return to a stock is higher than that suggested by its beta (the difference is known as alpha), it is undervalued, i.e. its price is lower than its expected utility, so an investor should buy it. CAPM assumes that all investors shared the same estimates of expected returns and variances; again historical data was and is most often used to approximate these variables.<sup>72</sup> The CAPM is a marriage of Markowitz's probabilistic solution to finding optimal investments and the equilibrium dynamics described in microeconomics and is still recognized today as "the centerpiece of modern financial economics."<sup>73</sup>

More importantly, by assuming that all investors would be rational optimizers of expected utility, CAPM laid the burden of price determination not on the fundamental value of the firm that the stock represented, but on supply and demand for that stock in financial markets. In financial markets, participants are all both buyers and sellers and thus, supply and demand can be distilled down to expected utility. The shift from fundamental value to expected utility suggested that investors' preferences for securities determined right prices. It wasn't that the fundamentals of a firm were irrelevant but

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<sup>72</sup> MacKenzie, *An Engine*.

<sup>73</sup> *Ibid.*, 279.

merely that they were already accounted for in expected utility; fundamentals didn't need a formal place in the pricing formula. It was a very short jump from the CAPM, the first version of which Sharpe published in 1964, to the efficient market hypothesis, a statement of which was published by Eugene Fama in 1970.<sup>74</sup> The efficient market hypothesis explicitly stated that all available information, i.e. all those reflections of fundamental value that fundamental analysis is dedicated to uncovering, is already reflected in equilibrium prices. This boils down to the point that while market prices may not exactly match fundamental values, the information gathering activity and buying and selling of market participants make them as correct as they possibly can be.

Mean-variance valuation, which found its apotheosis in the efficient market hypothesis, didn't completely dispatch the larger economic context in which firms operate, despite the fact that the mean and variance of historical returns were often used as placeholders for expected return and risk. Although it uses mean and variance to value securities, mean-variance valuation allows the broader economic context back in by assuming that prices already reflect it. Prices appear to only depend on expected return and risk defined historically, but the efficient market hypothesis assumes that investors are always analyzing information and looking for "underpriced" stocks to amend their expectations of return and risk from historical estimates. Fundamental analysis is the mechanism that drives supply and demand and fixes equilibrium prices. Mean-variance valuation, therefore, doesn't let analysts off the hook; they have to do

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<sup>74</sup> Eugene Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," *The Journal of Finance* 25, no. 2 (1970): 383-417.

fundamental analysis to have the correct expected utility and demand and supply stocks appropriately.

### *Relative valuation*

Although the strand of financial economics that turned from fundamental analysis to expected utility, stretching from portfolio theory to the CAPM, seemed to narrow the context of financial prices to financial markets, room for appeals to a broader context remained in this form of valuation. Paradoxically, although mean-variance analysis seems to supersede fundamental analysis, prices can only fully reflect available information because fundamental analysis is always underway. Mean-variance valuation didn't so much circumscribe the context in which financial prices are set to a narrower set of phenomena as state that prevailing prices in financial markets are perfect substitutes for the broader context in which financial prices are formed. That broader context that determines values or right prices isn't irrelevant, it's just always already perfectly reflected in prices.

The assumption that one needn't appeal to any extra-financial source to determine the right price of financial securities because that work is always already completed was a necessary precondition of relative valuation. Like mean-variance valuation, relative valuation denies the need for extra-financial sources to determine right prices but goes even further to assume that prices can be determined by their relationships to one another alone. In particular, relative valuation depends on the no-arbitrage condition to show what prices must necessarily be.

The origins of relative valuation and the no-arbitrage condition can be traced to the work of Modigliani and Miller on capital structure. In a 1958 paper, published between Markowitz portfolio theory and Sharpe's CAPM, Modigliani and Miller applied economic reasoning to a key problematic in corporate finance, specifically how a firm should finance a new project, i.e. whether by issuing stocks or bonds. Scholars of the descriptive, management-based finance popular prior to the 1950s examined multiple factors that might influence the decision, such as the reputation of stocks after the 1929 crash or the negative impact on a firm's image if it held too much debt.<sup>75</sup> Modigliani and Miller eschewed all these considerations for a single assumption: that "investors... prefer more wealth to less."<sup>76</sup> Using this assumption, they set up a logical, rather than empirical or descriptive, argument about the capital structure of a firm, i.e. the ratio of stocks to bonds that any firm issued.

Modigliani and Miller argued that the capital structure of a firm was irrelevant, i.e. that the firm's total market value wouldn't change depending on whether it financed a project with stocks, bonds or any mix of the two.<sup>77</sup> As proof of this proposition, they argued that two firms that offered investors access to equivalent future streams of profits were equivalent, even if their capital structures differed. So, if the value of two firms, for example one that only issued stock and another that issued stock and bonds,

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<sup>75</sup> MacKenzie, *An Engine*.

<sup>76</sup> Franco Modigliani and Merton H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," *The American Economic Review* 48, no. 3 (1958): 269, n11.

<sup>77</sup> Ibid.

differed, rational investors would perform arbitrage. For example, if the firm that issued some stocks and some bonds was more highly valued, investors in those securities could sell their stocks and bonds and buy an equivalent share of stock in the cheaper firm for less money. If the firms were truly equivalent, the investor would still expect the same future profit stream from the second firm, but would have netted a profit from the buying and selling of the two firms securities. According to Modigliani and Miller and based on their simple assumption that investors prefer more wealth, “The exchange would therefore be advantageous to the investor quite independently of his attitudes towards risk.”<sup>78</sup> Investors wouldn’t be taking on more risk by arbitraging the shares of one firm with the bonds of another since the firms offer the same future income stream. The arbitrage would offer riskless profit. Modigliani and Miller argued that the result of this arbitrage would eventually be that through the mechanism of supply and demand, the prices of the two firms would become the same (the higher value firm being sold would experience excess supply, lowering its price, while the lower value firm being bought would experience excess demand, raising its price).<sup>79</sup>

Modigliani and Miller’s “simplifying assumption” about investors preference for wealth was certainly not the only assumption they had to make in order for their

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<sup>78</sup> Ibid., 269.

<sup>79</sup> According to Rubenstein, Modigliani and Miller’s scenario should be understood not as arbitrage but as “dominance” because it “does not require that one be sold short against the other to create arbitrage profits.” Rubenstein, *A History*, 124. Nevertheless, the proposition still represents an important starting point for basing financial models on arbitrage logic.



economic reasoning to work.<sup>80</sup> In fact, the assumptions built into their “perfect market” with no fees or interest, perfect equivalence between shares of different firms, etc., were the subject of many critiques. Yet their approach would eventually become dominant in financial economics. By making the assumption that investors would engage in arbitrage if they could, Modigliani and Miller weren’t describing the actual prices of stocks and bonds from firms with differing capital structures but instead were asserting formalized rules that those prices must logically follow. These rules didn’t establish what the fundamental values of the firms actually were, only what the relationship of the firms’ values must be. In fact, early in their article, Modigliani and Miller relieve themselves of the responsibility of having to worry about fundamental value by deciding to focus on the market value of firms since “market prices will reflect... preferences of current and potential owners,” an early if veiled statement of the efficient market hypothesis.<sup>81</sup>

Like CAPM, Modigliani and Miller’s proposition applied equilibrium economics and the dynamics of supply and demand to issues of financial valuation. However, the focus on relative valuation evident in Modigliani and Miller would soon overtake expected utility models like the CAPM. The ascent of relative valuation undoubtedly began in earnest with the publication of Fischer Black and Myron Scholes options pricing formula in 1973. Unlike Modigliani and Miller’s decision to focus on market prices, however, the Black-Scholes-Merton (BSM) formula started out as a mean-

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<sup>80</sup> Fox, *Myth*.

<sup>81</sup> Modigliani and Miller, “Cost of Capital,” 264.

variance equation and only by accident became the foundation of the now dominant relative valuation approach in financial economics.

Black began his work on option pricing by applying the CAPM to warrants, financial securities very similar to options.<sup>82</sup> The CAPM related expected return, represented by the historical mean of stock returns, to riskiness, represented by the historical variance of stock returns. Black eventually worked with Scholes to make a similar attempt with options. However, in the equation they developed, which was based on the CAPM and thus should have contained the CAPM's two most important elements, expected return and risk of the underlying stock, the expected return term cancelled out. While Black and Scholes original option pricing formula was based on the CAPM and thus subjective investor probabilities for expected return, it didn't actually include expected return as a variable.<sup>83</sup>

Robert Merton claimed that although Black and Scholes' formula was correct, basing it on CAPM was an "intuitively appealing" but not "rigorous" justification.<sup>84</sup> Merton gave the Black-Scholes equation a rigorous mathematical derivation that gives the price of an option as a function of the current stock price, the "strike" price of the option (the price at which the option will pay its owner a positive return), the "risk-free" interest rate (the rate on safest borrowing, such as in the form of U.S. Treasury bonds), the time to

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<sup>82</sup> Warrants are options issued directly by a corporation and, when exercised, the corporation issues new stock to fulfill them. Hull, *Fundamentals of Futures*.

<sup>83</sup> Fox, *Myth. MacKenzie, An Engine*.

<sup>84</sup> Robert C. Merton, "Theory of Rational Option Pricing," *The Bell Journal of Economics and Management* 4, no. 1 (Spring 1973): 141-183, quoted in Mackenzie, *An Engine*, 135.

expiration of the option, and the volatility (the historical standard deviation or square root of variance) of the underlying stock.<sup>85</sup> Like Modigliani and Miller's capital structure argument, the proof of the BSM formula relies on an arbitrage argument. Option prices must conform to the BSM price because, if they didn't, an arbitrage opportunity would exist. An investor could produce a "replicating portfolio" consisting of fractions of the underlying stock and risk-free borrowing that would give the exact same payoff as the option. The option price must therefore equal the cost of producing such a portfolio. If an investor could produce a portfolio for less, he could and would purchase the portfolio and sell the high priced option, netting a riskless arbitrage profit from the difference.

BSM offers a logically necessary price for options, instruments that up until the publication of the formula were notoriously difficult to price and thus viewed as very risky investments. The price given by BSM didn't rely upon the subjective probabilities of expected return but was constructed relative to observable variables in the present, particularly the prices of the underlying stock and a risk-free bond. The only exception was volatility. A last vestige of mean-variance valuation, volatility, defined as the square root of the historical variance, found its way into BSM. However, within 3 years of the original publication of the formula, Latané and Rendleman suggested that since the prices of options had become stable and consistent after the BSM formula was published, they could actually be plugged into the formula so that the single

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<sup>85</sup> Bodie et al., *Investments*.

unobservable variable, volatility, could be solved for.<sup>86</sup> This “implied volatility” term gives an instantaneous, rather than historical, snapshot of the riskiness of the stock. The convention for traders became, and remains, to quote the implied volatility rather than the prices of options. This reversal banished the last unobservable element from the valuation of at least one type of financial security. BSM established the necessary relationship between observable variables of stock prices and option prices to deliver a measure of risk in the present, without appeal to past mean or variance or subjective analysis of possible futures. It was a form of valuation that drew only on the context of present financial markets and sought the “resting place” of prices rather than their fundamental value.<sup>87</sup>

It is hard to overstate the importance of BSM for establishing relative valuation as the dominant form of financial price determination. It allowed for the pricing of many forms of derivatives, from futures and options to more exotic financial securities whose values are “derived” from that of another. The derivation of that value occurs through the replicating portfolio technique underlying BSM.<sup>88</sup> For example, the price of a simple futures contract can be derived from the current (“spot”) price of a commodity or other security by calculating the price at which that contract could be replicated. If there is a futures contract to sell wheat in 3 months, a replicating strategy would be to buy wheat

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<sup>86</sup> Henry A. Latané and Richard J. Rendleman, Jr., “Standard Deviations of Stock Price Ratios Implied in Option Prices,” *The Journal of Finance* 31, no. 2 (May, 1976): 369-381, quoted in Rubenstein, *A History*, 242.

<sup>87</sup> Billingsley, *Understanding Arbitrage*, xvi.

<sup>88</sup> Elie Ayache, “Remarks,” (presentation, Cultures of Finance Summer Institute, Institute for Public Knowledge, New York University, New York, NY, June, 10-14, 2013).

now and pay to store it properly for 3 months. The futures contract cannot be more expensive than the cost of the replicating strategy. This is the meaning of the no-arbitrage condition. The futures price must be the price of the replicating strategy or else arbitrage would occur and eventually, through supply and demand, force the price to that level anyway.

Fundamental and mean-variance valuation continue to be taught in finance classes and practiced on Wall Street; the CAPM variables of beta and alpha are still important metrics for stock performance produced by information services and deployed in common parlance among traders. However, relative valuation has become so dominant a paradigm for pricing financial securities that it has been read back into mean-variance and fundamental valuation. This reading back is achieved quite literally when professor of financial engineering and retired “quant” Emanuel Derman even demonstrates in his “ Intelligent Graduate Student’s Guide to Pricing and Hedging” how the CAPM can be derived using a no-arbitrage argument instead of the expected utility one originally employed.<sup>89</sup> Using the same replicating portfolio strategy that underlies the relative valuation formula par excellence, i.e. Black-Scholes-Merton, Derman produces the exact CAPM formula, essentially showing that relative valuation can provide a unified theory of finance.<sup>90</sup>

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<sup>89</sup> Emanuel Derman, “The Intelligent Graduate Student’s Guide to Pricing and Hedging,” (handout, Columbia University, New York, 2011).

<sup>90</sup> Elsewhere, Derman refers to the no-arbitrage condition as “The One Commandment of Quantitative Finance.” Emanuel Derman, “Lecture 1: The Principles of Valuation” (handout, Columbia University, New York, 2013), 11.

I have already argued that mean-variance valuation actually builds upon fundamental analysis as a necessary precondition. Fundamental analysis seeks to determine the value of a firm from metrics that are objectively observable but always only reflections of the elusive value figure itself. Mean-variance valuation defines the value of a firm with appeals to subjective, future-oriented expected utility, but then immediately appeals to the past (historical mean and variance) or fundamental analysis (all information is already reflected in prices). Relative valuation takes market efficiency, and especially the relationship between expected return and risk, as given and dispenses with appeals to the past or the future. The relationships between instantaneous market prices is all that relative valuation encompasses.

Relative valuation is the one technique that has risen to the status of “law” in financial economics. There is only one law enumerated in finance textbooks, also called the “fundamental theorem of financial economics”: the Law of One Price. The Law of One Price has several forms, some more technical than others, but it essentially states that “if two assets are equivalent in all economically relative respects, then they should have the same market prices.”<sup>91</sup> The law encompasses the expected return-risk relationship of mean-variance valuation in that it contains the inherent principle that “uncertainty demands higher return.”<sup>92</sup> If assets are considered to be the same (along the metric of risk) their prices must also be the same or else arbitrage will inevitably occur between the uneven prices. The law of one price is also referred to as “the

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<sup>91</sup> Bodie et al., *Investments*, 325.

<sup>92</sup> Derman, “Intelligent Guide,” 39.

principle of no riskless arbitrage”, i.e. when prices are in parity, higher return can only be gained by taking on risk.<sup>93</sup>

However, the proof of the principle of no arbitrage is exactly that when the law is broken, arbitrage will take place to enforce it! As one textbook puts it, “The Law of One Price is enforced by arbitrageurs: if they observe violation of the law, they will engage in arbitrage activity... until the arbitrage opportunity is eliminated”, i.e. until the excess supply of the expensive asset and the excess demand for the cheap asset produced by the arbitrage trades force their prices to converge, just as Modigliani and Miller proposed.<sup>94</sup>

The no-arbitrage condition that underlies relative valuation is codified in the Law of One Price. It is assumed that arbitrage will always occur when possible, based on Modigliani and Miller’s assumption that investors will always prefer more wealth.<sup>95</sup> The Law of One Price thus establishes that finance is a closed and consistent mathematical system of prices that doesn’t require any outside elements to function. I am using the terms “closed” and “consistent” in loosely the same way they are employed in mathematical logic, where closure means that any operation on one element of the system will produce another element of the system and consistency means that no equation in the system contradicts any others. These conditions do not hold in every

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<sup>93</sup> Derman, “Lecture 1,” 11.

<sup>94</sup> Bodie, *Investments*, 325.

<sup>95</sup> According to Anne Villamil, Modigliani and Miller’s proposition “represents one of the first formal uses of a no arbitrage argument.” Anne Villamil, “The Modigliani-Miller Theorem,” *The New Palgrave Dictionary of Economics* (New York: Palgrave Macmillan, 2008), 674.

instance—for example, the no-arbitrage condition doesn't apply to non-linear combinations of assets<sup>96</sup>—however, the system of prices imagined by relative valuation is closed in that all prices can be determined relative to other prices in the system (i.e. through a replicating portfolio) and consistent in that the no-arbitrage principle requires that if securities are equivalent, they cannot have different market prices, i.e. they cannot contradict one another.

Relative valuation can thus be understood as the vital element in the production of finance as disembedded, the main location of its embedded disembeddedness. The closed and consistent system of financial prices imagined (and partially enacted as I will discuss in the next section) by relative valuation techniques is the theoretical statement of financial autonomy par excellence.

### The Paradox of (No) Arbitrage

The concept of arbitrage plays dual, even opposed roles in financial economics. Relative valuation models require that arbitrage opportunities are not available, but the proof of that condition is that investors will always already engage in arbitrage, forcing prices to converge to “One Price.” Arbitrage is thus paradoxically assumed to be both absent, as a condition of the formal economic models, and present as the assumed real world mechanism that polices the system to bring it in line with the models. In this second role, arbitrage comes to be viewed as a kind of public service that imposes

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<sup>96</sup> Hal Varian notes that “the No Arbitrage Condition cannot be directly applied” to an asset which “is a nonlinear function of another asset’s price.” So for example, prices of derivatives that have more complicated relationships to the prices of underlying assets may not fit the no-arbitrage condition. Hal R. Varian, “The Arbitrage Principle in Financial Economics,” *Economic Perspectives* 1, no. 2 (Fall 1987): 62.



fairness on the system of finance. The Law of One Price sounds like it could be a criminal statute, one that echoes actual laws like the Equal Credit Opportunity Act, price gouging laws and insider trading prohibitions. Different financial market participants should get the same price for the same security; it's only fair.

Insofar as arbitrage enforces the Law of One Price, ensuring that prices cannot fluctuate relative to one another, it seems to impose order such that all market participants can know what prices are and buy and sell at that same price.<sup>97</sup> Arbitrageurs have used just such an argument—that arbitrage performs a public service for financial markets—at times when their activities have been challenged. Hirokazu Miyazaki writes that when index arbitrage<sup>98</sup> came under scrutiny as a possible cause of the 1990 stock crash in Japan, “Sekai arbitrageurs... asserted that arbitrage performed the important economic function of linking the cash and futures markets so that investors might use the futures markets for hedging.”<sup>99</sup> The arbitrageurs echoed textbook arguments that their activities kept prices fair and transparent; if they didn't undertake index arbitrage, the futures price of the index could deviate from the price given by relative valuation models and thus cease to function as a part of a consistent,

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<sup>97</sup> Even on regulated exchanges, securities do not have “One Price.” Market makers profit by quoting slightly different prices (i.e. the bid-ask spread) at which they will buy and sell securities.

<sup>98</sup> Index arbitrage is a strategy in which traders compare the futures price for a stock index such as the S&P 500 to the cost of buying or selling the individual stocks that make up that index in the present and holding them until the settlement date of the futures contract. If those prices are not equal, the arbitrageur could buy the cheaper and sell the dearer, netting a positive payoff and exchanging the bundle of stocks for the index at the settlement date.

<sup>99</sup> Miyazaki, “Between Arbitrage,” 404.

intelligible system of financial securities available for hedging. In fact, the public service function of arbitrage was noted long before arbitrage took up its place at the center of financial economics. In a 1931 book on the subject, Meyer H. Weinstein declares, “Arbitrage operations tend to balance demand and supply in all the markets of the world.”<sup>100</sup>

Understanding arbitrage as the police of the closed and consistent system of financial prices confirms to the extreme Adam Smith’s fantasy of the invisible hand. The single assumption of the insatiable profit motive leads to the conclusion that arbitrage will always occur, ensuring the rationality of the financial system. The logic portrays and produces finance as a system completely separated from the broader economic and cultural context, i.e. as disembodied.

As already discussed in the introduction, many critics of finance point out that the autonomy of finance constructed by financial economics is simply not true. This is self-evidently the case with the no-arbitrage condition. For starters, arbitrage actually does happen. But even in its second role as the policing mechanism that ensures market efficiency, arbitrage is also fraught with complications. Financial models are based on wildly unrealistic assumptions of perfect frictionless markets; real markets contain all sorts of limits that make the models poor or totally incongruous representations. However, financial economists never really thought that the frictionless world they assumed was real. Some were just more willing than others to believe that it wasn’t the

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<sup>100</sup> Weinstein, *Arbitrage in Securities*, 8.

assumptions that mattered, only the predictive power of the model.<sup>101</sup> For example, MacKenzie reports that Modigliani was somewhat uncomfortable with the unrealistic assumptions underlying his joint work with Miller on the irrelevance of capital structure from the beginning.<sup>102</sup> Similarly, in her ethnography of current and former students of a Masters of Computational Finance program at a business school in New York, Stephanie Russell-Kraft reports that her informants were aware that financial models in general and the Law of One Price in particular are “all wrong.”<sup>103</sup>

In the 1980s and 90s, behavioral finance economists began documenting the “limits to arbitrage” and simultaneously compiling a long list of factors that prevent arbitrage opportunities from being taken up. They argue that, unlike the frictionless, riskless arbitrage trade alluded to by Modigliani and Miller, real world arbitrage is necessarily risky, and that those risks can foil attempts at arbitrage or prevent them altogether, which results in a number of persistent “anomalies” in financial prices. For example, De Long et al. discuss the effects of noise traders, irrational traders who may be unjustifiably bullish or bearish on certain securities.<sup>104</sup> Arbitrageurs who try to profit from the resulting mispricings of assets can only do so if prices eventually start to move

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<sup>101</sup> This is the argument of Milton Friedman’s influential essay “The Methodology of Positive Economics.” Milton Friedman, *Essays in Positive Economics* (Chicago: University of Chicago Press, 1962).

<sup>102</sup> MacKenzie, *An Engine*.

<sup>103</sup> Stephanie Russell-Kraft, “The Quantification of Finance: The Rise and Education of MFEs on Wall Street” (master’s thesis, Humboldt University of Berlin, 2013), 39.

<sup>104</sup> J. Bradford De Long, Andrei Shleifer, Lawrence H. Summers and Robert J. Waldmann, “Noise Trader Risk in Financial Markets,” *Journal of Political Economy* 98, no. 4 (Aug., 1990): 703-738.

back towards rational values, i.e., the values they should have under the Law of One Price. If arbitrageurs do not have an infinite time horizon, i.e., if they hope to use the capital tied up in the trade in some other capacity or if their investors wish to eventually withdraw their money, noise traders may cause the mispricing to persist so long that the arbitrage is impossible. Similarly, Schliefer and Vishny suggest that firms that perform arbitrage with investors' money face limits.<sup>105</sup> For example, in real markets, arbitrage trades may diverge even more during a given time horizon, requiring investors to put in more funds for margin calls. This divergence will appear to investors like a loss and they may respond by pulling money out instead of investing more. Gromb and Vayanos discuss other constraints on arbitrage such as the cost of selling stock short<sup>106</sup> and constraints on the amount of money an arbitrageur can invest (they don't all have infinite wealth!).<sup>107</sup> They also list persistent anomalies such as the value of stocks going up when they are added to prominent market indices and the value of stocks sold by distressed mutual funds going down. The limits to arbitrage have prevented arbitrageurs from completely eliminating the anomalies.

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<sup>105</sup> Andrei Schleifer and Robert W. Vishny, "The Limits of Arbitrage," *The Journal of Finance* 52, no. 1 (Mar., 1997): 35-55.

<sup>106</sup> Short selling is a necessary component of many arbitrages. Because arbitrage involves buying a low priced security and selling a higher priced one, arbitrageurs must borrow, i.e. sell short, the high priced security. Once the prices of the two securities converge or the settlement date of a derivative contract is reached, the borrowed security is returned.

<sup>107</sup> Denis Gromb and Dimitri Vayanos, "Limits of Arbitrage: The State of the Theory," *NBER Working Paper* no. 15821 (March 2010).

The “limits to arbitrage” literature reflects the fact that financial economists are well aware of the unrealistic assumptions underlying the Law of One Price and that such arguments don’t fit real world circumstances. However, the banner under which this research is carried out (“limits to arbitrage”) suggests that despite issues with arbitrage, it cannot be scrapped completely as an explanation of pricing. Economists are quick to defend arbitrage against regulations that threaten to impose further limits, such as short selling bans.<sup>108</sup> The limits to arbitrage literature can be read as an immunization against claims that the assumptions underlying the closed and consistent system of financial prices are unrealistic. By identifying the factors that hinder or prevent arbitrage, this literature shifts the blame for the unrealistic assumptions underlying financial models from financial economics to irrational investors and regulators who choose to limit arbitrage and thus the rationality of financial markets. It is the responsibility of these irrational actors to conform to the models, not the models to conform to irrational market practices. Financial economics acknowledges that the autonomy of finance is in fact fragile and must be approached politically as a project rather than a taken-for-granted certainty. Imperfections in the system are a consequence of these irrational limiting factors, but the goal of a closed and consistent system is self-evidently a good one in which fair pricing prevails. Unrestricted arbitrage is the means to achieving that goal.

Statistics on arbitrage are not readily available because arbitrage is a secretive practice. Profiting from arbitrage depends upon the arbitrageur having knowledge of the

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<sup>108</sup> See for example Robert H. Battalio, Hamid Mehran and Paul H. Schultz, “Market Declines: Is Banning Short Selling the Solution?” *Federal Reserve Bank of New York Staff Report* no. 518 (Sept. 1, 2011).

mispricing before anyone else; otherwise other investors would, by their own buying and selling activities, remove the opportunity. For this reason, firms don't release details about their arbitrage trades. However, anecdotal evidence suggests that the focus on arbitrage in financial practice has increased in conjunction with the growing dominance of relative valuation founded conceptually on the no-arbitrage condition.<sup>109</sup> Specifically, there appears to be an academic-trading pipeline by which financial economists identify theoretical arbitrage opportunities and publish journal articles describing them and then market participants undertake those arbitrages. Perhaps the first and most significant of these happened with the publication of the BSM options pricing formula. Despite evidence that math professor turned hedge fund manager Edward Thorp used a formula very similar to the BSM before its publication for arbitraging options, options prices were notoriously inconsistent.<sup>110</sup> However, when Black began to publish price sheets listing the BSM theoretical prices and volatility estimates for different options, traders used them "in the practice of arbitrage... and the effects of that arbitrage seem to have been

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<sup>109</sup> A 1984 American Management Association newsletter claimed that the "emphasis on arbitrage... is already well on its way to revolutionizing corporate attitudes and practices." Frederick C. Militello, Jr., "Growth of Arbitrage Changing Financial Management Practice," *AMA Forum* 73, no. 9 (September 1984): 29. Similarly, in 1986 Richard Croft reported that "Some analysts think that as much as 40 per cent of all trading on the New York Stock Exchange is, in fact, [index] arbitrage" and that the "number and range of participants continue to grow." Richard Croft, "Arbitrage Growing in Popularity," *The Globe and Mail* (Toronto, ON), Sep 13, 1986, B2. A 2003 article in *The Financial Times* quoted hedge fund manager Andy Preston as saying "Over the past five years [arbitrage] strategies have become increasingly sought after because they have delivered phenomenal returns." Elizabeth Rigby, "Running Arbitrage with Attitude," *The Financial Times* (London), June 16, 2003, 2.

<sup>110</sup> Fox, *Myth*.

to move patterns of prices toward the postulates of the model” thus removing the arbitrage opportunity.<sup>111</sup>

The academic-trading pipeline continued to operate after the publication of the BSM, with financial economists describing “anomalies” that indicated arbitrage opportunities in academic journal articles and traders undertaking the arbitrage and, if not erasing the anomalies completely due to “limits to arbitrage” factors, at least reducing them.<sup>112</sup> Arbitrage is thus the technique that disembeds finance based on the model provided by financial economics. Arbitrage brings prices into parity and erases, at least to some extent, anomalies that disrupt efficiency. Therefore, the disembeddedness of financial markets isn’t then merely theoretical or ideological; it is put into practice. The function that arbitrage is assumed to serve, of making markets efficient, self-regulated and autonomous is limited, but these limitations are framed not so much as failures of market efficiency but as constraints imposed from outside the closed and consistent system by irrational noise traders, uninformed investors or misguided regulators. Financial autonomy is thus a project to be perfected.

I have already argued that cultural studies of finance must begin a critique of finance by reformulating financial economics to describe what finance actually does instead of what financial economists say it does. It is easy to critique the no-arbitrage

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<sup>111</sup> MacKenzie, *An Engine*, 166. This is the flagship example for MacKenzie of the strongest “Barnesian” form of performativity he describes in his book.

<sup>112</sup> R. David McLean and Jeffrey Pontiff, “Does Academic Research Destroy Stock Return Predictability” (paper, European Financial Data Institute-French Finance Association Finance Meeting, Paris, December 2012), [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2156623##](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2156623##).

condition underlying financial models because arbitrage does happen. Yet, financial economists know arbitrage does happen and instead of allowing this fact to contradict their no-arbitrage models, they allow that in practice arbitrage is the mechanism that polices the system of financial prices, promoting fairness and autonomy. Critiquing this second assertion is more difficult because arbitrage actually has been the mechanism by which prices have been made to conform to relative valuation models like BSM and anomalies in pricing have been attenuated. Arbitrage is the conceptual device that allows financial economics to describe finance as autonomous or disembedded, but even more so, it is also the device that produces limited but very real autonomy in the form of a closed and consistent system of prices. While crashes, crises and persistent anomalies show that market efficiency is limited, financial economists have produced an explanation for those limits in the limits to arbitrage literature, framing market efficiency as an imperative project that can only be achieved by removing regulatory and behavioral restrictions on arbitrage. Arbitrage is thus precisely the fulcrum of the embedded disembeddedness of finance.

However, for all of its importance to financial autonomy, arbitrage remains only half theorized by financial economics. We know that arbitrage happens subject to certain limits, but the result of that arbitrage, the profit, is not accounted for by financial models. According to the mean-variance models that underpin relative valuation, profit is assumed to be the remuneration for taking on risk. Therefore, any return over the so-called “risk-free” rate of interest must correspond to some risk. Arbitrage is specifically defined as garnering riskless profit. So, tautologically, relative valuation models based



on the no-arbitrage condition cannot account for arbitrage profit! This aporia is precisely the place that cultural studies of finance can offer a necessary reconstruction of financial economics. Arbitrage is an important mechanism of financial profit making, therefore it is necessary to construct an understanding of where that profit comes from.

The “limits to arbitrage” literature, which does acknowledge the practice of arbitrage, suggests a possible interpretation of arbitrage profit. Behavioral finance economists claim that arbitrage is necessarily risky. This suggests that arbitrage profit is just like the profit from holding a risky stock, a remuneration of risk. For example, some arbitrage trades are subject to so called “fundamental risk”, meaning that new information in the future could change the value of the expected payoff to the trade.<sup>113</sup> This is the case with arbitrage between stocks and arbitrage carried out during a merger or acquisition between two firms (unsurprisingly called “risk arbitrage”). In these cases, the profit can be thought of as remuneration for the fundamental risk of the trade.

However, the risk that many behavioral finance economists describe in the limits to arbitrage literature is different. These are the risks that come with even guaranteed arbitrages, i.e. those that involve securities like futures or bonds that have a set payoff at a future time regardless of new information that might emerge in the interim. One such risk is the agency problem described by Schliefer and Vishny, in which investors who are unwilling to meet margin calls might force a firm to exit an arbitrage trade at a loss even though the payoff is still guaranteed.<sup>114</sup> It does not make sense, however, to

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<sup>113</sup> Bodie et al., *Investments*, 390.

<sup>114</sup> Schleifer and Vishny, “Limits of Arbitrage.”

suggest that the profit that one might gain from this arbitrage is the remuneration of the risk that investors might pull out of the deal. This is not so much a risk as a radical uncertainty.<sup>115</sup> The conditions that behavioral finance economists identify as risks inherent in guaranteed arbitrage are contingencies faced by any investor because the future is unknowable. An individual who owns stock might have to sell her position during a down week to pay for medical expenses. Similarly, an exchange might be permanently shut down leaving all investors who own securities traded there unable to exit their positions by selling on the exchange. These events are products of radical uncertainty, not the risk that an investment might go up or down that is priced in mean-variance models. Radical uncertainty is a condition of existence of the investor, not a fundamental risk to an investment strategy. Therefore, forms of arbitrage besides those that face fundamental risk, i.e. equity or risk arbitrage, still produce a profit that no branch of financial economics can explain.

Arbitrage is the engine of the embedded disembeddedness of finance. It is either assumed to be impossible or to be the mechanism that secures finance as a closed and consistent system of prices. Yet we cannot rely on financial economics to understand

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<sup>115</sup> I choose to use the term “radical uncertainty” here instead of just “uncertainty” because of the work of Frank Knight. Knight famously distinguished between risk—uncertainty that can be reduced to known probabilities—and uncertainty and claimed that profit arises only from uncertainty. Knight’s theory, which predated the risk-return relationship established by mean-variance techniques such as CAPM, might in fact contradict my argument here, and suggest that arbitrage profit is precisely the remuneration of the uncertainty of the trade. However, Knight made his claims about the context of entrepreneurship and the profit accruing to the entrepreneur who makes business decisions that are uninsurable. By radical uncertainty, I am referring to the contingency of existence. I do not believe that Knight would claim, nor that any reader would accept, that profit accrues to those who exist contingently. If it did, the critique of finance would likely be unnecessary. Knight, *Risk, Uncertainty*.

the profit that results from arbitrage. The vision of finance that arbitrage supposedly secures as one where fair prices prevail completely ignores the wealth that is earned by those who perform arbitrage. It also makes the question of where that wealth comes from unintelligible. Arbitrage is understood as the mechanism that corrects mispricings so if anything, arbitrage profit might be understood as an error in the system that the arbitrageur captures out of pure self-interest. But to whom did that error belong in the first place and why was it deemed an error that could be captured? This is a crucial question in light of the fact that over the same period of time that arbitrage has flourished as a technique of financial profit making, income inequality in the U.S. has grown exponentially, with those in financial services sector leading the expansion at the top.<sup>116</sup> Arbitrage is then not only a key to the embedded disembeddedness of finance but also a mysteriously unexamined mechanism of financial enrichment. The source of arbitrage profit is utterly neglected, and even rendered an unintelligible realm of inquiry for financial economics. It is thus precisely the topic with which a reformulated financial economics, one that describes what finance actually does rather than what economists say it does, should begin. A critique of finance from a cultural studies perspective must start by examining not what arbitrage supposedly accomplishes for the system of finance, but what arbitrage profit is composed of and where it comes from.

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<sup>116</sup> Lawrence Mishel and Natalie Sabadish, "CEO Pay and the Top 1%: How Executive Compensation and Financial-Sector Pay Have Fueled Income Inequality," *Economic Policy Institute Report: Inequality and Poverty*, May 2, 2012, <http://www.epi.org/publication/ib331-ceo-pay-top-1-percent/>.

## Conclusion

Finance displays a kind of double embedded disembeddedness in that, although it is socially constructed, it maintains an apparent and actual relative autonomy from its social and macroeconomic context. Beginning in the 1950s, financial economics has progressively framed financial markets as a closed and consistent mathematical system of prices that need not reference any context outside itself to function. This framing relies on the paradoxical function of arbitrage. Relative valuation models assume no arbitrage and thus provide no theory of arbitrage profit, even while financial economists assume that market efficiency is guaranteed by arbitrageurs. Arbitrage does happen, and it also provides some limited efficiency to markets by ensuring price parity. However, financial economics entirely neglects the other face of this efficiency; arbitrage provides a significant source of profit to firms powerful and wealthy enough to engage in it. Thus, arbitrage is the mechanism that produces finance as disembedded, yet it is only half-theorized by financial economics. Its economic function is crucial to the framing of finance as an autonomous system but no theory of arbitrage profit exists.

Critiquing financial autonomy from a cultural studies perspective requires more than asserting that financial models rest upon unrealistic assumptions or that they are socially constructed. It calls for a reconstructed financial economics that describes what finance actually does. Focusing on the role of arbitrage in financial economics acknowledges the fact that financial autonomy is a project that has been historically produced. But it also accepts that arbitrage works: it creates markets in which prices are, subject to a number of limits, a closed, consistent system. Finance is both

embedded and disembedded through arbitrage. But focusing on arbitrage also reveals that financial economics does not account for the significant wealth produced by arbitrage for those who can successfully engage in it, even though this is precisely what happens. Therefore, cultural studies of finance should begin with a theory of arbitrage profit. This theory must examine what arbitrage is and does, its cultural and technological conditions of possibility and the relations of power that suffuse it. To begin the project of proposing such a theory, I turn in the next chapter to a different economic tradition, one that is critical of neoclassical economics: Marxism. I ask if Marxist value theory can challenge the financial economic implication that arbitrage profit as a mathematical error and contribute to a robust theory of arbitrage profit.

## CHAPTER 2: ARBITRAGE AND MARXIST THEORIES OF FINANCE

The notion of arbitrage as guarantor of market efficiency in financial economics can only lead to the conclusion that arbitrage profit accidentally results from an error in efficient pricing. When arbitrageurs correct the error of mismatched prices, they just happen to receive a profit. However, it is the promise of this profit that directs so much professional financial activity to the creation of arbitrage trades. The idea that this profit is a mere error doesn't support the importance of arbitrage as a profit making strategy. There is, however, another significant economic tradition that might explain the source of arbitrage profit: Marxian economics contains a rigorous theory of profit in capitalism, specifically the theory of surplus value.<sup>117</sup> Therefore, it is worth looking to this tradition for an answer to the question of how arbitrage profit is constituted.

To understand whether Marxism can offer a better account of arbitrage, I first must first explain the relationship between the Marxist theory of surplus value and finance, the domain in which arbitrage takes place. Marxist interpretations of finance rest upon the distinction Marx makes between two sets of terms: productive and unproductive labor, and real and fictitious capital. The two dichotomies are related but not identical. Productive labor is that which results in surplus value, while unproductive

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<sup>117</sup> Although I am aware of the importance of the "transformation problem" in Marx's work, for the purposes of this chapter I assume identity between surplus value and profit for two reasons. First, offering an interpretation of the transformation problem is beyond the scope of this work; and second, in the next chapter I will argue against distinctions made in both Marxian and neoclassical economics between a real or fundamental value and price.

labor is labor, whether paid or unpaid, that does not ultimately produce surplus value, such as some forms of service work or reproductive labor. Marx clarifies this distinction in Vol. I: “Capitalist production is not merely the production of commodities, it is essentially the production of surplus-value... That labourer alone is productive, who produces surplus-value for the capitalist, and thus works for the self-expansion of capital.”<sup>118</sup>

Later interpreters of Marx have clarified this distinction in a way that makes its implications for a Marxist theory of finance clear. Wolff and Resnick explain the difference between productive and unproductive labor with regard to management: “The productive capitalist directs me to supervise productive laborers, to make sure they perform the maximum possible surplus labor. In this case I do unproductive labor since my labor power is not a direct part of the production of capitalist commodities.”<sup>119</sup> In addition to managing, Wolff and Resnick classify merchanting, renting land and moneylending as unproductive labor, that is labor that does not create value, even though it indirectly aids in the production and appropriation of surplus value.

Harry Braverman explains that unproductive labor is that which relates to the realization of surplus value, through the “distribution, storage, packaging, transportation, display, etc.” of commodities, or the appropriation of surplus value, through “the use of

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<sup>118</sup> Karl Marx, *Capital Vol I: A Critical Analysis of Capitalist Production*, ed. Frederick Engels (New York: International Publishers, 2003), 477.

<sup>119</sup> Richard D. Wolff and Stephen A. Resnick, *Economics: Marxian versus Neoclassical* (Baltimore, M.D.: Johns Hopkins University Press, 1987), 166.

capital simply for purposes of credit, speculation, etc.”<sup>120</sup> Braverman argues that while realization and appropriation “engage... enormous masses of labor,” this labor “does not enlarge the value or surplus value available to society or to the capitalist class by one iota.”<sup>121</sup>

From the perspective of Marxian economics, the activities of financiers are unproductive.<sup>122</sup> Lending at interest is specifically categorized by Wolff and Resnick as an unproductive, “nonclass” process in which “no labor or surplus labor is done, no new commodities are created.”<sup>123</sup> Although lending may be done to industrial capitalists who then use the money as capital, the labor of the banker is nonetheless itself unproductive of value. Lending increases money, but not surplus value, which is only created through productive labor. This interpretation of moneylending is supported by Marx’s designations of both usury (lending to non-capitalists, i.e. consumer lending) and banks lending to capitalists as “parasitic”.<sup>124</sup>

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<sup>120</sup> Harry Braverman, *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century* (New York: Monthly Review Press, 1998), 286.

<sup>121</sup> *Ibid.*, 287.

<sup>122</sup> Wolff and Resnick, *Economics*.

<sup>123</sup> *Ibid.*, 165.

<sup>124</sup> “Usury centralizes money wealth where the means of production are dispersed. It does not alter the mode of production, but attaches itself firmly to it like a parasite and makes it wretched.” Karl Marx, *Capital Vol. III: The Process of Capitalist Production as a Whole*, ed. Friedrich Engels, (New York: International Publishers, 1894), *Marxists Internet Archive*, 1999, <https://www.marxists.org/archive/marx/works/1894-c3/ch36.htm>. “The credit system, which has its focus in the so-called national banks and the big money-lenders and usurers surrounding them, constitutes enormous centralisation, and gives to this class of parasites the fabulous power, not only to periodically despoil industrial capitalists, but also to interfere in actual production in a most dangerous



On the other hand, “fictitious capital” refers to paper securities that appear to have value but do not have a basis in real commodity production.<sup>125</sup> For Marx, the credit system is the domain of fictitious capital, in which government bonds, other claims on debt, bills of exchanges and titles of ownership such as stocks are traded. All are fictitious in that they represent claims on value but are not themselves values produced by labor. Capital is advanced in the form of a loan or to buy a stake in a company; the paper that represents that capital is not the real capital advanced, but a fictitious doubling of it.<sup>126</sup>

Unproductive labor and fictitious capital can overlap, but unproductive labor doesn’t necessarily involve fictitious capital. A merchant exchanging commodities for payment in commodity money is not dealing in fictitious capital. However, within this framework, arbitrage fits both within the unproductive sphere and the credit system as the home of fictitious capital.<sup>127</sup> It is a transfer of fictitious capital between financiers that does not produce value. Wolff and Resnick would likely designate arbitrage as another

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manner.” Karl Marx, *Capital Vol. III: The Process of Capitalist Production as a Whole*, ed. Friedrich Engels, (New York: International Publishers, 1894), *Marxists Internet Archive*, 1999, <https://www.marxists.org/archive/marx/works/1894-c3/ch33.htm>.

<sup>125</sup> Karl Marx, *Capital Vol. III: The Process of Capitalist Production as a Whole*, ed. Friedrich Engels, (New York: International Publishers, 1894), *Marxists Internet Archive*, 1999, <https://www.marxists.org/archive/marx/works/1894-c3/ch29.htm>.

<sup>126</sup> “With the development of interest-bearing capital and the credit system, all capital seems to double itself, and sometimes treble itself, by the various modes in which the same capital, or perhaps even the same claim on a debt, appears in different forms in different hands. The greater portion of this “money-capital” is purely fictitious.” Ibid.

<sup>127</sup> Even arbitrage in “commodities” markets is actually arbitrage of futures or forwards that represent commodities.

“nonclass process.”<sup>128</sup> Thus, at first glance, it appears that arbitrage profit does not qualify as “real” according to the Marxist theory of profit as surplus value.

However, many scholars have produced their own interpretations of finance from a Marxist perspective that delve more deeply into the subject and elaborate the distinctions between productive and unproductive labor and real and fictitious capital. These interpretations can be grouped into four broad categories. The first dismisses the importance of finance altogether. The second cedes to finance a central role in capitalism even while maintaining that it does not produce value. The third category suggests that finance is exploitative in a way similar to the appropriation of surplus value described by Marx, but still maintains a distinction between real value production and finance. The fourth category explodes the productive/unproductive and real/fictitious distinctions, opening the possibility that finance in general and arbitrage in particular play a fundamental role in value production and appropriation in the contemporary context.

In the remainder of this chapter, I present each of these categories and explore their implications for understanding arbitrage. In response to work in the third and fourth categories, I present the first of two central claims of this dissertation. I claim that surplus value appropriation can occur outside the context of industrial capitalism. In fact, the appropriation of surplus value produced by labor is just one form of a broader logic, *capture*, which takes different forms in different formations of capitalism. Arbitrage is the form of capture unique to financial capitalism.

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<sup>128</sup> Wolff and Resnick, *Economics*, 165.

## Marx on Finance

### *Category 1: Money and Finance Do Not Matter*

As late as 1982, in a review of Rudolf Hilferding's *Finance Capital*, Jerry Coakley wrote: "A common attitude on the left is the notion that money and finance do not matter."<sup>129</sup> While this may be somewhat hyperbolic and it was certainly not a universally held notion, there have been and remain today large and influential strains of Marxism that largely dismiss the importance of finance. In a 1996 journal article, Simon Mohun defended the productive/unproductive dichotomy as an essential feature of the Marxian labor theory of value, and dismissed the notion that remuneration of labor done in the commercial or financial sectors is anything other than "the consequence of unequal exchange with industrial capital, the terms of which are determined by competitive struggle."<sup>130</sup> Profits "'really' earned in the productive sector" are distributed to the financial sector, but the financial sector plays no role in producing surplus value.<sup>131</sup>

Critiques of finance as unimportant rest not only on Marx's productive/unproductive dichotomy, but also the notion of fictitious capital. Even contemporary Marxian theorists maintain that the vast profits of the financial sector are fictitious, i.e. representations of capital advanced but not created. Financial activities are not truly important for the economy the way productive capitalist activities are. For example, in

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<sup>129</sup> Jerry Coakley, "Finance Capital: A Study of the Latest Phase of Capitalist Development," *Capital & Class* 6 (1982): 140.

<sup>130</sup> Simon Mohun, "Productive and Unproductive Labor in the Labor Theory of Value," *Review of Radical Political Economics* 28, no. 4 (1996): 45.

<sup>131</sup> *Ibid.*

their 2013 explanation of the financial crisis, Dumenil and Levy ask, “Were the profits of the financial sector real profits?” (127) and answer themselves: “The analysis of the financial sector in the United States suggests... the formation of a strong bias toward fictitiousness, at least from the second half of the 1990s, with a dramatic expansion after 2000.”<sup>132</sup> The financial sector produced fictitious profits through techniques like mark-to-market accounting that did not anchor the prices of financial securities to real production.

Dumenil and Levy start to move towards the second category, in which finance is seen as important even though not productive, when they claim that the redistribution of real value to the financial sector impacted the greater economy: “The other side of the coin is that such *fictitious* gains nourished the income flows paid out by financial corporations as wages to upper management or dividends, *real* drains on the own funds of corporations.”<sup>133</sup> They interpret the crisis as the result of the diversion of real capital from reinvestment into production to pay financiers for their unproductive labor:

the outstanding surpluses garnered during the years preceding the crisis were, to a large extent, fictitious... Conversely, the outstanding flows of high wages at the top of the wage pyramid and the dividends paid to shareholders were quite real. When accounts were adjusted to reality, the

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<sup>132</sup> Gérard Duménil and Dominique Lévy, *The Crisis of Neoliberalism* (Cambridge, M.A.: Harvard University Press, 2011) *UNC-Chapel Hill Libraries*, eBook, 127-8.

<sup>133</sup> *Ibid.*, 130-1.

cost of these real drains on fictitious surpluses was dramatically revealed in the sudden meltdown of corporations' own funds.<sup>134</sup>

In this interpretation, finance is not productive of value and its importance lies only in the way it drains value away from the productive sphere.

In this interpretation of finance, arbitrage would seem to be even less significant than mainstream financial economics suggests it is. The profit gained in arbitrage is only a transfer of fictitious capital between individual financiers. No value is produced and real value is only redistributed as remuneration for the unproductive labor of the arbitrageurs. In this way, arbitrage may be indirectly harmful to capitalism, but it is not a part of the real economy.

#### *Category 2: Finance Is Necessary but Not Productive*

In contrast to the work that dismisses finance, work in this second category shows the importance and necessity of finance, even while it maintains that it does not produce value. Chief among these contributions is Rudolf Hilferding's 1910 *Finance Capital*.<sup>135</sup> In it, Hilferding maintains the productive/unproductive interpretation but adds nuance to Marx's theory of finance. He distinguishes two forms of credit: private or circulation credit used as a means of deferred payment in commodity exchange and capital or investment credit, which "involves the transfer of a sum of money from the owner, who cannot employ it as capital, to another person who intends to use it for that

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<sup>134</sup> Ibid., 223-4.

<sup>135</sup> Rudolf Hilferding, *Finance Capital: A Study of the Latest Phase of Capitalist Development*, ed. Tom Bottomore, trans. Morris Watnick and Sam Gordon (London: Routledge & Kegan Paul, 1981).

purpose.”<sup>136</sup> His major focus is analyzing the role of banks in producing money and capital markets for these two kinds of credit and the relative power over industrial capital that they acquire in this role.

Hilferding’s book provides an extensive treatment of Marx’s position on finance and also highlights a lasting contradiction in the Marxist theory of finance: financial capital is “necessary” but not “productive.”<sup>137</sup> Hilferding argues that capital credit significantly aids production: “For productive capitalists, therefore, their own productive capital becomes only the basis of an enterprise which is expanded far beyond the limits of the original capital with the aid of borrowed capital.”<sup>138</sup> Lenders’ money capital accrues a portion of the profit that it helps to create, in the form of interest.

For Hilferding, shares of stock are also “certificates of indebtedness” that transfer money capital to industrial capitalists for production; however, the shares themselves are not capital at all.<sup>139</sup> He writes, “Once a share has been issued it has nothing more to do with the real cycle of the industrial capital which it represents.”<sup>140</sup> Unlike money capital that is lent out for interest, the money capital advanced to the capitalist at the time of the initial flotation of shares is transformed into industrial capital for good: it “is in the hands of the sellers of this productive capital and will never return to its starting

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<sup>136</sup> Ibid., 88.

<sup>137</sup> Ibid., 139.

<sup>138</sup> Ibid., 93.

<sup>139</sup> Ibid., 128.

<sup>140</sup> Ibid., 113.

point.”<sup>141</sup> For Hilferding, a share is merely a title to dividend income, which therefore makes it “fictitious capital.”<sup>142</sup> Thus, activities of traders in capital markets are clearly unproductive and can’t even result in a true profit. Speculation, as he calls any purchase or sale of “titles to interest”<sup>143</sup> results in

gains or losses [that] arise only from variations in the current valuations of claims to interest. They are neither profit, nor parts of surplus value, but originate in fluctuations in the valuations of that part of surplus value which the corporation assigns to the shareholders... Whereas the capitalist class as a whole appropriates a part of the labour of the proletariat without giving anything in return, speculators gain only from each other. One’s loss is the other’s gain.<sup>144</sup>

There are important implications of this characterization of shares and speculation for the interpretation of arbitrage and the source of arbitrage profit.

Hilferding includes activities that we could reasonably identify as arbitrage in his description of speculation:

[the speculator] does not hold securities in the hope of sharing in the higher profit – as an investor does – but seeks to gain by buying and selling his securities... His gain does not arise from a share in profit, for he gains also from declining profits, but from price changes, which means that at a particular time he can buy securities more cheaply than he sold them, or sell them more dearly than he bought them... [speculative gains] occur only because contradictory valuations are made, only one of which can turn out to be correct.<sup>145</sup>

Arbitrage, since it trades two assets that are somehow similar but have different prices, could fit within Hilferding’s definition of speculation as profiting from

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<sup>141</sup> Ibid., 130.

<sup>142</sup> Ibid., 128.

<sup>143</sup> Ibid., 134.

<sup>144</sup> Ibid., 135.

<sup>145</sup> Ibid., 136.

“contradictory valuations.” Arbitrage profit then, is a gain that comes not from surplus value, but only at the expense of other speculators. Arbitrage is like a game of *Monopoly* between members of the capitalist class. Slips of paper are passed around, some players may end up with more than others, but nothing is made, no value is added to the game. Although he adds the insight that credit and finance are necessary for capitalism, the interpretation of arbitrage that follows from Hilferding remains within the productive/unproductive dichotomy. What’s more, if finance is necessary for capitalism, arbitrage looks very much like it does in mainstream financial economics, a necessary part of making efficient markets. Hilferding, in fact, suggests just that:

The development of a market for fictitious capital makes speculation possible. In turn, speculation is necessary to keep this market open for business at all times, and so give money capital as such the possibility of transforming itself into fictitious capital, and from fictitious capital back into money capital, whenever it chooses. For the fact that marginal gains can be made by buying and selling is a constant stimulus to engage in these activities and to ensure the permanent existence of an active market. The essential function of the stock exchange is to provide such a market for the investment of money capital. Only in this way is the investment of capital as money capital made possible on a large scale.<sup>146</sup>

This sounds similar to financial economists Shleifer and Vishny’s discussion of the essential function of arbitrage: “Arbitrage plays a critical role in the analysis of securities markets, because its effect is to bring prices to fundamental values and to keep markets efficient.”<sup>147</sup> Arbitrage is necessary for markets to function.

The understanding of finance as necessary, but unproductive and fictitious, is an interpretation mirrored by other Marxist theorists. John E. Parsons challenges “bubble

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<sup>146</sup> Ibid., 139.

<sup>147</sup> Shleifer and Vishny, “Limits of Arbitrage,” 35.



theorists” such as Harry Magdoff and Paul Sweezy who “mention only the possibility of crisis embodied in the capitalists financial system.”<sup>148</sup> In contrast, he finds that the “expansion of the financial sphere is supportive of the expansion of the productive sphere.”<sup>149</sup> Similarly, according to David Harvey, “fictitious capital is contained in the very concept of capital itself.”<sup>150</sup> Harvey says that all paper claims, including credit money, are “characterized as *fictitious value*” but they reduce the time and costs of circulation, especially by transforming fixed into circulating capital.<sup>151</sup> Investments in fixed capital equipment and buildings “would be impossible without access to credit,” and the “credit system permits continuity in money circulation while embracing discontinuity in production.”<sup>152</sup> In short, fictitious capital is necessary for the development of capitalism: “The barrier fixed capital creates to future accumulation... can be overcome only by way of the credit system in general and by the creation of fictitious forms of capital in particular... Fictitious capital is as necessary to accumulation as fixed capital itself.”<sup>153</sup>

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<sup>148</sup> John E. Parsons, “Bubble, Bubble, How Much Trouble? Financial Markets, Capitalist Development, and Capitalist Crises,” *Science and Society* 52, no. 3 (Oct 1988): 261.

<sup>149</sup> *Ibid.*, 286.

<sup>150</sup> David Harvey, *The Limits to Capital* (Chicago: University of Chicago Press, 1982), 269.

<sup>151</sup> *Ibid.*, 269.

<sup>152</sup> *Ibid.*, 265, 264.

<sup>153</sup> *Ibid.*, 269.

Harvey agrees with Hilferding that finance is necessary but unproductive, but he also critiques Hilferding for not foregrounding the internal contradictions of finance capital. Fictitious capital in finance may be necessary for capitalism, but it is also the source of many problems and crises. While it has the potential to “fine-tune the engine of accumulation”, in the long run finance capital exacerbates the tendency towards over-accumulation, allowing a small group of powerful financiers to accumulate a great deal of value at the expense of industrial capitalists and even of production itself, and permits speculation that causes “fictitious accumulation” (bubbles) bringing on crises in their aftermath.<sup>154</sup> While adding this caveat to Hilferding might suggest a slightly less rosy interpretation of arbitrage than the one proposed by mainstream financial economics, the necessary but not productive category still suggests that arbitrage is a zero sum game between speculators in which profits are not “parts of surplus value,” i.e. not “real” profits in the Marxian sense.<sup>155</sup>

### *Category 3: Financialization as Exploitation*

In the 1980s and 90s, Marxists and other social theorists began to use the term “financialization” to describe “a gravitational shift toward finance in capitalism.”<sup>156</sup> The term has been used and the shift described in many different ways and a comprehensive survey is not possible here. However, the general thrust of work in this category is to move beyond older notions of how finance works (such as those found in

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<sup>154</sup> Ibid., 284, 287.

<sup>155</sup> Hilferding, *Finance Capital*, 135.

<sup>156</sup> Foster and Magdoff, *Great Financial Crisis*, 78.

*Capital, Vol. III* and Hilferding) to suggest a new functionality. Finance is seen within the financialization literature as central to capitalism and to processes of exploitation. Some of these scholars go so far as to reject the notion that finance concerns only fictitious capital. However, even those who espouse some kind of financialization thesis still maintain the productive/unproductive dichotomy and ultimately place finance in the later category.

In *A Brief History of Neoliberalism*, David Harvey argues that recent decades have been characterized by processes of neoliberalization and “the main substantive achievement of neoliberalization... has been to redistribute, rather than to generate, wealth and income.”<sup>157</sup> The main mechanism by which this redistribution is achieved is what Harvey calls “accumulation by dispossession.”<sup>158</sup> Accumulation by dispossession is not a process of appropriating surplus value, but rather “the continuation and proliferation of accumulation practices which Marx had treated of as ‘primitive’ or ‘original’ during the rise of capitalism.”<sup>159</sup> In addition to privatization, manipulation of crises, and state redistributions, finance is one of the main mechanisms of accumulation by dispossession. In fact, financialization, and in particular the “speculative raiding carried out by hedge funds and other major institutions of finance capital” constitutes the “real cutting edge” of the new process of accumulation by dispossession.<sup>160</sup>

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<sup>157</sup> Harvey, *Brief History*, 159.

<sup>158</sup> *Ibid.*

<sup>159</sup> *Ibid.*

<sup>160</sup> *Ibid.*, 162.

For Harvey, neoliberalism is characterized by the same inevitable class struggle as previous iterations of capitalism, but this new battle is being fought through accumulation by dispossession rather than through battles over, for example, the length of the workday or wages. Finance is important because it is a central way in which redistribution to elite classes occurs. And yet, Harvey is unable to permit that the wealth accumulated is surplus value, i.e. true capitalist profit. He declares that finance “creates a vast amount of fictitious wealth” not real value.<sup>161</sup> Accumulation by dispossession is therefore not a radical rethinking of finance in capitalism, but a rewording of an old idea that financial processes are parasitic. Except for Harvey, finance is now closer to outright theft than mere leeching off production.

Costas Lapavitsas gives another term for his rethinking of the role of finance in capitalism: “financial expropriation.”<sup>162</sup> Financial expropriation is “extracting financial profit directly out of the personal income of workers and others.”<sup>163</sup> Financial expropriation is the form of exploitation attendant to financialization, which has taken place since the 1970s due to “mediocre and precarious growth” in “real accumulation.”<sup>164</sup> Since profits to real production have stagnated, financial expropriation has allowed continued profitability by accessing workers’ income in other ways: “the increasing ‘financialisation’ of individual worker-income is clear, in terms both of

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<sup>161</sup> *Ibid.*, 157.

<sup>162</sup> Costas Lapavitsas, “Financialised Capitalism: Crisis and Financial Expropriation,” *Historical Materialism* 17, no. 2 (2009): 114.

<sup>163</sup> *Ibid.*, 115.

<sup>164</sup> *Ibid.*, 126.

liabilities (mostly borrowing for housing) and assets (mostly pensions and insurance).”<sup>165</sup> As workers must borrow to consume and use their own funds for things previously provided by the state, wages functionally decrease.

Lapavitsas suggests that contemporary financial expropriation has much in common with pre-capitalist usury. Financial institutions funnel workers’ income, through both debt and investment, into capital markets where they can extract fees and otherwise “tilt transactions to their own benefit.”<sup>166</sup> This happens in conjunction with the breakdown of social provisions for things like education, pensions and welfare. As individuals must rely more and more on financial markets, financiers are able to enrich themselves

And yet, Lapvitsas is clear that financial expropriation does not involve the production of surplus value. That is, in the last instance, finance is again parasitical, only in this case it leeches value off of workers directly, as in usury, instead of appropriating a share of the surplus value, as interest or dividends, created in production:

Financial expropriation, then, is a source of profit that has emerged systematically during the recent decades. It should be clearly distinguished from exploitation that occurs in production and remains the cornerstone of contemporary capitalist economies. Financial expropriation is an additional source of profit that originates in the sphere of circulation. In so far as it relates to personal income, it involves existing flows of money and value, rather than new flows of surplus-value. Yet, despite occurring in circulation, it takes place

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<sup>165</sup> Ibid., 129.

<sup>166</sup> Ibid., 132.

systematically and through economic processes, thus having an exploitative aspect.<sup>167</sup>

Finally, work that fits under the banner of autonomous Marxism makes similar moves with regards to rereading the place of finance in contemporary capitalism. One piece that stands out in this regard is Vercellone's "The Crisis of the Law of Value and the Becoming-Rent of Profit" in *Crisis in the Global Economy*.<sup>168</sup> Vercellone rejects the reading of the financial crisis that sees it as a spectacular build up of fictitious capital, the remedy to which would be refocusing on real production. Instead, the crisis is indicative of a genuine crisis of "the law of labor time value."<sup>169</sup> Previously, capitalists organized production and reinvested surplus value in production; they were "agent[s] of production."<sup>170</sup> Today, labor organizes itself autonomously to produce value out of the general intellect.<sup>171</sup> Production no longer relies on capitalists, and yet, capitalists still appropriate surplus value. They now do so through a rentier logic that is facilitated by

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<sup>167</sup> Ibid., 131.

<sup>168</sup> Carlo Vercellone, "The Crisis of the Law of Value and the Becoming-Rent of Profit," in *Crisis in the Global Economy: Financial Markets, Social Struggles, and New Political Scenarios*, eds. Andrea Fumagalli and Sandra Mezzadra, trans. Jason Francis McGimsey (Los Angeles: Semiotext, 2010).

<sup>169</sup> Ibid., 86.

<sup>170</sup> Ibid., 98.

<sup>171</sup> Marx uses general intellect to refer to the state of "general social knowledge" and "social practice" that are responsible for the relative productivity of social production at any point in history. Karl Marx, *The Grundrisse*, trans. Martin Nicolaus (London: Penguin Books, 1973), *Marxists Internet Archive*, 1973, <https://www.marxists.org/archive/marx/works/1857/grundrisse/ch14.htm>.

finance. But rent is “*a pure relation of distribution.*”<sup>172</sup> Financialization “results from an endogenous change in the logic of valorization” in which “large companies are today essentially concerned with their financial architecture and ultimately seem to occupy themselves with everything but the direct organization of production.”<sup>173</sup>

Vercellone’s argument places finance at the center of the new logic of capital. Finance is the method by which surplus value is appropriated. However, finance today is different from industrial capitalist management in that it is solely a parasitical drawing of rent from autonomous labor processes. In some ways, this reading is even more protective of the notion that finance cannot produce value than orthodox Marxist readings. All profit making is now financial rent and thus finance is utterly external to value production; it has no “real function in the process of production.”<sup>174</sup>

The work in this third category makes more room for finance within the Marxist theory of capitalism. Even though finance may play a more central role, as the cutting edge of accumulation processes, usury-like expropriation or surplus value appropriation, these authors still reinscribe a fundamental commitment to the notion that finance does not produce value. From such a perspective, arbitrage can be interpreted as playing some kind of role in the parasitic function of finance and thus having a negative or exploitative impact on workers or lower classes. Arbitrage trading can fit well within a Marxist notion of exploitation. To illustrate the strength of this characterization I’ll

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<sup>172</sup> Vercellone, “Becoming-Rent,” 98.

<sup>173</sup> *Ibid.*, 107.

<sup>174</sup> *Ibid.*, 102.

present a brief case study of an arbitrage trade that has been characterized as exploitative.

#### Arbitrage as exploitation: The case of market timing

Market timing is the practice of buying or selling mutual funds based on “stale prices.”<sup>175</sup> Mutual funds calculate their net asset value (NAV) at the close of trading each day based on the closing prices of component securities (stocks, bonds, etc). Investors wishing to purchase the fund pay the per share percentage of the NAV, so it is essentially a price that is only updated once daily, despite continuous trading of component securities.<sup>176</sup> Mutual fund timing takes advantage of the mismatch between when the price of the fund and the prices of its components are updated. Say for example, that an international stock held by a particular mutual fund and traded on a foreign exchange that has closed for the day will, according to certain financial models (for instance long-term correlation between domestic and foreign markets), be significantly influenced by after-hour’s events.<sup>177</sup> Until 4 p.m. EST, the mutual fund’s price will still reflect the “stale” price for the stock. If a savvy investor could see that the

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<sup>175</sup> Todd Houge and Jay Wellman, “Fallout from the Mutual Fund Trading Scandal,” *Journal of Business Ethics* 62, no. 2 (2005): 131.

<sup>176</sup> This is only true for “open-end funds”. “Closed-ended funds” trade between investors in the market and so the price of shares may be above or below NAV. “Open-End Fund,” *Investopedia*, <http://www.investopedia.com/terms/o/open-endfund.asp>. “Closed-End Fund,” *Investopedia*, <http://www.investopedia.com/terms/c/closed-endinvestment.asp>.

<sup>177</sup> Like all arbitrage, market timing is “theory-dependent” in that it relies on models of value to articulate two sets of securities with different prices as being essentially equivalent. In this case, the prices are not actually different at the time of the trade, but there is an anticipated difference determined by the model. Beunza et al., “A Price,” 733.



component stock will likely have an amazing day, he would buy up many shares of the mutual fund at the lower price, wait until the NAV is recalculated and sell it back the next day for an arbitrage profit.

Regular mutual fund investors do not engage in this kind of trading, but instead buy mutual funds for long-term gains; they are known as “buy-and-hold” investors. Buy-and-hold investors would also stand to benefit from the increase in NAV the following day in so far as that would be an increase of their long-term investment.<sup>178</sup> However, when arbitrageurs buy up lower priced shares and sell them the following day the net effect is a smaller increase in the value of the fund for buy-and-hold investors. This occurs for three reasons. First, administrative costs increase with multiple rapid short-term trades. Second, managers may not have enough time to invest quick in- and out-flows of cash, such that that money never “goes to work” for the fund as a whole, earning returns in fund investments. But most importantly, when arbitrageurs buy the fund at the “stale” prices, they gain immediate access to returns. They realize the returns when they sell the next day upon the recalculation of the NAV. Part of those returns are cashed out by arbitrageurs, instead of delivered to long-term investors.

This form of arbitrage is thus criticized as “diluting” returns for buy-and-hold investors.<sup>179</sup> As Houge and Wellman put it, “the trading profits earned by market timers come at the expense of other long-term investors.”<sup>180</sup> They continue:

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<sup>178</sup> Houge and Wellman, “Fallout.”

<sup>179</sup> *Ibid.*

<sup>180</sup> *Ibid.*, 132.

Market timers utilize information produced during U.S. trading hours that is not fully reflected in daily NAVs. By observing large index movements or trends in similar types of securities, timers are able to predict the direction of future NAV changes. For example, the positive correlation across global financial markets implies that large increases in U.S. equity indexes are often followed by positive changes across international equity markets. Thus, a market timer could purchase international equity funds following a sharp rise in U.S. markets and sell these funds when U.S. markets trend down. This strategy generates significantly positive excess returns because the timer is able to trade at stale net asset values. Moreover, the strategy is perfectly legal.<sup>181</sup>

The last line of this quote highlights the tension between the notion that arbitrage is a legal strategy and the exploitation evident in the trade. What's more, market timing is not a limited activity that affects a few unlucky investors but rather a systematic practice. Eric Zitzewitz estimated in 2002 that over 70% of mutual funds were subject to market timing and the average buy-and-hold mutual fund investor lost 2% of the value of their assets to arbitrage.<sup>182</sup>

The "dilution" critique of market timing exposes the exploitation inherent in arbitrage trades. Just like industrial capitalism in which "free laborers," bereft of any resources but their own labor power, confront the owners of the means of production,

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<sup>181</sup> Ibid.

<sup>182</sup> Eric Zitzewitz, "Who Cares About Shareholders? Arbitrage-Proofing Mutual Funds," *The Journal of Law, Economics & Organization*, 19, no. 2 (2003): 245-80.

arbitrage is about relative positions of power. The notion that arbitrage is exploitation, rather than a zero-sum game among traders, suggests that it is central to capitalism and thus to the uneven power relations in society. However, the authors in the third, “financialization as exploitation” category are at pains to differentiate the exploitation of finance from the fundamental exploitation of capitalism: the appropriation of surplus value by industrial capitalists. Even Vercellone who actually says that finance is a form of the appropriation of surplus value must add the caveat that surplus value is now only appropriated as rent, i.e. in a way utterly separated from the production of that value.<sup>183</sup> This distinction is necessary to maintain the notion that value is only produced by labor and only appropriated by the capitalists that deploy that labor to increase value. The notion that finance could somehow produce real value is wholly rejected except in a narrow category of work that refuses to allow its analysis of contemporary capitalism to be limited by the productive/unproductive and real/fictitious dichotomies.

#### *Category 4: Financial Value*

In their 2006 book, *Capitalism with Derivatives*, Dick Bryan and Michael Rafferty radically reinterpret a key aspect of finance, derivatives, from a Marxist perspective.<sup>184</sup> They argue that in a post-Bretton Woods world, financial derivatives serve as a new, global form of money, commensurating between different forms of capital in the absence of fixed exchange rates. In the course of their analysis, they reject the

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<sup>183</sup> Vercellone, “Becoming-Rent.”

<sup>184</sup> Dick Bryan and Michael Rafferty, *Capitalism with Derivatives: A Political Economy of Financial Derivatives, Capital and Class* (New York: Palgrave Macmillan, 2006).

productive/unproductive dichotomy while maintaining fidelity to Marx's theory of money.

The write:

The interpretation of Marxian theory through the productive/unproductive distinction proves stifling of an understanding of changes that occur within finance. If the premise of analysis is to identify finance as unproductive (but necessary) and the object of analysis is the question of whether finance has increased its share of surplus value at the expense of the share of productive capital, the subject of finance itself becomes highly simplified... Developments within finance, such as the enormous growth of financial derivatives, fail to receive direct analytical attention.<sup>185</sup>

But Bryan and Rafferty do find this growth significant. They argue that Marx's theory of money is fundamentally about the function of money as commensurating between different values (commodities, capital, labor time, etc). Marx, however, "took for granted the equivalence of money to other forms of capital" because he examined money only as gold.<sup>186</sup> Today, the proliferation of state fiat money with floating exchange rates and forms of capital such as financial assets make the problem of commensuration one that cannot be solved by recourse to a single commodity equivalent such as gold. Derivatives perform money functions that are impossible for any single commodity in contemporary capitalism. They are "literally thousands of types of commodities whose specific characteristics are designed to secure commensurability between different forms of capital."<sup>187</sup>

Bryan and Rafferty's argument has significant implications for a Marxist theory of finance. Derivatives trading performs the key function in capitalism of commensurating

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<sup>185</sup> Ibid., 156.

<sup>186</sup> Ibid., 158.

<sup>187</sup> Ibid., 161.

across currencies and forms of capital. If finance thus has a distinctly financial form of money, it cannot be a fictitious parasite on the real value circuit, but instead must be understood as an integral part of it. In short, if derivatives are now the money capital (M) in M-C-M' and money capital is what mysteriously increases in the capitalist process, as represented by the prime ('), perhaps there is a truly financial form of that growth.

Similarly, in his response to the global financial crisis, geographer Geoff Mann claims that Marxist value theory must decisively reject the notion that finance is fictitious.<sup>188</sup> Mann suggests that the “labour’ predicate” of Marxist value theory may be an anachronism.<sup>189</sup> He writes, “To see value as historically determinate is also to understand that – while value remains ‘value’, the organising principle of capitalism – as capitalism changes, so too will the way in which value operates.”<sup>190</sup> (176). For Mann, the financial crisis reveals that “value as such has more recently escaped labour’s bonds” (176).

He challenges the notion that factories, machines and land are “real” values whereas derivatives like those involved in the financial crisis, asset backed securities (ABS), credit default swaps (CDS) and collateralized debt obligations (CDOs), are somehow fictitious by noting that the latter are “just another, albeit sophisticated and mystifying... commodity – one that the crisis has not so much exposed as fictional as rendered just plain valueless” (181). Like Bryan and Rafferty, Mann suggests that

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<sup>188</sup> Geoff Mann, “Value after Lehman,” *Historical Materialism* 18, no. 4 (2010): 172-188.

<sup>189</sup> *Ibid.*, 176.

<sup>190</sup> *Ibid.*

financial activity need not be understood as unproductive, but goes further to suggest that taking finance seriously requires a reconceptualization of value. Value should not be defined as that which is produced by labor, but is “best understood as a form of social wealth constituted by a spatially and temporally generalizing social relation of equivalence and substitutability under, and specific to, capitalism” (177). That does not mean that abstract labor is no longer important, as he notes: “contemporary capital’s power still lies to a significant extent in the expropriation of labour’s surplus-product” (ibid). But other formations of the social relations that constitute value as such also exist. In particular, “the web of social relations” that constitutes finance is a source of value just as the social relations of labor are (181). For Mann, the financial crisis shows that financial value is no less real than labor value.

The fourth category of Marxist approaches to finance deviates significantly from the other three by claiming that finance deals in real values and that financial activity may even be productive of value. From this perspective, arbitrage may play a more integral role in capitalism than suggested by other Marxist approaches. If money and value are both now legitimately financial and arbitrage is, as I have argued, the central profit making strategy of finance, arbitrage profit must consist of real surplus value. Although Bryan and Rafferty and Mann open the door to this possibility, neither offers a rigorous explanation of how arbitrage profit is constituted. What is needed is an explanatory framework that builds upon their analyses and allows a broader conception of surplus value appropriation that can occur in more than one way.

In line with the possibilities opened up by this work, I offer the first of two central claims of this dissertation: *surplus value appropriation is not confined to industrial capitalism but instead is a process that can occur in many different configurations of capitalism. This process or logic, which is definitional of capitalism but not singular in its manifestation, is renamed “capture”. Arbitrage is the form of capture proper to finance and without it finance would not exist as such.*

Renaming arbitrage as capture seems to provide an answer to the question of where arbitrage profit comes from. Like industrial capitalist value appropriation, arbitrage as capture must involve exploitation, i.e. uneven relations of power that allow the appropriation of value by some at the expense of others. The case of market timing seems to demonstrate these relations. Buy-and-hold investors don't have the information or resources to perform arbitrage and so suffer diluted returns. But in fact, claiming that arbitrage is exploitative in the capitalist sense raises even more questions. If arbitrage is like the capitalist appropriation of surplus value created by labor in commodity production, how is the value captured by arbitrage created? Put differently, who wins and who loses? Is it always buy-and-hold investors who are exploited by arbitrage? Even if it is, are we to believe that buy-and-hold investors are, like workers, producers of value? These questions cannot be answered simply by naming arbitrage as capture. Instead, a rigorous explanation of capture in general and the process of arbitrage capture in particular are needed.

## Conclusion

Traditional Marxist conceptions of finance open the way for a better understanding of arbitrage profit than that offered by mainstream financial economics. Although the first two categories of Marxist work on finance presented in this chapter suggest that arbitrage is insignificant or a zero-sum game between speculators, the third category raises the possibility that arbitrage may be a form of capitalist exploitation. This notion is worth pursuing, but only in light of work in the fourth category that successfully critiques the salience of the productive/unproductive and real/fictitious dichotomies in the context of contemporary financial capitalism.

What is needed is a framework that answers the question of how finance in general and arbitrage in particular can be productive of value. In the next chapter, I propose a framework based on the work of Grossberg et al. that accounts for the multiple ways that value operates in capitalism by framing value much as Mann does, in terms of social relations.<sup>191</sup> This framework allows me to redefine arbitrage as the apparatus of capture unique to financial capitalism. I explain the functioning of that apparatus of capture in detail.

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<sup>191</sup> Grossberg et al., “Conjunctural Theory.”



### CHAPTER 3: ARBITRAGE AS CAPTURE

In financial theory, arbitrage is either assumed to be impossible in efficient markets, or is the very mechanism that secures financial markets as closed, consistent systems. In the latter guise, arbitrage is seen as a sort of beneficent policing force in financial markets, but no account of the source of arbitrage profit can be given. The Marxist theory of surplus value points towards an alternative account of arbitrage, but only once notions of finance as unproductive are eschewed. The work of Dick Bryan and Michael Rafferty and Geoff Mann offer constructive notes towards allowing finance to be a domain of real capitalist value, but a rigorous, detailed framework is necessary to finally understand how arbitrage functions and how arbitrage profit is constituted.

In this chapter, I present my interpretation of a recent article by Lawrence Grossberg, Carolyn Hardin and Michael Palm, “Contributions to a Conjunctural Theory of Valuation” as such a framework.<sup>192</sup> In this article, Grossberg et al. build upon Postone’s rethinking of Marx to produce “the outlines of a theory that approaches value in both formal (conceptual) and conjunctural terms.”<sup>193</sup> This theory significantly broadens the category of value, beyond both the subjective valuations of utility maximizing consumers and producers in neoclassical economics and the Marxist category of wealth produced by labor. This has significant implications for understanding

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<sup>192</sup> Lawrence Grossberg et al., “Conjunctural Theory.”

<sup>193</sup> Ibid., 313.

arbitrage. It allows arbitrage into the real world of value, dissolving the productive/unproductive dichotomy and the notion that finance is the domain of fictitious capital. In Grossberg et al.'s framework, arbitrage occupies a central position in the value processes of financial capitalism.

The remainder of this chapter is divided into two parts. First, I present Grossberg et al.'s framework, noting some implications of their work for rethinking value. Second, I follow up on the claim that arbitrage is an apparatus of capture by analyzing a specific historical example to offer a redefinition of arbitrage. Against the vague financial economic definitions of arbitrage that neglect the issue of profit, the capture framework demonstrates that arbitrage is a creative process oriented precisely to that task of capturing profit. It involves three steps: the proposal of equivalence, the calculation of profit, and the actualization of capture. I conclude by meditating on the issue of risk. Risk is not a category that Grossberg et al. reference when presenting their capture framework, and yet arbitrage is always referred to as "riskless" in financial economics. This contradiction will be taken up more fully in the next chapter.

### Rethinking Value

Grossberg et al.'s framework begins by building on the work of Moishe Postone. In *Time, Labor, and Social Domination*, Postone argues that value is not a universal, transhistorical category, but a category specific to capitalism that reflects a particular organization of society.<sup>194</sup> Postone reinterprets Marx's critique not as a critique of capitalism or of the distribution of value from the standpoint of labor, but a critique of

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<sup>194</sup> Moishe Postone, *Time, Labor, and Social Domination: A Reinterpretation of Marx's Critical Theory* (New York: Cambridge University Press, 1993).

labor itself as playing “a historically unique role in mediating social relations.”<sup>195</sup> The labor theory of value is then at best a limited and contingent theory of value. Postone explains that labor is not “the transhistorical essence of social life” but only plays that role within capitalism.<sup>196</sup> For Postone, traditional Marxist critiques that see labor as this essence and see value as created by labor, rather than by the social mediating role of labor, miss the mark.

Grossberg et al. also add historical specificity to the category of value, but unlike Postone, they do not limit value only to the capitalist period. Instead, they present a taxonomy of different values along with a “diagram... of value transformations.”<sup>197</sup> For Grossberg et al., there is a distinctly capitalist value, but there is also pre- or non-capitalist economic value, aesthetic value, ethical value and many other forms.

Grossberg et al.’s framework is opposed to the Marxist labor theory of value in that they do not identify the way or ways that value is produced, but instead suggest that all value begins as what they call “social mattering.”<sup>198</sup> Those things that we come to understand as values or having value, in whatever form, are originally defined by:

the primordial stickiness that holds people together in relations of mutuality before any commonality but out of which commonalities and collectivities can be formed. In our view, a primordial state of sociality is defined by an

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<sup>195</sup> Ibid., 16.

<sup>196</sup> Ibid., 167.

<sup>197</sup> Grossberg et al., “Conjunctural Theory,” 314.

<sup>198</sup> Ibid., 312.

affective organization of nonindividuated investments or desirings that constitute the very possibility of social relationality as a simultaneously attenuated and dense web of mutual matterings.<sup>199</sup>

Social mattering is the foundation of value, but this insight is only a starting point for the goal of their analysis, to describe the ways that social mattering is transformed into different forms of value. While they acknowledge that social mattering can follow many trajectories of transformation into forms of value like those mentioned above, their focus is on the transformation of social mattering into economic and capitalist value.

Before describing these transformations, I want to note two important facets of their overall approach to this framework of value. First, they place a great deal of importance on obligation and debt. Obligation does not result, for Grossberg et al., from a lack or emptiness that must be filled but instead is a sort of photo negative of value; obligation indicates what matters. They write: “We thus argue that value, at this point taking the form of affective matterings, is indicated and actualized through obligation. Obligation marks what matters.”<sup>200</sup> That which matters is actualized as obligation and, in later transformations, debt, an important distinction in their work. They find evidence for this notion in scholarly work on gift giving, reciprocity and the debt-origins of money. For instance, Geoffrey Ingham suggests that ancestral sacrifice “codified elements of social structure into a hierarchy of value” by indicating what debts had to be paid to ancestors

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<sup>199</sup> Ibid., 318.

<sup>200</sup> Ibid.

and with which valuable items they could be satisfied.<sup>201</sup> The connection between value and obligation is born out in Grossberg et al.'s framework by the fact that each form of value (social mattering, economic value and capitalist value) corresponds to a specific kind of debt (obligation, indebtedness and capitalist debt).

Second, while Grossberg et al. find evidence of the “primordial stickiness” of social mattering in the work of economic sociologists and anthropologists focused on so-called “primitive societies”, they insist that the category is not purely historical.<sup>202</sup> The transformations of value they describe are identifiable as historical and anthropological realities but also take place in countless daily transformations as well. Thus, they do not suggest a single temporal trajectory in which social mattering has given way to economic value and then finally capitalist value. All three of these forms of value, as well as many others, coexist. The processes that transform values are both broadly historical and quotidian. Their framework is thus open to a great deal of complexity around the ways value functions.

A large part of Grossberg et al.'s article is taken up with describing the transformation of social mattering into economic value and economic value into capitalist value. Beginning with the notion of social mattering as described above, they map the emergence of something identifiable as economic value. This transformation is evident historically in the development of money. Money, they argue, developed out of a codification of the “undifferentiated mutual indebtedness” that they associate with social

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<sup>201</sup> Geoffrey Ingham, *The Nature of Money* (Malden, MA: Polity, 2004).

<sup>202</sup> Grossberg et al., “Conjunctural Theory,” 314.

matterings.<sup>203</sup> Citing scholars like David Graeber and Geoffrey Ingham, they reject the neoclassical myth of money as a technology for solving problems with barter and instead see debt money as the originary form of money.<sup>204</sup> Money was first and foremost an accounting of debts between individuals. Tokens only developed as a way to reliably pay those debts.

The transformation from social mattering expressed by webs of undifferentiated obligation to economic value expressed by countable, recordable indebtedness between individuals is thus evident in the development of debt money. More generally, Grossberg et al. describe this transformation as one of deterritorialization, enumeration and commodification. They borrow the term “deterritorialization” from Deleuze and Guattari but define it for themselves in this way:

Deterritorializing processes pry apart or dissociate relations from their contexts. Through deterritorialization, debts and the now fully economic values they mark are no longer tethered to the location of their origin within a community and context; they can travel. Deterritorialized debts can circulate and change form, becoming commodities or money. Deterritorialized commodities circulate the values that can repay these debts. Deterritorialized humans, meanwhile, are constituted as unique individuals who enter into two-sided debt relations, rather than as indivisible constituents of a fabric of sociality/obligation.<sup>205</sup>

In the “structure of feeling of obligation” that Grossberg et al. associate with social mattering, obligations are singularities—the are unique, non-transferable, non-

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<sup>203</sup> Ibid.

<sup>204</sup> David Graeber, *Debt: The First 5,000 Years* (Brooklyn, N.Y.: Melville House, 2011). Ingham, *The Nature of Money*, 92-3.

<sup>205</sup> Grossberg et al., 319.

commensurable relations.<sup>206</sup> Deterritorialization extricates singularities from the particularities of the context in which they are embedded. Deterritorialized lumps of metal can function as circulating money. Deterritorialized lengths of cloth can be bought and sold on markets instead of used by the family that produced them. Or to take a more modern example, a deterritorialized share of ownership of a corporation can be sold by its original owner.

The deterritorialization process results in commodification: the production of sets of enumerable goods that can be sold in markets for roughly the same price.<sup>207</sup> Commodities, whether money or other forms of exchangeable goods, can also now be used to pay debts. An obligation that formerly cemented a social bond of shared history and complex mutuality can now be rendered as a countable economic indebtedness. Again, this is not solely a historical transformation from primitive sociality to market society. For instance, if one neighbor views giving another neighbor a cup of sugar as a

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<sup>206</sup> Ibid., 317.

<sup>207</sup> Commodification necessarily proceeds as a relative process historically. Similarity between coins of different weights and composition might have been taken for granted in the Middle Ages but would seem to us today to be grossly inadequate. The historical process of commodification is thus complex and ongoing. Grossberg et al. argue that “the transformation achieved through the deterritorialization and enumeration of unique debts is likewise the condition of possibility for markets.” Grossberg et al., “Conjunctural Theory,” 321. The continuity of trade in markets required commodification, of currencies as I have already described, but also of other goods. As early as 1439, regulations in Paris fixed the respective weights of “*Chalilli* bread, blistered or *bourgeois* bread and brode bread (a brown bread)” to be sold in markets. Fernand Braudel, *Capitalism and Material Life, 1400-1800*, trans. Miriam Kochan (New York: Harper Row, 1973), 95. I would argue that even before the emergence of markets, deterritorialization must have been a necessary aspect of early credit systems in which units of account were based in specific weights of metal, but the means of payment was often commodities like bushels of grain. Graeber, *Debt*.

neighborly duty, she is operating at the level of obligation. The sugar is a part of a structure of feeling of obligation that deepens the social bond between them. However, if the neighbor receiving the sugar pulls out her wallet and asks, “what do I owe you?” she has moved to the register of economic value and debt. Paying the money equivalent of the sugar closes down the social bond associated with obligation. The sugar no longer indicates social mattering of the neighbor relationship, but is instead an economic debt payable in money (or another gift, etc).

It is important to note again here that this transformation is neither total nor complete. Although both neighbors may routinely buy sugar for money at the market, the idea that one neighbor would give another neighbor money for “borrowing” a cup of sugar is crass, which demonstrates this point. The dense web of social matterings that they call obligation is not obliterated or totally used up in the transformation to economic indebtedness. The transformation of the structure of feeling of obligation into economic debt always partially fails, such that obligation remains alongside and within the economic register. None of the transformations that Grossberg et al. describe are total in the sense that we ever reach a new plane of full economization. Similarly, economic indebtedness remains even after the next transformation they describe, the emergence of capitalist value.

Grossberg et al. do not equate economic value and capitalist value. Much as Postone does, they define capitalist value as the result of particular social relations. However, unlike Postone, they broaden the conception of capitalist value beyond the labor relation, to define it as the form of value that is subject to the process of capture



and the social relations and taken-for-granted rules that enable the latter. The notion of capture is derived from the work of Deleuze and Guattari. An apparatus of capture is an assemblage that is made up of two operations: “direct comparison and monopolistic appropriation.”<sup>208</sup> In the process of capture, comparison produces a “difference or excess constitutive of profit.”<sup>209</sup> Deleuze and Guattari name ground rent, profit from the appropriation of surplus labor, and taxation as three apparatuses of capture.<sup>210</sup>

Grossberg et al. characterize capture in this way:

Capture names a seemingly paradoxical operation in which the appropriation of a surplus (from some stock or totality) constitutes the very totality from which the surplus is appropriated. Capture works precisely by establishing the possibility of a difference (between the surplus and the stock), which enables the possibility of a comparison. And it is the comparison that enables the identification and appropriation of the surplus. Capture introduces difference into transformations of value by constituting both sides of the equation, so that the capture of the surplus (re)constitutes the stock from whence it came in the very act of capturing the difference.<sup>211</sup>

For Grossberg et al., capitalist value is defined by a transformation of value whose end point and driving force is the operation of capture. Three articulated processes characterize this transformation of economic into capitalist value and are preconditions of capture: decoding, unitization and flow. Decoding can be understood as a stripping away of the “specific and concrete meaning” that links commodities to the

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<sup>208</sup> Deleuze and Guattari, *A Thousand Plateaus*, 444.

<sup>209</sup> *Ibid.*, 446.

<sup>210</sup> *Ibid.*

<sup>211</sup> Grossberg et al., “Conjunctural Theory,” 324-5.

contexts out of which they emerge.<sup>212</sup> Currencies and other commodities that reach the level of economic value through deterritorialization still retain the markings and significance of their origins. Deleuze and Guattari describe the traces that remain inscribed on things even after they have been to some degree disassociated from particular territorial locations as “codes”. The process of decoding strips away those traces so that coins from one particular region may be interchangeable with those from another. According to Grossberg et al., decoding effectively “obliterates any concrete actuality of obligation” leaving debts and values without reference to origins or meaning.<sup>213</sup>

However, this process of decoding is not complete without unitization. Unitization is an operation of recoding decoded values that renders each an equivalent, equalized unit. Unitization replaces old traces of meaning with quantification, making debts, commodities and values not only countable, but transferable and interchangeable. Our uniform state-issued currency is one good example of decoded, unitized debt-value. In the past, multiple private and semi-public currencies have circulated in the U.S.<sup>214</sup> But today, we have a uniform, government issued currency denominated in fully exchangeable units. Even though physical US currency still contains small traces (serial numbers, magnetic strips)—which reinforce the notion that even this transformation is never complete)—any US dollar can be used to clear any debt within the U.S. (and also

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<sup>212</sup> Ibid., 322.

<sup>213</sup> Ibid., 323.

<sup>214</sup> Stephen Mihm, *A Nation of Counterfeiters: Capitalists, Con Men, and the Making of the United States* (Cambridge, M.A.: Harvard University Press, 2007).

in many other countries). Electronic dollars are even more decoded, lacking the traces of physical dollars.

Along with decoding and unitization, flow completes the transformation of economic values necessary for capture. Capture is, as Grossberg et al. put it, a process of “comparison that enables the identification and appropriation of the surplus.”<sup>215</sup>

Decoded units allow comparison and identification of surplus, but flow is the necessary movement of those units such that those comparisons can actually occur. Decoded, unitized values must circulate so that exchange can take place and the difference illuminated by the comparison can be captured.

Drawing heavily on the work and language of Deleuze and Guattari, Grossberg et al. establish a framework for understanding value that breaks with both neoclassical and Marxist conceptions. However, their framework maintains fidelity to the Marxist theory of value in two ways. First, it acknowledges that a process of value appropriation is at the heart of capitalism. Second, it actually frames the surplus value appropriation described by Marx as one of several forms of capture. The calculus described by Marx in *Capital* fits within the framework of capture presented by Grossberg et al. For Marx, exchange value, as opposed to use value, is produced by abstract labor time measured only quantitatively. The time spent by individual human laborers creating use values is, in the process of capitalist production, decoded into abstract labor time. Unitized quanta of abstract labor time are then crystallized in commodities that circulate. Units of the value of commodities expressed in money capital are fully commensurable regardless of the

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<sup>215</sup> Grossberg et al., “Conjunctural Theory,” 324.

use values to which they are attached. Through flow or circulation (production, sale, purchase, reinvestment, etc.), these quanta are compared to socially necessary quanta of abstract labor time such that a surplus of value produced by labor can be identified and captured by the capitalist. The comparison of socially necessary labor time and surplus labor time does not exist prior to the conception of surplus value appropriation. Instead industrial commodity production is an apparatus of capture in which profit is derived from surplus labor time that makes socially necessary labor time—the stock—an intelligible category.

### Arbitrage as Capture

Grossberg et al.'s framework offers a way to understand capitalism as one point on one of many trajectories in multiple complex transformations of value. In addition, capitalism is multiple—it is different depending on the different forms that apparatuses of capture can take. Grossberg et al. suggest that arbitrage is the apparatus of capture that defines contemporary finance capitalism. They write:

the variety of [financial] securities—such as claims on an industrial capitalist enterprise (stocks, dividends), claims on future production (futures), claims on debt repayments (bonds and debt-backed derivatives), as well as second-order representations of volatility and the risk of these claims (options, swaps, etc.)—follow the same process of decoding, unitization, and flow, producing an enormous flow of fluctuating and changing values.<sup>216</sup>

And further,

two sets of securities are selected out of the proliferating flow of decoded and unitized claims. They are placed into a relationship of comparison whereby the trader, depending on the model he or she chooses to judge their fundamental value (and there are many, often conflicting models), determines that they are both equal in value and different in price (Beunza, Hardie, and MacKenzie 2006).

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<sup>216</sup> Grossberg et al., “Conjunctural Theory,” 330.

This comparison produces a surplus of price, which the trader captures through buying and selling.<sup>217</sup>

Grossberg et al. note that arbitrage fits the process of capture in their model. This lends far more analytical clarity to the general process of arbitrage than financial economic definitions do. For example, in his 2006 book *Understanding Arbitrage*, finance professor and business consultant Randall Billingsley offers this rather typical definition: “Arbitrage is the process of buying assets in one market and selling them in another to profit from unjustifiable price differences. ‘True’ arbitrage is both riskless and self-financing... use of the term has broadened to include often-risky variations.”<sup>218</sup> This definition is too abstract (“buying assets in one market and selling them in another” could apply to any and all merchant or foreign trade activities) and at worst contradictory (“true” arbitrage is riskless, but there are risky versions!)

Reformulating arbitrage as an apparatus of capture clarifies the process. In the next section, I provide an analysis of a particular historical example of arbitrage to demonstrate the way arbitrage functions as capture. The value transformations explained by Grossberg et al. are evident in this example, but they take unique forms in the process of arbitrage. In particular, arbitrage involves three steps: the proposal of equivalence (decoding and unitization), the calculation of excess (the comparison of sets) and the actualization of capture (flow and appropriation).

### *Postlewayt’s Arbitrage*

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<sup>217</sup> Ibid., 331.

<sup>218</sup> Billingsley, *Understanding Arbitrage*, 2.

According to finance professor and economic historian Geoffrey Poitras, the first documented instance of something like modern arbitrage can be found in eighteenth century merchant manuals, under the name “arbitration of exchange.”<sup>219</sup> Poitras recounts an arbitrage described in a 1751 merchant manual authored by Malachy Postlethwayt. The manual provides calculations of “arbitrated rates” between London, Paris and Amsterdam.<sup>220</sup> Arbitrated rates were the rates of exchange that established parity between all three currencies, i.e. the same amount of currency would be gained from exchanging London sterling directly for French crowns as making a “triangular” trade between London sterling to Amsterdam groats and Amsterdam groats to Paris crowns.<sup>221</sup>

Next, “Having shown how to determine arbitrated rates, Postlewayt provides worked examples of appropriate arbitrage trades when the actual exchange rate is above or below the arbitrated rate.”<sup>222</sup> In one example, the Amsterdam-Paris exchange rate is significantly higher than the arbitrated rate. Therefore, the arbitrageur can carry out the following trade. First, he sells a bill of exchange (a promise to pay at a future date) in London for repayment in Paris and receives sterling in exchange. He uses these funds to buy a bill of exchange in London repayable in Amsterdam in groats. The arbitrageur then travels to Amsterdam and receives groats. He transports these to Paris

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<sup>219</sup> Poitras, “Arbitrage,” 14.

<sup>220</sup> *Ibid.*, 15.

<sup>221</sup> *Ibid.*, 14.

<sup>222</sup> *Ibid.*, 15.

and exchanges them for crowns to cover the original bill sold. This trade would net a “self-financing arbitrage profit” if the Amsterdam-Paris exchange rate were high enough to more than cover the transport costs involved.<sup>223</sup>

Postlewayt’s arbitrage can be reread through the framework of capture provided by Grossberg et al. To begin with, despite the fact that he was a merchant, Postlewayt’s arbitrage didn’t involve sugar, coffee, or fabric, but rather currencies. In Poitras’ history of arbitrage, every example of arbitrage presented until the modern period of stock and bond markets concerns currencies. Other sources also claim that the first arbitrage trades involved currencies, particularly in the activities of moneychangers and bankers.<sup>224</sup> This focus on currencies is indicative of a key precondition for arbitrage: the similarity of the things being arbitrated. In other words, the transformation of social mattering into economic value detailed by Grossberg et al. is a necessary precondition of arbitrage. Arbitrage is only possible on commodities that have been deterritorialized. Prior to the standardization of commodities in the industrial era, currencies were the only exchangeable articles that exhibited a high level deterritorialization and, therefore, were subject to arbitrage.

Beyond that precondition, Postlewayt’s arbitrage involves three distinct, identifiable steps that map onto the process of capture explained by Grossberg et al. The first step involves a seemingly simple assumption: that the value of currencies in one place is the same as their value in another place. This equivalence is more radical

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<sup>223</sup> Ibid., 15.

<sup>224</sup> Weinstein, *Arbitrage in Securities*. Ingham, *The Nature of Money*.

than the similarity assumed as a precondition of arbitrage. Understanding certain coins or bills to be similar enough to one another to pay debts or serve as media of exchange within a particular jurisdiction such as a state or nation requires only deterritorialization; codes that trace the origins of those currencies remain. However, assuming that coins or bills should have the same value even in different contexts involves actually making a claim about the irrelevance of differences between those contexts. In other words, the first step of arbitrage consists of proposing the processes of decoding, removing the context specific codes of that which is to be arbitrated, and unitization, recoding commodities as units of a single, universal set.

Postlewayt explains that groats in Amsterdam can be converted to crowns in Paris, which requires that groats be recognized and accepted as currency in both locations, despite the fact that groats are not used as the medium of exchange in Paris. Thus, his choice to describe a potential arbitrage trade that traverses those contexts is the first step of the trade. However, while it may seem self-evident, the relation is not given. As I will explain, this first step doesn't really involve making an assumption but instead proposing an equivalence, asserting that commodities do not have "specific and concrete meaning[s]" within a context but instead are all members of an extra-contextual set.<sup>225</sup>

The second step in arbitrage is the calculation of profit. The example that Postlewayt gives shows how an arbitrage profit can be made if currencies that are considered to be equivalent members of a single universal set have differing prices. The

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<sup>225</sup> Grossberg et al., "Conjunctural Theory," 322.



comparison of prices leads to the calculation of a possible profit if the low priced currency is exchanged for the high priced one. This comparison takes up the extra-contextual set and distributes it according to a difference in price. Once two sets are constituted by their difference in price—in Postlewayt’s example, goats in Amsterdam and goats in Paris—they can be compared to one another. In the act of comparison, that difference becomes an excess. As Deleuze and Guattari put it, “between the two sets... there is established a correspondence, a comparison.”<sup>226</sup> The arbitrageur makes the comparison to identify the profit that can be captured through arbitrage.

Finally, the third step is the one that Postlewayt recommends his readers take, capturing the excess that has been calculated. This step requires the flow, the putting into circulation of and exchange of the things to be arbitrated. In Postlewayt’s arbitrage, actualization would require purchasing the appropriate bills and transporting specie to make the trade. I refer to this step as actualization because it brings forth two consequences. First, if successful, an arbitrage trade actualizes the capture of the profit calculated in the second step—the arbitrageur ends up taking ownership of the calculated excess. Secondly, many (though not all) arbitrage trades are self-negating, which means that if the trade is carried out a number of times, the forces of supply and demand bring down the higher price and increase lower price until the prices are in parity. This actualizes, to a degree, the equivalence proposed in the first step. Two items that could have had very different contextual significances that contributed to their disparate prices are made equivalent in price.

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<sup>226</sup> Deleuze and Guattari, *A Thousand Plateaus*, 445-6.

In what follows, I expand upon this characterization of arbitrage by unpacking the precondition and each step outlined above. What emerges is a description of arbitrage that lends a great deal more specificity to financial economic definitions, but also contradicts the notion that one “finds” arbitrage opportunities. Instead, arbitrage is the process of actively proposing and producing the relation of equivalence and excess that allows capture to take place.

*Step 0: Deterritorialization/Commodification*

Equivalence between any two things, whether coins, bushels of grain, or lengths of fabric, is not a natural or essential condition. Two coins exist instead as *singularities*. Singularities refer to “being *such as it is*”, the unique conditions of existence specific to something unto itself.<sup>227</sup> However much a coin may be categorized in different ways, as made of metal, as a ducat, as having a certain weight, in and of itself, it is not the same as any other coin, no matter how closely they may resemble one another. They do not occupy the exact same physical location; the condition of their making, from the ore that was mined to the time, if not also the place, of minting are different.

The “dense web of mutual matterings” that defines the origins of value is occupied only by singularities.<sup>228</sup> Deterritorialization extricates singularities from the particularities of the context in which they are embedded constituting instead a set of commodities that are defined by their similarity. The main purpose of currencies, to serve as units of account for the payment of debt and trade, required that they be more

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<sup>227</sup> Giorgio Agamben, *The Coming Community*, trans. Michael Hardt (Minneapolis, MN: University of Minnesota Press, 2007), 1.

<sup>228</sup> Grossberg et al., “Conjunctural Theory,” 318.

fully deterritorialized. According to David Graeber, Geoffrey Ingham, and other critics of the neoclassical economic theory of money, currencies did not emerge as a way to manage the logistical problems of barter, but instead, as methods of accounting for debt relations.<sup>229</sup> Money started out as an abstract accounting of debt and only developed into forms of coinage as trade intensified and the need for impersonal methods of payment emerged. Currencies, first as units of account and later as coinage, were thus a method of enumerating and recording personal relations of obligation as credit, i.e. in ways that separated obligation from the precise time, place and situation in which it was incurred.

In order to serve this function, currencies had to be organized into sets of similar coins or bills that could be accepted to close debts. This is not to say that currencies have always been self-evidently homogenous. Trade in medieval Europe was characterized by a complicated hodgepodge of currencies in circulation. Multiple units of account allowed different coins to circulate, but political turmoil, debasement of base metals, and clipping of minted coins meant that even within a unit of account, the value of any particular coin could be uncertain. According to Geoffrey Ingham, strong central authorities set up “sovereign monetary spaces” by imposing a common unit of account.<sup>230</sup> Within these spaces, such as the one set up by Charlemagne, coins become “invariable, in that people continued to count in these ratios regardless of the

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<sup>229</sup> Graeber, *Debt*. Ingham, *The Nature of Money*.

<sup>230</sup> Ingham, *The Nature of Money*, 99.

debasement, clipping or deterioration of the actual coinage.”<sup>231</sup> That is, despite physical differences, coins circulating in the Middle Ages that contained as little as 3 percent of the amount of silver as their face value indicated according to the abstract standard retained their purchasing power in relation to other coins. Sovereign monetary spaces served to deterritorialize currencies so that sets of similar coins were constituted to aid in the payment of debt and trade of commodities within those spaces. Importantly, deterritorialization is always a bounded process; it only sets up the similarity of commodities within a particular territory or context defined in some specific way, for instance as a sovereign monetary space.

Commodification of currencies has reached, through a long and storied history, something of a pinnacle, at least within some sovereign territories, but many commodities still retain territorialities that make a tremendous difference. Wine, for instance, is a commodity characterized specifically by its variations, from varietal to varietal, year to year, and geographical location of origin. While it does not matter where or in what circumstances a U.S. dollar, physical or electronic, came into existence, other commodities are segmented into far narrower sets. Agricultural food products in the U.S. for instance have experienced marked reterritorialization since the inception of the sustainability movement. Sustainably and ethically raised animals are consciously distinguished from factory farmed animal products because the contexts in which they were produced are different in significant ways. Labels such as “organic”, “natural” and

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<sup>231</sup> Ibid., 110.

“free range” are all affixed to these differentiated products to justify the difference in price between this set of commodities and factory-farmed products.

Arbitrage requires as a precondition that these singularities be deterritorialized into sets of similar commodities within specific contexts. Commodities defined by important differences are thus not suitable for arbitrage. For instance, the sets defined as Tyson chicken breasts on the one hand, and organic chicken breasts sold at Whole Foods on the other, retain differences that make arbitrage between them untenable. Absent some form of willing duplicity, an arbitrageur would not attempt to arbitrage between Tyson chicken and organic chicken. These goods are distinct. But he might attempt to arbitrage between say domestic organic chicken and imported organic chicken if he can argue that the difference between the contexts of these two sets is irrelevant. This illustrates the first true step of arbitrage. Deterritorialization/ commodification is an economic process that is a necessary condition of arbitrage, but arbitrage only properly begins with the proposal of a more radical relation than deterritorialized similarity, the relation of true equivalence made possible by decoding and unitization.

*Step 1: Proposing Equivalence (Decoding and Unitization)*

Units of account are mechanisms specific to money that can standardize the value of different coins within a particular context regardless of physical weight or composition, constituting them as sets of similar commodities. This deterritorialization is a necessary precondition for arbitrage. However the first distinct step in the arbitrage trade requires decoding that strips commodities of the codes that continue to distinguish

individual elements as different in anyway. Even deterritorialized commodities may retain traces of their origins and unique differences that prevent the proposal of true equivalence. Proposing this more radical relation of equivalence requires decoding and unitization to transform two or more contextually specific sets of similar commodities into a universal set of identical commodities. A contemporary example will illustrate this shift.

Book publishers routinely produce two different editions of their textbooks; domestic, English language textbooks are reproduced, with minor aesthetic changes, but identical text, for foreign markets. These “international edition” books are sold overseas, often at lower prices. The lower prices attached to international editions express the difference in contexts in which the books are used. U.S. higher education markets are characterized by inflated and ever increasing prices for tuition, fees and textbooks. In other markets the cost of education is lower so international editions are priced lower at what these other markets will bear.

In 2013, John Wiley & Sons, Inc., appealed its a lawsuit against a Thai college student named Supap Kirtsaeng who financed his U.S. education by reselling cheap international editions of their textbooks in the U.S. (via eBay and other similar sites) for higher prices all the way to the Supreme Court.<sup>232</sup> Kirtsaeng prevailed, basing his defense on the “first sale doctrine,” that a book lawfully purchased may be resold as the owner sees fit. The lawsuit highlights two important points for the current study. First, and to be revisited later, arbitrage, as that is precisely what Kirtsaeng was doing, is

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<sup>232</sup> Gary Shapiro, “Supreme Court Gives American Consumers Victory Over Copyright Owners in Kirtsaeng vs. John Wiley & Sons,” *Forbes*, March 20, 2013, <http://www.forbes.com/sites/garyshapiro/2013/03/20/supreme-court-gives-american-consumers-victory-over-copyright-owners-in-kirtsaeng-vs-john-wiley-sons/>.

often vilified and attacked as cheating or gaming the system, despite its glowing reputation within financial economics. Second, the equivalence of commodities across contexts is a relationship that is not natural but must be established. Proposing this equivalence across contexts is the first of three steps in executing an arbitrage trade.

Decoding and unitization remove the traces that connect commodities to their origins and contexts to constitute a universal, extra-contextual set where any unit is interchangeable with any other unit. Arbitrage must propose this relation but it is not always successful in actualizing it. In the case of *Kirtsaeng vs. John Wiley & Sons, Inc.*, the success of the arbitrage rested on the decision of the U.S. Supreme Court. It could have also failed; the court could have decided that Kirtsaeng did not have the right to resell the books, voiding the relation of equivalence.

In the case of currencies, bills of exchange that originated in long distance merchant operations offer a prime example of this proposition of equivalence across contexts. Bills of exchange were notes issued by one banker to a buyer that instructed a second banker to repay a sum at a future date in a different location to a different payee, often in a different currency and at a specified rate of exchange (Ingham 2004). According to Ingham they originated in Islamic trade and entered Europe around the thirteenth century. Bills of exchange replaced physical coinage with abstract and thus perfectly equivalent representations of currencies that could circulate far outside sovereign spaces. Whether used to complete merchant transactions or for arbitrage, as in the Postlewayt example recounted above, bills were a technology aimed at fixing the relationship between currency here and currency there as one of equivalence. Instead

of transporting pounds sterling to Antwerp and exchanging them for groats there, which would leave the arbitrageur in the uncertain position of having to find someone to make the exchange at an unknown rate, the bill effectively actualized the equivalence of pounds in London with pounds in Antwerp and fixed the rate of exchange that would be used upon delivery of the bill. This was done in part to alleviate some of the dangers of transporting specie and of changing exchange rates over time. But bills had the effect of both deterritorializing and decoding currencies by drawing on imagined universal sets.

In the example of Postlewayt's arbitrage recounted above, currencies are the subject of the trade because, as I have already argued, currencies were deterritorialized relatively early through the unique mechanism of units of account. Postlewayt's example also calls for the use of bills of exchange as they do the work of securing equivalence across contexts in advance of the actual transport of the currencies. Bills of exchange decoded and unitized currencies, insuring their availability and equivalence across contexts. Thus, their mere existence in the 18<sup>th</sup> century enabled the first step of Postlewayt's arbitrage, the proposition that groats in London were the same as groats in Amsterdam, that crowns in London were the same as crowns in Paris, and so on.

*Step 2: Calculating Profit (Comparison of Sets)*

The proposition that currencies could be equivalent, effectively the proposal of decoding and unitization, across different contexts led to the logical consequence for Postlewayt that the prices of those currencies, i.e. their exchange rates, should be the same across contexts as well. In other words, if pounds, groats and crowns were all units of universal sets of particular currencies, exchanging pounds for groats for crowns



should cost the same as exchanging pounds directly for crowns. Equivalence of all units of each set meant that no price discrepancy could be justified. However, price parity, is, like equivalence of commodities between contexts, not essential or given. Prices are contextual.

That prices differ across contexts is not a radical revelation, at least not to corporations and business consultants. A group of consultants and a professor of public management recently published *Contextual Pricing*, in which they offer tools for taking advantage of context. They explain:

Success comes from understanding context. This idea has been leveraged with great results by some leading companies. The Coca-Cola Company, for instance, includes *temperature* at the point of sale in its pricing context. An ice cold cola commands a better price in the middle of summer on a hot beach than during a snowstorm in the Arctic! Being able to adjust prices to the immediate context of the buying occasion is how Coke has moved to monetize contextual insights.<sup>233</sup>

There are so many examples of seemingly identical commodities having different prices in different contexts, its hard to know how the economic Law of One Price explained in chapter one can bear the weight of its name: a can of soda from a grocery store or an amusement park vending machine, a pair of Levi's jeans in a Spanish boutique or an American outlet mall, a cup of clean water in the suburban U.S. or in Koya District in Sierra Leone. In short, prices are contextual things.<sup>234</sup>

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<sup>233</sup> Robert Doctors, Michael Barzelay, John G. Hanson and Cecilia Nguyen, *Contextual Pricing: The Death of List Price and the New Market Reality* (New York: McGraw Hill, 2012).

<sup>234</sup> In addition to being a central argument of this dissertation, this declaration is a playful homage to Carruthers and Stinchcombe's "price is a social fact" and Beunza et al.'s "a price is a social thing". Bruce G. Carruthers and Arthur L. Stinchcombe, "The Social Structure of Liquidity: Flexibility, Markets, and States," *Theory and Society* 28, no. 3 (1999): 358. Beunza et al., "A Price."

I have already argued in chapter one that economists have, since the inception of their discipline, been concerned with defining which elements of a context determine prices. Neoclassical economics narrows the supposed context of prices to individual subjective preferences and the mechanisms of supply and demand. The theory of marginal utility misses, of course, the fact that individual preferences are themselves conditioned by the context. It misses, in short, the cultural nature of pricing. Prices are the result of economic calculation, but economic calculation is built precisely on social mattering that inheres in specific contexts. How much something costs is determined not by the intersection of preferences but by the intersection of relations that constitute a context. Oscar Wilde's famous aphorism "Nowadays people know the price of everything and the value of nothing" is a statement not about errors in price but about the state of collective mattering.<sup>235</sup> That we value things the way we do, that prices are what they are, is a reflection of the state of collective mattering. But just because mattering is collective, does not mean it is communal. Prices are not neutral expressions of collective desires to produce and consume goods. They are the result of the tensions and uneven relations of power that suffuse a context. Thus, Wilde's aphorism is a war cry: we must change what matters!

Collective mattering obviously differs from one context to the next. So, one would not expect the price of a cow in the U.S. to be the same as the price of a cow in India. However, the first step of arbitrage, the proposition of equivalence between sets of commodities across contexts such that both merge into a universal set, reframes

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<sup>235</sup> Oscar Wilde, *The Picture of Dorian Gray* (San Francisco: Ignatius Press, 2008).

differences in prices as errors or excesses. Supap Kirtsraeng proposed that the English language, international edition textbooks he found in his native Thailand were in fact equivalent to domestic edition textbooks in the U.S. This intercontextual comparison reframed the prices of those textbooks not as the unique results of collective mattering in each context, but as prices of units of a single universal set of fully equivalent commodities. Their disparity was therefore necessarily an error or excess, or more specifically, profit.

The second step of arbitrage, reliant entirely on the first step of proposing equivalence between sets of commodities across contexts, is the calculation of price difference as an excess available for capture as profit. The entire example given by Postlewayt in his 1751 manual is an exposition of this second step of arbitrage. Postlewayt first calculates the possible arbitrage profit available to the merchant moving bills of exchange and specie in a particular triangular route. This calculation is the working out of “arbitrated rates”, of the theoretical price parity that would prevent arbitrage profit. Then, Postlewayt imagines the realistic possibility that those rates are not in parity and calculates the profit an arbitrageur could capture from that disparity.

However, arbitrage is an apparatus of capture so the proposal of equivalence is oriented specifically to the purpose of comparison and capture. As Deleuze and Guattari write, “the mechanism of capture contributes from the outset to the constitution of the aggregate upon which capture is effectuated.”<sup>236</sup> In arbitrage, that aggregate is extra-

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<sup>236</sup> Similarly, Deleuze and Guattari write that an apparatus of capture is “inseparable from a process of relative deterritorialization” that makes differences “comparable” and excess “appropriable.” Deleuze and Guattari, *A Thousand Plateaus*, 441.

contextual, universal set equivalent units commodities. In financial economics definitions, arbitrage is the process of *finding* two equivalent commodities trading at different prices and exchanging one for the other to profit from the error in their pricing. But understood as an apparatus of capture, arbitrage is not about “finding” opportunities for comparison and capture, but creating them.

The calculation of profit proposes price parity in order to render price disparity as an error and the difference between prices as excess rather than radically contextual difference. Work in the sociology of finance that focused on arbitrage in the 2000s contains indications of this interpretation of arbitrage. In their article “Tools of the Trade: the Socio-Technology of Arbitrage in a Wall Street Trading Room,” Beunza and Stark argue that arbitrage traders use a number of social and technological tools to make associations and construct equivalencies between securities in order to arbitrage between them.<sup>237</sup> In order for successful arbitrage to take place, traders must find two sets of financial securities that are equivalent (for contemporary financial markets this almost exclusively means they have the same risk and expected return) but are trading at different prices. Arbitrage traders use different models and techniques for identifying securities that are equivalent but here-to-for not identified as such. In other words, they produce equivalences depending on which model they use. Thus, Beunza and Stark can argue that “a trading room is an engine for generating equivalences.”<sup>238</sup>

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<sup>237</sup> Beunza and Stark, “Tools of the Trade.”

<sup>238</sup> *Ibid.*, 373.

Similarly, Beunza et al. suggest “many—probably most—current forms of arbitrage exploit discrepancies in the prices not of the ‘same’ asset but of ‘similar’ assets”, i.e. they rely on constructed equivalences.<sup>239</sup> The foregoing discussion of the way that commodification is the creation of sets of similar items through deterritorialization should demonstrate that the difference between arbitrage of the “same” or “similar” assets isn’t really a difference at all. Nonetheless, following this claim, they note that “the ‘similarity’ of financial assets is always in a sense theory-dependent” which is to say that all arbitrage relies upon deterritorialization as a precondition, and has as its first step, the theoretical proposition of equivalence across contexts.<sup>240</sup> This proposition must be defended and promoted in order for the calculated arbitrage profit, the excess available for capture, to be successfully achieved. Thus, Beunza et al. discuss the ways that arbitrageurs at investment banks and hedge funds must convince others, such as managers, that the equivalencies are true in order to get and keep the capital necessary for a trade. Convincing other traders may even play a material part in ensuring the success of a trade. In a discussion of certain kinds of bond arbitrage that involved buying and selling bonds in the (supposed) knowledge that their prices would converge over time, Beunza et al. write: “If that discussion and attention [of a particular arbitrage trade] leads others also to seek to exploit a discrepancy, then their purchases and sales will narrow the discrepancy, or at least reduce the risk of it

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<sup>239</sup> Beunza et al., “A Price,” 733.

<sup>240</sup> Ibid.

widening.”<sup>241</sup> Thus, the proposition of equivalence is a project that may be successful or unsuccessful, depending upon the final step.

*Step 3: Actualization (Capture and Flow)*

The first two steps of arbitrage propose “the constitution of the aggregate upon which capture is effectuated”, i.e. equivalent sets of commodities across contexts, and calculate the potential profit for capture. Through the proposition of decoding and unitization and the comparison of sets, the stage is set for putting units into flow in the act of trading, i.e. the process that is usually identified in financial economics as arbitrage. Within the capture framework offered by Grossberg et al., however these first two steps are as integral to the process as the third because, if successful, capture actualizes the propositions made in the first two steps in two ways. First, it may have the effect of actualizing the relation of equivalence between commodities insofar as it may bring their prices into parity. For example, if enough arbitrageurs undertook Postlewayt’s arbitrage, the act of buying groats and selling crowns would, via the mechanism of supply and demand, raise the price of groats and lower the price of crowns, bringing them into parity. Such an arbitrage trade would be self-negating. After a certain amount of arbitrage is carried out, the opportunity for further profit from that trade is erased. But the forces of supply and demand don’t always work to ensure parity, as I explore in the next chapter.

Second, capture renders the difference in price as an excess insofar as it is successfully taken as profit. However, this actualization may also fail. Postlewayt’s

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<sup>241</sup> Ibid., 735.

proposed arbitrage would have to be carried out by an arbitrageur actually buying and selling the coins and bills in the triangular trade. The success of such an attempt would depend first on the actual costs and outcome of the necessary journeys. If the cost of travelling from London to Amsterdam and then from Amsterdam to Paris were higher than the proposed arbitrage profit, the trade could not be successfully completed. Similarly, the journeys themselves could prove disastrous. The arbitrageur could have his coins or bills stolen or could fall ill or be attacked. Finally, the part of the trade in which the rate of exchange is not set in advance by the purchase or sale of a bill of exchange, specifically the exchange of groats for crowns in Paris, might be adversely affected by a change in exchange rates from the time the potential arbitrage trade is calculated to the time the trade is carried out.<sup>242</sup>

### Conclusion

Grossberg et al., drawing heavily on the work of Deleuze and Guattari, provide a theoretical framework that reimagines value as something that is based in social relations but undergoes multiple transformations. This framework also repositions the labor theory of value as an account of one form of capitalist capture among many. In this framework, arbitrage is freed from the productive/unproductive labor dichotomy and notions of fictitious value that are traditionally attached to finance in Marxism, and instead is the apparatus specific to financial capitalism.

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<sup>242</sup> Poitras makes this point, “Though the actual rate is assumed to be known, in practice this rate could change over the time period it takes to settle the relevant bill transactions.” Poitras, “Arbitrage,” 16.

The value transformations that lead to capitalist capture as well as the operation of capture itself are all evident in the process of arbitrage. Arbitrage requires deterritorialization/commodification as a precondition and proceeds through three steps: proposing equivalence (decoding and unitization), calculating profit (comparison of sets) and actualization (capture and flow). Although arbitrage is often discussed as a process of discovery, of finding opportunities for capturing profit from price differences, it is actually creative: the first two steps propose relations that didn't previously exist and the third step attempts to actualize those relations. Because the process produces the possibility of new relations, it may either succeed or fail; those relations may come into being or not. No arbitrage trade can, from the outset, be guaranteed success.

This reformulation of arbitrage challenges traditional financial economic definitions of the term in two ways. First, while arbitrage may bring prices into parity across contexts, the effect that financial economics focuses on when it frames arbitrage as guarantor of market efficiency, the capture framework foregrounds capture as the driving force of arbitrage. It thus reverses the logical order of the financial economic definition. In the capture framework, efficiency is the side effect of arbitrage driven by profit rather than the other way around.

Second, fitting arbitrage into the framework of capture provided by Grossberg et al. also challenges the idea that "true" arbitrage is riskless. As I already indicated, multiple factors may endanger arbitrage even if a potential profit is identified. In financial economics, these factors are categorized as risks. Recall the second part of Billingsley's definition of arbitrage given in the introduction of this paper, "'True' arbitrage is both



riskless and self-financing... use of the term has broadened to include often-risky variations.”<sup>243</sup> It seems that Postleway’s arbitrage wouldn’t therefore qualify as true arbitrage at all. In Billingsley’s definition, it seems that guaranteed success, or in his terms risklessness, is definitional of “true” arbitrage and arbitrage that faces possible failure is something else. However, the framework that I have presented, of success and failure, is much more useful for understanding arbitrage. Why then does the economic definition of arbitrage make the distinction between true, riskless arbitrage and activities that are not quite arbitrage, but are nonetheless deemed “variations”?

The answer to this question must be sought within the specialized world of financial economics, which proposes that all profit must be remuneration for risk. If you earn a dollar, it is because you risked some amount of money in the investment. This idea is formalized in the Capital Asset Pricing Model, an equation that gives the expected return of any financial security as a function of its riskiness. The profit one gains from trading activities should always derive from taking on some risk; this is the process of investing. Arbitrage can be conceived as riskless in this world because it is framed as the exception that proves the rule. Recall that arbitrage is, for financial economics, the guarantor of market efficiency. It polices markets for unfair price disparities and through the mechanism of supply and demand brings them back into parity. In other words, anytime prices reflect anything other than a remuneration of risk, they are “unjustifiable”. Arbitrage fixes the error, bringing prices back to levels that are justified by the riskiness of the securities they represent. Because it is addressing and

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<sup>243</sup> Billingsley, *Understanding Arbitrage*, 2.

correcting errors in the relationship between risk and return, arbitrage is, in the world of financial economics, the sole financial activity that can produce a profit without taking on risk.

The reformulation of arbitrage as an apparatus of capture that I have offered in this chapter is fundamentally inconsistent with this economists' world. All arbitrage, because of its creative nature, is subject to the possibility of failure, and thus, to some degree, involves what economists would call risk. Part of the problem in adjudicating the difference between the economists' definition of arbitrage and the framework I have proposed is the fact that the term risk is deeply problematic, especially in moving in and out of the economist's specialized world. On the one hand, risk that a stock might go up or down, if it is something that can actually be measured, seems to be something that might reasonably be tied to return. However, some degree of risk, or what I have called radical uncertainty, is ubiquitous to existence. What is truly guaranteed? An arbitrage profit that seems sure on paper might be prevented by the closure of an exchange, the death of a counterparty or even an act of god like an earthquake. Radical uncertainty in this sense is not something that can ever be entirely quantified. Moving between the financial meaning of risk as the source of profit and the colloquial definition that encompasses the contingencies of radical uncertainty presents a significant challenge to rigorously analyzing the specificity of arbitrage. To make sense of the economists' claim that arbitrage is riskless, it will therefore be necessary to reject the language of risk altogether and instead take up the question of what conditions influence success or failure in arbitrage trades. This is the topic of the next chapter.

## CHAPTER 4: ARBITRAGE AND “RISK”: TIME CONTINGENCY AND SIMULATED INSTANTANEITY

I want to add to the reformulation of arbitrage offered in the last chapter a rethinking of the notion that arbitrage is necessarily riskless. Framing arbitrage as an apparatus of capture suggests that arbitrage is better understood as a creative endeavor that may succeed or fail. In the example of Postlewayt’s arbitrage presented in the last chapter, there were multiple factors that could influence the success or failure of the trade, including the costs and dangers of the journeys between Paris, Amsterdam and London and the possibility that exchange rates could change during those journeys. The intervening time between the proposal of an arbitrage trade based on a price disparity that can provide a profit and the execution of the trade, as well as the time between each piece or “leg” of the trade, in some way determines the success or failure of the trade. If the arbitrage could be somehow instantaneously carried out when the profit is first proposed, it would always be successful. However, the creation of the new relations of equivalence between commodities in different contexts and of price difference as excess takes time. Time is a crucial component of success or failure of arbitrage. Put differently, instead of understanding arbitrage as riskless, the capture framework suggests that the success or failure of arbitrage relies on the arbitrageur’s ability to control what I will call *time contingency*.

In this chapter, I first explain this term, time contingency, and use it as an analytical tool to distinguish different forms of financial profit making and different forms of arbitrage. Second, I argue that the success of arbitrage relies on controlling time contingency in such a way as to simulate instantaneity. Arbitrage only appears to be riskless ex post facto for the arbitrageur who successfully simulates instantaneity at the expense of others. The financial economic definition of arbitrage thus confuses the eventual success of some arbitrage trades with an ontological condition of being without risk. I provide several historical examples of arbitrage trades that successfully simulate instantaneity to illustrate this point. Each of these examples demonstrates not only the importance of simulated instantaneity but also the fact the market efficiency is indeed not the goal of arbitrage but rather an eventual side effect that must be continually overcome. I conclude by noting the common popular interpretation of arbitrage as cheating or gaming the system. This interpretation recalls the notion that arbitrage is exploitative in the capitalist sense. In the next chapter, I further pursue the idea that characterizing arbitrage as cheating or exploitation fully explains the source of arbitrage profit.

### Time Contingency

Writing in 1896, economist Henry Crosby Emery distinguishes “time speculation” or “time-dealings” from “place-speculation.”<sup>244</sup> The former attempts to capitalize on time with the use of financial derivatives such as futures and options. Time speculation occurred when derivatives were used “when an anticipated difference in the present and

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<sup>244</sup> Henry Crosby Emery, *Speculation on the Stock and Produce Exchange of the United States* (New York: Columbia University, 1896), 137.

future prices of the commodity in question leaves room for a possible profit.”<sup>245</sup> This he contrasts to the “place-speculation” of arbitrage. For Emery, place speculation—“to buy where goods were cheap, and to sell where goods were dear”—is initially inseparable from “trader’s business.”<sup>246</sup> “Place-speculation... was not separable from ordinary trade under the earlier conditions of imperfect and uncertain means of communication.”<sup>247</sup>

Place-speculation became modern arbitrage when communication technologies (in his time, the telegraph and the telephone) became so advanced that “the prices in both the selling and the buying markets are known at the same moment.”<sup>248</sup> For Emery, arbitrage differs from the buying and selling that constitute ordinary trade by the instantaneity of price discovery. I will return to the issue of this instantaneous knowledge shortly, but first, Emery’s distinction of time-speculation and place-speculation affords a more productive differentiation of financial activity with reference to time rather than risk and risklessness. In particular, financial activity can be categorized according to the way that changes in price over time impact the profitability of that activity.

First, investing and speculation can be grouped together as activities that require openness to time. What we might think of as traditional investing—buying a share of stock or even contributing to a new project directly—requires an openness to time; the hope is that the capital disbursed will grow in value over time. Investing does not yield

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<sup>245</sup> *Ibid.*, 33.

<sup>246</sup> *Ibid.*, 137.

<sup>247</sup> *Ibid.*

<sup>248</sup> *Ibid.*

instant profit, but instead requires time to pass. What Emery calls time-speculation, the use of derivatives to secure future profits, also requires this openness. Both investing and speculation seek to profit from what I am calling time contingency, the uncertainty of future events.

The only meaningful differentiation that can be made between investing and speculation in this register is in the potential direction of changes in value over time. Investing is undertaken in the hopes that the original investment will be returned with an additional return. Speculation also seeks a profit in the future, but does not necessarily profit from increased returns. For example, one can speculate using futures, by entering a futures contract to sell corn at \$450 per bushel in one month in the hopes that corn will actually trade for \$440 at that future time, and he can immediately buy corn at the prevailing market price and then fulfill his contract at \$450 a bushel netting a \$10 profit. A decrease in price may still produce a positive speculative return. If the price rises to \$460, the speculator will lose \$10, making speculation, like investing, an uncertain endeavor. Both investing and time-speculation seek profit from openness to time—from the possibility of change between the present and the future—but speculation may profit from a decrease or increase in value, depending on the strategy used, whereas investing profits only from an increase in value.

A meaningful distinction can be made between investing and time-speculation on the one hand and hedging—taking an offsetting investment position to reduce the risk of one's initial investment—on the other. Hedging, whether with stocks, bonds or derivatives, attempts to negate specific pieces of time contingency so as to manufacture

a narrow, targeted openness to time as opposed to a radical openness to whatever fluctuations the future might bring. So, for example, a farmer might sell corn forward at a rate of \$450 per bushel to guard against the possibility that the price could fall substantially and reduce her profit. She has negated the possibility that prices will fall below \$450 per bushel, but in the process has lost the advantage of being able to sell at a higher price as well, should the market move in that direction. She could also buy options to sell at \$450. For a cost, she would again negate the downside risk of prices falling, but keep the upside possibility of selling at a higher price should prices increase over time. Both are examples of hedging limiting the openness to time such that only certain outcomes are possible (i.e. future sales will only occur at \$450 or above \$450.)

In contemporary financial markets, unhedged investing is generally practiced only by individual and institutional investors, not by investment banks, hedge funds and traders. The latter engage in sophisticated hedging strategies to limit time contingency when they engage in speculative activities. They also engage in three additional forms of profit making with different relationships to time: taking fees for executing trades for clients; functioning as “market-makers;” and engaging in arbitrage. Fees for service are not distinctly financial in that such profit making takes place in many other sectors. Market making and arbitrage, on the other hand can be analyzed and distinguished from investing, speculation and hedging in terms of time contingency.

Market makers offer to buy stocks at a slightly lower price than they offer to sell them. This “bid-ask spread” is the remuneration for their service of always being willing to buy or sell the stock, thus providing “liquidity” or convertibility of the stock into cash.

According to Carruthers and Stinchcombe, “market makers in organized stock exchanges help to conduct a continuous auction of a given stock,” meaning that “sometimes for short periods the market makers must own stocks for which there are no bidders at the moment (a “long” position) or have sold stocks they have not yet bought (a “short” position).”<sup>249</sup> Unlike investment or time-speculation, market making doesn’t rely on changes in price unfolding in time for profit to be achieved. Market makers’ profit is structural. As supply and demand for a stock push its price up and down, the bid-ask spread and thus the market makers profit stays relatively stable. However, market makers’ positions as guarantors of liquidity mean that their activities are nonetheless subject to time contingency insofar as they must hold unhedged long or short positions in stocks if no buyers or sellers are available. If the price changes during that period, the new price at which they must offer or accept a stock may wipe out their profit.

Market making occupies a sort of middle position between investing and time-speculation on the one hand and arbitrage, what Emery calls “place-speculation,” on the other. In as much as investing and time-speculation require time contingency for profit, arbitrage is the opposite: arbitrage is defined by opposition to the contingency of passing time. As with market making, arbitrage profits are endangered in proportion to the amount of time that passes between the buying and selling legs of that trade. But additionally, time passing between the calculation of profit and the execution of the trade also works against the profitability of arbitrage. Instead of openness to time, instantaneity is key to arbitrage profit because any temporal separation between

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<sup>249</sup> Carruthers and Stinchcombe, “The Social Structure,” 360.



calculating profit and actualizing capture of that profit introduces the possibility that the conditions upon which the calculation of profit is based may change. The same is true for the temporal separation of buying and selling. If one leg of the trade is entered into at a time prior to the second, the price of the latter asset may change disadvantageously. This fact is evident in the inclusion of the phrases like “almost immediately” or “simultaneous” in many definitions of arbitrage.

The success of arbitrage is predicated on an impossible feat—instantaneous trading. Even the fastest computer programmed with an algorithm to identify (i.e. create, based on various models of value) arbitrage opportunities and act on them immediately is still limited by the speed at which electronic signals can travel. The absolute limit of fiber optic cable is the speed of light, but differing cable lengths and software execution times introduce further constraints.<sup>250</sup> True instantaneity of execution and simultaneity of both legs of arbitrage is an absolute limit point that existing technology cannot achieve. In light of this fact, the meaning behind the quotation marks around “true” in Billingsley’s definition of arbitrage (see pg. 112) is evident: instantaneous arbitrage is impossible. The only trades that are possible involve some degree of time contingency, and thus are not totally guaranteed. However, some arbitrage trades are more successful than others.

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<sup>250</sup> Donald MacKenzie, Daniel Beunza, Yuval Millo and Juan Pablo Pado-Guerra, “Drilling Through The Allegheny Mountains,” *Journal of Cultural Economy* 5, no. 3 (2012): 279-296.

## Simulated Instantaneity

The probability of success or failure in arbitrage depends upon the way that time contingency is addressed. Successful arbitrage relies on what I call simulated instantaneity. Simulated instantaneity involves limiting time contingency in relation to other arbitrageurs to ensure successful trading. Simulating instantaneity requires winning a battle on two fronts: first, against time itself, which threatens the profit that is posited through calculation and necessarily separates the two legs of any arbitrage trade; and second, against other arbitrageurs whose trading activities may negate or “use up” the arbitrage profits available from a particular trade. The first battle, as I have already explained, relates to the dangers of time contingency. The second relates to the self-negating nature of some (but not all) arbitrage trades over time. The act of buying goods in one market increases demand, and thus may increase price. Similarly selling goods in another market increases supply, and thus may decrease price. In markets where supply and demand have these effects, arbitrage trading will eventually raise the price of cheap goods and lower the price of expensive goods until the disparity of prices (essential to the possibility of arbitrage profit) is erased. Therefore, the first arbitrageur(s) to carry out a trade may in many cases very quickly exhaust its profitability, leaving slower arbitrageurs out of profit making entirely.

The twin-front battle for simulated instantaneity is fought in two different ways. First, advantages in communication, especially the speed and connectedness of arbitrageurs’ communication networks, allow some to profit more securely from arbitrage, by reducing the time lag between calculation and trade and between each leg

of a trade, and thus to profit before/at the expense of slower arbitrageurs. The three steps of arbitrage trading that I described in the previous chapter—proposing equivalence, calculating profit and actualizing capture—all rely upon and deploy processes of communication across contexts. Arbitrageurs, whether of currencies in the eighteenth century or equities in the twenty-first century stock market, must learn of the existence of similar items in different contexts between which equivalence can be proposed. Calculation of profit relies upon the discovery of price information between contexts. And the actualization of an arbitrage trade depends upon the transportation of goods and/or communication of trading signals for the purposes of buying and selling. Arbitrage thus relies on the differential ability of some arbitrageurs to achieve advantages of speed and connectivity that allow them to communicate through their networks better and faster than others.

However, advantages in communication for the purposes of arbitrage are not only about who has the fastest communication technologies. As will become evident in several of the examples below, relative advantages of network connectivity can sometimes trump absolute advantages of speed. Sarah Sharma has critiqued the contemporary, hegemonic discourse of speed as analytically limiting. Speed theorists, she argues, miss the multiple, intersecting and contradictory speeds at which life is lived. She writes, “the explanatory power of speed works to produce differential time and exacerbate structural inequalities experienced at the level of time.”<sup>251</sup> Drawing on her notion of differential time, I will refer to the advantages of speed and connectivity that

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<sup>251</sup> Sarah Sharma, *In the Meantime: Temporality and Cultural Politics* (Durham, N.C.: Duke University Press, 2014), 15.

allow some arbitrageurs to simulate instantaneity at the expense of others, a necessarily structural inequality, as network differentials. Importantly, because network differentials are used to secure arbitrage profits, and arbitrage is often self-negating, network differentials usually even out over time. This evening out tends to bring greater efficiency to markets, but also forces arbitrageurs to seek out ways to create new advantageous network differentials.

Second, price stabilization, often in the form of contracts such as futures, allows arbitrageurs to “lock in” arbitrage profits, effectively simulating instantaneity not through network differentials but by artificially negating the possibility of change over time. Contracts such as futures, options, and some exotic derivatives that are created in contemporary financial markets are designed to limit time contingency by fixing a price, thus negating the effects of supply and demand over time. In the service of arbitrage, this limiting simulates instantaneity. Neither advantageous network differentials nor the stabilization of prices through contracts fully erase time contingency, but each simulates instantaneity in ways that reduce the time contingency of arbitrage trading in particular ways. However, there is another important distinction to be made. I have already suggested that supply and demand do not always have the effect of reducing or erasing arbitrage profit opportunities. In some cases, complex forms of price stabilization produce what I will call money machines, arbitrage trades that rely on structural inequalities in price that are maintained over time. In these trades, profits are seemingly endless. In the next section, I will discuss the way that simulated instantaneity, both

through network differentials and price-stabilizing contracts, enable ordinary arbitrage. Following that, I will discuss the special case of money machine arbitrage.

*Network Differentials and Price-Stabilizing Derivatives Contracts*<sup>252</sup>

The configuration of advantageous network differentials and price stabilization for the purposes of arbitrage often go together, so there is no easy way to disentangle the two in analysis. Indeed, perhaps the first significant technology for controlling time contingency, bills of exchange, fits into both categories. As James Carey points out, prior to the invention of the telegraph, “transportation and communication were inseparably linked” (15). Hence, early arbitrage trades relied upon transportation networks. Bills of exchange reconfigured early transport-communication networks by replacing physical coinage with lighter, easy to conceal paper slips, thus alleviating some of the dangers of transporting specie. Arbitrageurs who used bills instead of coins could travel faster and cheaper than those carrying specie. This created a network differential between those who used bills and those that had to transport physical coins. The network differential made arbitrage cheaper, easier and faster for the carriers of bills, i.e. it simulated instantaneity by allowing bill carriers to be the fastest or only arbitrageurs. In some cases, this may have amounted to a reduction in costs that quite literally produced an arbitrage profit where before none existed. Einzig writes that physical coinage had to be moved “under the guard of a heavily armed convoy.”<sup>253</sup>

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<sup>252</sup> A portion of the research presented in this section was adapted for Carolyn Hardin and Adam Rottinghaus, “Introducing a Cultural Approach to Technology in Financial Markets,” *Journal of Cultural Economy* (forthcoming).

<sup>253</sup> Paul Einzig, *The History of Foreign Exchange* (New York: St. Martin’s Press, 1970), 67.

Because arbitrage profit is calculated as the difference in prices minus the costs of enacting the trade, removing the cost of an armed convoy may have allowed the calculation of an arbitrage profit previously unavailable. Network differentials that allow some arbitrageurs to simulate instantaneity often also reduce costs and thus increase, or even produce new, arbitrage profits.

Bills of exchange were also contracts that fixed exchange rates during the duration of the bill, and therefore across the physical space over which they were transported, making them a technology of price stabilization as well. Because bills of exchange necessarily specified a rate of exchange at which they could be used as payment or exchanged for coins, they stabilized the exchange rate that could have otherwise fluctuated over the intervening time that an arbitrageur had to take to travel from one location to another. This price stabilization was key to early triangular arbitrage.

Bills of exchange provided one means of achieving faster transportation and price stabilization in early arbitrage, but the very configuration of transportation networks was also important. Discussing early triangular arbitrage trades that could be carried out between bills of exchange in different urban centers in the medieval period, Poitras claims that “As late as the 16th century, only the Italian merchant-bankers, the Fuggers of Augsburg, and a few other houses with correspondents in all banking centres were able to engage actively in arbitrage.”<sup>254</sup> These houses formed networks that allowed them to achieve the fastest communication about exchange rates under the conditions

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<sup>254</sup> Poitras, “Arbitrage,” 11-2.

of slow, treacherous transport-communication. The bankers who established correspondents (not unlike modern bank branches) in multiple locations who could carry out transactions with bills and specie already on site thus reduced the time-to-trade to the time it took a messenger to move between banking centers. Arbitrageurs without such a network might learn of a price discrepancy but be unable to undertake the trade because they did not have the coins on hand to purchase appropriate bills.

By the mid-eighteenth century, the diffusion of bills of exchange and advances in banking that allowed relative ease of currency exchange evened out the advantageous network differentials, allowing all merchants to undertake triangular arbitrage, as Postlewayt's manual encouraged them to do. However, this arbitrage was still conducted entirely through transportation of bills, coinage, and information. Arbitrage was influenced dramatically by the introduction of communication technologies in the nineteenth century that created new network differentials for some at the expense of others.

### Shunting

According to Emery, arbitrage was transformed from an "essential part" of "ordinary trade" into its modern form when it became possible for "prices in both the selling and the buying markets [to be] known at the same moment."<sup>255</sup> This is a fascinating claim, coming as it does from a book written at the end of the nineteenth century. By our standards today, telegraph and telephone communication could never be considered truly instantaneous. Yet, Emery highlights what I believe to be a crucial

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<sup>255</sup> Emery, *Speculation*, 137.

moment in the history of arbitrage. The telegraph, according to James Carey, “permitted for the first time, the effective separation of communication from transportation.”<sup>256</sup> This separation, for Carey, “ushered in the modern phase of history.”<sup>257</sup> It also allowed a dramatic leap forward in simulated instantaneity. Before the telegraph, the speed of arbitrage transactions was impeded by the limits of physical transport—either of specie and bills or—in the case of those dispersed merchant bankers, of price information and orders. With the invention of the telegraph and soon after, the telephone, that limit point was breeched, for some, and both Emery and Carey assign a great deal of weight to that event.

Emery suggests that by 1896, the impact of the separation of communication and transport had made arbitrage as nearly instantaneous as could be imagined. He describes the case of domestic shunting, the name given to arbitrage between stock exchanges within the U.S.<sup>258</sup>

Private wires between the cities, telephones in the exchanges, and operators quick to translate and transmit the signals of the brokers on the floor, constituted an effective machinery for operations of a very interesting kind. By means of these devices the same man was practically trading in Boston and in New York at the same time. A change in price in either place was known by the broker on the floor of the other within less than thirty seconds. This was trade reduced to its finest point.<sup>259</sup>

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<sup>256</sup> James W. Carey, *Communication as Culture, Revised Edition: Essays on Media and Society* (New York: Routledge, 1992), 203.

<sup>257</sup> *Ibid.*

<sup>258</sup> Emery, *Speculation*.

<sup>259</sup> *Ibid.*, 139.



For Emery, technologically mediated arbitrage was so successful and complete that it had effectively erased price differences between exchanges and ceased to be speculation at all. He writes, “If both prices are actually known at the same moment, to buy at one price and sell at another is not to take a risk, and so is not speculation.”<sup>260</sup> Carey, who cites Emery in his discussion of the telegraph, actually declares the “decline of arbitrage” to be one of the significant outcomes of the introduction of telegraphy.<sup>261</sup> Carey was in some ways correct that the telegraph “brings the conditions of supply and demand in all markets to bear on the determination of a price.”<sup>262</sup> Arbitrage involved the proposal of equivalence between contexts and, when successful, the equalization of prices between those contexts. This is the efficiency producing side effect of arbitrage. As arbitrage is continuously sought for the purpose of capturing profit, it also brings price into parity.

However, Carey’s assertion that this evening out of prices across markets “eliminates opportunities for arbitrage by realizing the classical assumption of perfect information” misses the mark.<sup>263</sup> Prices between markets are not equalized once and for all, but kept in parity by continuous arbitrage operations. Any small fluctuation in prices is a profit opportunity for arbitrageurs. But perhaps more importantly, the telegraph was not instantaneous; it was only the fastest in comparison to previous speeds of transport-

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<sup>260</sup> Ibid., 139.

<sup>261</sup> Carey, *Communication as Culture*, 217.

<sup>262</sup> Ibid.

<sup>263</sup> Ibid.

communication. As telegraphy became widespread, arbitrage at the speed of the telegraph would become easier for anyone to engage in. This would ensure efficient pricing, i.e. that prices remained in parity across markets, but also make arbitrage more distributed and less profitable since anyone could do it. The diffusion of the technology essentially evened out the network differential.

Elsewhere, Adam Rottinghaus and I have argued that diffusion of technologies throughout markets results in “increased market coordination”, i.e. it erases previous network differentials.<sup>264</sup> This diffusion also “results in dwindling profits and therefore presents a serious problem” for arbitrageurs.<sup>265</sup> An arbitrageur who could cut the communication time between exchanges down even further from “less than thirty seconds”, i.e. construct a more advantageous network differential, stood to profit at the expense of others who still used the old technology. Far from ending arbitrage, the telegraph ushered in a communication technology arms race that is still going on today. It was the first in a long procession of emerging technologies used to create network differentials. Each new technology redefined the possibilities of simulating instantaneity and thus of arbitrage.<sup>266</sup>

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<sup>264</sup> Hardin and Rottinghaus, “Cultural Approach,” 12.

<sup>265</sup> Ibid.

<sup>266</sup> John Durham Peters makes a similar point more eloquently in his commentary on the very same section on arbitrage in Carey: “The friction of transporting information may be infinitesimally small compared to transporting cargo, but all kinds of mischief can happen inside of infinitesimally small things.” John Durham Peters, “Thinking and Ideology: The Case of the Telegraph Revisited,” in *Thinking With James Carey: Essays on Communications, Transportation, History*, eds. Jeremy Packer and Craig Robertson (New York: Peter Lang, 2006): 148.

## Index Arbitrage

Subsequent to the invention of the telegraph, other communication technologies were used for the purposes of arbitrage, including the telephone and early computer technologies. In the 1970s and 80s, developments on the Chicago Board of Trade (CBOT), Chicago Mercantile Exchange (CME) and New York Stock Exchange (NYSE) allowed for another dramatic leap in simulating instantaneity. Between 1968 and 1978, the NYSE went from transmitting orders via phone and swapping paper stock certificates at the end of each day to electronic trading and clearance.<sup>267</sup> In addition, from 1972 to 1987, the CBOT and CME successfully introduced financial futures on currencies and stock indices and implemented electronic trading of them as well.<sup>268</sup>

Previously, futures were only traded on commodities. Allowing financial futures, and particularly futures on stock indexes,<sup>269</sup> created a new kind of arbitrage opportunity. Index arbitrage involves buying (low) a portfolio of stocks that closely approximates<sup>270</sup> an index and entering into a futures contract to sell (high) that index at a future date (or vice versa), on the assumption that when that expiration date arrives, the index and the portfolio will have nearly the same value and the difference between the contracted

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<sup>267</sup> "Timeline: Highlights: Technology," NYSE.com, 2014, [http://www1.nyse.com/about/history/timeline\\_technology.html](http://www1.nyse.com/about/history/timeline_technology.html).

<sup>268</sup> "Timeline of CME Achievements," CMEGroup.com, 2015, <http://www.cmegroup.com/company/history/timeline-of-achievements.html>.

<sup>269</sup> A stock index is a calculated value for an aggregated group of stocks, such as the S&P 500 or Dow Jones Industrial Index.

<sup>270</sup> Buying and selling 500 individual stocks would involve transaction costs (commissions, etc) so high as to completely erode any arbitrage profit. A smaller subset is often used.

futures price and the present price will yield a profit. This deal would fall into the second category of simulated instantaneity: price stabilization. Assuming that the cost of holding the securities (such as interest on money borrowed for such a purpose) did not erase the difference between today's (spot) price and the futures price, an arbitrage profit was secured via contract instead of network differentials. As with other forms of arbitrage, profits would be swiftly eroded by initial trading and remain only for intermittent fluctuations in spot or futures prices.

However, the introduction of electronic trading around the same time that financial futures were also introduced led to a high-speed form of index futures arbitrage that yielded enormous profits from small, intermittent fluctuations that were previously too fleeting to capitalize upon. Large banks with advanced computer programs were able to engage in automated "program trading," the "coordinated purchase or sale of an entire portfolio of stocks" for the purpose of arbitraging between stock index futures and spot prices.<sup>271</sup> Program trading relies on computer algorithms to respond to changes in prices for the calculated index and a group of stocks that approximates that index. Programs identify disparities between future and spot prices and automatically send orders through electronic trading platforms to "almost simultaneously" perform the arbitrage trade.<sup>272</sup>

Stock index arbitrage through program trading relies on both kinds of simulated instantaneity: network differentials for those firms with the computer algorithms and

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<sup>271</sup> Bodie et al., *Investments*, 66.

<sup>272</sup> *Ibid.*

access to electronic trading platforms to carry out program trading, and price stabilization through the use of index futures. Index arbitrage is only successful for the arbitrageur with the most advantageous network, the one who can develop the fastest network of computer programs, connections to electronic trading systems and access to capital to fund the trades. An arbitrageur who sees a disparity and then calls his broker to place an order will likely find that either the program trading of more sophisticated arbitrageurs has already erased the disparity, or worse, the duration of his “slow” trade could leave him buying up stocks at spot only to find that he cannot sell a futures contract at a profit. The trade is only successful for the fastest, most well connected arbitrageur. For the slow arbitrageur, the trade is very risky, as he is left with a mound of unhedged stocks. This example sheds some light on the use of the term “riskless” in the economic definition of arbitrage. Arbitrage is riskless ex post facto for the arbitrageur who successfully simulates instantaneity at the expense of others. Traders and commentators never assume ex ante risklessness. They are fully aware of the fact that arbitrage can either succeed or fail, as evidenced by this quote from an analysis of program trading: “there is a great deal of competition among arbitrageurs, arbitrageurs only place programs when an opportunity exists to execute a program successfully.”<sup>273</sup>

In 1988, following spirited debate among traders and journalists about the role of program trading in amplifying stock market volatility, the NYSE restricted program trading, banning firms from using the electronic Designated Order Turnaround (DOT)

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<sup>273</sup> Janet E. Kerr and John C. Maguire, “Program Trading-A Critical Analysis,” *Washington and Lee Law Review* 45, no.3 (1988): 1004.

system when markets rose or fell more than 50 points.<sup>274</sup> This ban or “collar” as it was called, had the effect of foiling many attempts at arbitrage.<sup>275</sup> Large swings in market values allowed firms to arbitrage between the spot value of stocks whose value had changed dramatically and the futures price of the index that had yet to reflect that swing. If electronic trading was banned when large swings occurred, arbitrageurs could not lock in their trades quickly enough to profit before the index futures price was updated.

In response, a number of Wall Street firms voluntarily halted index arbitrage, at least on their own accounts.<sup>276</sup> Thus, some index arbitrage was effectively suspended by removing access to the high-speed communication technology (the DOT system) that was a crucial part of simulating instantaneity in the trade. However, not every firm needed the DOT technology to perform the arbitrage. When the “collar” was later removed, Goldman Sachs petitioned the NYSE board to reinstate it, ostensibly for the good of investor confidence, as there was widespread belief that index arbitrage increased market volatility.<sup>277</sup> However, Goldman spokesperson Robert Mnuchin admitted in 1989 that keeping the collar “would work to the advantage of large firms, such as Goldman, which have enough traders to execute such trades without using the

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<sup>274</sup> Anise C. Wallace, “Program Trading Gets More Brutal,” *New York Times* (New York, N.Y.), May 1, 1988.

<sup>275</sup> *Ibid.*

<sup>276</sup> Steve Swartz and Kevin G. Salwen, “Five Companies Decide to Halt Index Trades: Securities Firms Won’t Use The Program Technique for Their Own Accounts,” *Wall Street Journal* (New York, N.Y.), May 11, 1988.

<sup>277</sup> Kurt Eichenwald, “Revolt Spreading on Street Against Index Arbitrage Use,” *Market Place*, *New York Times* (New York, N.Y.), October 27, 1989.

computer system.”<sup>278</sup> In other words, Goldman wanted to restrict use of the DOT technology because it evened out network differentials among all the large firms, making markets more efficient and thus reducing opportunities for arbitrage. In the absence of the DOT, Goldman could use the advantageous network differential between its human network and the human networks of other, smaller and less well connected firms, to successfully simulate instantaneity better than those firms could without access to the DOT. Goldman’s request demonstrates that successful arbitrage doesn’t depend on absolute speed but on simulating instantaneity under whatever the given technological conditions. In this case, restricting communal access to the DOT system would have benefited Goldman because it would have reduced market efficiency and allowed the firm to profit from being fastest at using the older, slower telephone ordering system.

### High Frequency Trading

Instantaneous arbitrage is never truly possible, but simulated instantaneity allows some arbitrageurs to profit as if it were. It follows that the ultimate goal of arbitrageurs is to simulate instantaneity, either through network differentials or through price stabilization, better than anyone else. For network differentials, there is today an arms race fought in the realm of emerging technologies. For example, latency arbitrage, a form of high frequency trading (HFT), utilizes network differentials between high speed networks of superfast fiber optic cables and computer algorithms on the one hand, and the slower electronic trading systems of exchanges on the other. A large buy or sell

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<sup>278</sup> Ibid.

order for a stock will decrease or increase supply and thus increase or decrease price. Latency arbitrage anticipates these changes before the trade actually reaches a central electronic clearing house and a new price is calculated and distributed electronically.<sup>279</sup> Arbitrageurs can sell short at the current price knowing that once the new price is calculated, they can buy the stocks at the new lower price. Latency arbitrage guarantees a profit to those arbitrageurs who are able to, in effect, see the future, to know what the price will be fractions of a second before the price actually changes. Their profit is guaranteed because they trade in the fractions of a second between a price changing event and a change in price, i.e. nearly instantaneously.

The network differentials utilized for successful latency arbitrage depend on the speed of communication technologies to give one arbitrageur an advantage over the slower electronic trading systems, but also over other arbitrageurs. If a faster latency arbitrageur buys up all available stock for an anticipated trade before any others, no one else can profit. Therefore, there is a constant push to increase speed to stay ahead of other traders. MacKenzie et al. point out that “high-frequency trading firms rent space for their computer servers in the same building as an exchange’s,” a practice known as co-location.<sup>280</sup> One particular high-frequency trader commissioned a new fiber optic cable between Chicago and New York for the purposes of arbitrage, drilling through the

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<sup>279</sup> Mark Gongloff, “High-Frequency Trading is Bad for Profits, Including Those of High-Speed Traders: Study,” *Huffington Post Business*, June 18, 2013, [http://www.huffingtonpost.com/2013/06/18/high-frequency-trading-profits\\_n\\_3459497.html](http://www.huffingtonpost.com/2013/06/18/high-frequency-trading-profits_n_3459497.html)

<sup>280</sup> MacKenzie et al., “Drilling Through,” 286.



Allegheny Mountains to achieve the most direct route. The cable shaved “1.3 milliseconds off the previously fastest one-way time.”<sup>281</sup>

As more and more high-frequency traders use new, fast communication technologies, they increase market efficiency, as evidenced by the increased liquidity and lowered bid-ask spreads evident in many markets since the inception of HFT. This diffusion also, however, decreases arbitrage opportunities by evening out previously advantageous network differentials. The result is that many high frequency traders are now unable to gain a significant advantage. According to Matthew Phillips at *Bloomberg Businessweek*, the profitability of HFT is declining because high-speed algorithms and co-location have become too common in the market. Since 2011, the volume and profit margin of HFT have both been halved. Many HFT firms have shut down, and the remaining firms make a fraction what traditional investment firms make.<sup>282</sup> The result, along with decreasing profits, is a more frantic search for the next fastest method of simulating instantaneity.

This race for new network differentials for latency arbitrage seems to be reaching its own limit point. High frequency traders already rely on both fiber optic connections and networks of microwave dishes to transmit signals as quickly as possible between exchanges. Financial engineering firm Anova, in partnership with military contractor AOptix, has already completed a laser network connection between exchanges in

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<sup>281</sup> *Ibid.*, 287.

<sup>282</sup> Matthew Phillips, “How the Robots Lost: High-Frequency Trading’s Rise and Fall,” *Bloomberg Business*, June 6, 2013, <http://www.bloomberg.com/bw/articles/2013-06-06/how-the-robots-lost-high-frequency-tradings-rise-and-fall>.

London and Frankfurt and is set to construct another connecting the NYSE with the NASDAQ. The new laser network will shave *nanoseconds* off the current connection between the two exchanges for a cost of several billion dollars.<sup>283</sup>

Similarly, financial journalist Bruce Dorminey claims that physicists are developing technology that would be able to transmit encoded neutrinos between particle accelerators and they see an application in transmitting financial information over long distances.<sup>284</sup> According to the J.P. Morgan Chase options trader Dorminey interviewed for the piece, many firms would be willing to pay for the average 30 millisecond advantage the technology would afford for the purposes of international arbitrage.<sup>285</sup>

Falling profits to high frequency traders do not suggest that latency arbitrage will die off completely, but that there is more competition for the trades that are available because simulating instantaneity at the expense of other arbitrageurs has become more difficult. To be assured of success, arbitrageurs most hope for new ways to achieve advantageous network differentials, for example with lasers or particle accelerators. Technologically simulated instantaneity is only ever fleeting. As soon as new

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<sup>283</sup> Sebastian Anthony, "New Laser Network Between NYSE and NASDAQ Will Allow High-Frequency Traders to Make Even More Money," *ExtremeTech.com*, February 14, 2014, <http://www.extremetech.com/extreme/176551-new-laser-network-between-nyse-and-nasdaq-will-allow-high-frequency-traders-to-make-even-more-money>.

<sup>284</sup> Bruce Dorminey, "Neutrinos to Give High-Frequency Traders the Millisecond Edge," *Forbes.com*, April 30, 2012, <http://www.forbes.com/sites/brucedorminey/2012/04/30/neutrinos-to-give-high-frequency-traders-the-millisecond-edge/>.

<sup>285</sup> *Ibid.*

technologies are available to many players, previously advantageous network differentials dissolve.

### Money Machine Arbitrage

Not all simulated instantaneity is fleeting. In this final section, I will discuss money machines, arbitrage trades that depend on structural price inequalities that do not converge over time under the pressures of supply and demand. An illustrative case of money machine arbitrage comes not from the world of finance but instead from the world of petty crime. As of 2014, the per pack tax on cigarettes in New York state was \$4.35. The per pack tax in several southern states was less than \$.50 per pack.<sup>286</sup> It should not be surprising, then, that nearly 60% of cigarettes sold in New York are “smuggled” in by arbitrageurs who buy them in southern states and drive them to New York.<sup>287</sup> While journalists and politicians might refer to these traders as criminals or even “gangsters”<sup>288</sup> they are in fact executing an arbitrage trade.

(<http://www.economist.com/news/united-states/21567111-when-government-gets-greedy-some-people-turn-crime-urge-smurf>). The cigarette arbitrageur utilizes structural inequalities in prices set up by differing tax law in different states that force prices to be

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<sup>286</sup> Liz Emanuel and Richard Borean, “State Cigarette Tax Rates in 2014,” *Tax Foundation*, July 02, 2014, <http://taxfoundation.org/blog/state-cigarette-tax-rates-2014>.

<sup>287</sup> Joseph Henchman and Scott Drenkard, “Cigarette Taxes and Cigarette Smuggling by State,” *Tax Foundation*, March 19, 2014, <http://taxfoundation.org/article/cigarette-taxes-and-cigarette-smuggling-state>.

<sup>288</sup> “Cigarette Smuggling-The Urge to Smurf: When Government Gets Greedy, Some People Turn to Crime,” *The Economist* (Richmond, V.A.), November 24, 2012, <http://www.economist.com/news/united-states/21567111-when-government-gets-greedy-some-people-turn-crime-urge-smurf>.

uneven. This is a form of lasting price stabilization that is achieved not by derivatives contracts but by regulatory authorities.

Arbitrage proposes equivalence across contexts, and in many cases, if successful, it actualizes that equivalence, bringing both prices into parity through the dynamic of supply and demand. In the case of money machine arbitrage, this effect is restricted. The difference in tax rates represents a kind of short circuit in the contextual pricing of cigarettes. Successful cigarette arbitrage (this criminal industry supposedly costs governments \$10 billion a year) nonetheless does not equalize prices, meaning that the opportunity for profit from the arbitrage is perpetual.<sup>289</sup> It is a veritable money machine, churning out profit to any arbitrageur who undertakes it. Of course, in the case of cigarette arbitrage, there is a deterrent for would be arbitrageurs – the practice is illegal. The regulatory matrix of state tax law that sets up the money machine is also invested in not allowing it to function. New York State wants the tax dollars that come from legal cigarette sales, which it misses out on when “gangsters” sell their illegal cartons. However, not all money machine arbitrage trades are outlawed. I will argue in chapter six that one of the central mechanisms that precipitated the 2007-9 financial crisis was a money machine arbitrage in subprime mortgage-backed securities. Like cigarette arbitrage it relied on a regulatory matrix of structural price inequalities. Unlike cigarette arbitrage, the money machine did eventually break down.

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<sup>289</sup> Ibid.

## Conclusion

The success of arbitrage depends upon the ability of arbitrageurs to control time contingency by simulating instantaneity. Instantaneity can be simulated through network differentials or price stabilization. Network differentials allow faster arbitrageurs to profit at the expense of others, but are often evened out by the diffusion of communication technologies. As a result, price parity and market efficiency increase, even while the availability of arbitrage decreases. Arbitrageurs must always seek new technologies to create advantageous network differentials. At the opposite end of the spectrum is money machine arbitrage in which price stabilization is structural and lasting.

This account of arbitrage differs considerably from economic accounts of riskless buying and selling. Financial economic accounts of arbitrage foreground its efficiency producing effects, framing it as a benevolent, policing force that makes prices fair for everyone. The alternative account I have suggested frames arbitrage as a battle and perpetual race to game the system, to find new ways of capturing value at the expense of others (the opposite of fairness). In this account, efficiency is an unwanted side effect that limits profit making ability, not the driving force of trading.

The public service image of arbitrage suggested by financial economics also contradicts the historical record of actual arbitrage trading. In each of the examples provided in this chapter, the specific arbitrage was vilified or outright banned. Domestic shunting was effectively banned by the New York Stock Exchange in 1898.<sup>290</sup> The greatest grievance against arbitrageurs appears to have been that brokers who assisted

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<sup>290</sup> Ranald Michie, *The New York and London Stock Exchanges, 1850–1914* (London: Allen and Unwin, 1987).

one another with arbitrage on two exchanges did not charge each other commissions but instead “shared the costs incurred, dividing any profits or losses resulting”, a clear violation of the exchange’s rules.<sup>291</sup> The Governing Committee of the NYSE eventually settled on a “prohibition on sending continuous quotations” from the floor of the exchange via telephone, which effectively curtailed domestic arbitrage by brokers who then had to rely on the slower, riskier, technology of the ticker.<sup>292</sup>

I have already discussed the suspicion surrounding program trading and its contributions to stock market volatility. The 50-point “collar” that the NYSE imposed on program trading effectively curtailed the most profitable index arbitrage trades, as the latter relied upon volatility for intermittent fluctuations in spot-futures parity. Latency arbitrage has received similar scrutiny and hostility for promoting volatility and harming investors. High frequency trading is the new bogeyman of stock market investing. The 2010 “Flash Crash” was blamed on high frequency traders and in 2013, a contributor to CNNMoney claimed that latency arbitrage leaches billions of dollars from “unwitting investors.”<sup>293</sup>

Arbitrage is characterized as a battle to find new, better ways of gaming the system for profit, a battle that has been historically decried as unfair and banned

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<sup>291</sup> Ibid., 201.

<sup>292</sup> Ibid.

<sup>293</sup> Rob Curran, “Make \$377,000 Trading Apple in One Day,” Term Sheet, *Fortune.com*, August 30, 2013, <http://fortune.com/2013/08/30/make-377000-trading-apple-in-one-day/>. Felix Salmon challenges Curran’s claim that high-frequency trading robs individual investors of return. Felix Salmon, “Don’t Cry for ‘The Little Guy on Wall Street,’” *Reuters*, September 2, 2013, <http://blogs.reuters.com/felix-salmon/2013/09/02/dont-cry-for-the-little-guy-on-wall-street/>.

multiple times by popular observers. This resonates with the idea, raised in chapter two, that arbitrage is exploitative. In the capture framework, arbitrage profit is not a mere error or mathematical excess that accrues to arbitrageurs engaged in the public service of making markets efficient, it is value, transformed from social mattering and captured by arbitrageurs. But, who wins and who loses in this battle? Is it exploitation only of other arbitrageurs? Are buy-and-hold investors the losers? What remains in the project of redefining and reframing arbitrage is to seriously examine the exploitation of arbitrage. In the next chapter, I take up that task.

## CHAPTER 5: ARBITRAGE AND THE AXIOMATIC

In the last two chapters, I endeavored to support the claim that arbitrage is the form of surplus value appropriation unique to finance. In this chapter, I offer and support the second central claim of this dissertation, that arbitrage profit is the result of the organization of the system of finance, not the activities of individual arbitrageurs. This claim suggests that while arbitrage is, like the exploitation that results in surplus value appropriation in industrial capitalism, an apparatus of capture, something more is needed to understand how that exploitation works.

This claim is predicated on the fact that there is more than one theory of capitalist exploitation. In particular, Postone distinguishes between what he calls the “traditional” Marxist critique of exploitation and his own critique of “abstract domination.”<sup>294</sup> In the traditional critique of exploitation the inequalities of capitalism are reduced to exploitation as the theft of value. Under this interpretation, redistribution that returns the products of labor back to workers would correct the inequality. Postone convincingly argues that the traditional critique misses the “abstract domination” at the heart of capitalism by focusing solely on the distribution of value. He writes, “Capitalism is a system of abstract, impersonal domination. Relative to earlier social forms, people appear to be independent; but they actually are subject to a system of social domination

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<sup>294</sup> Postone, *Time, Labor, 127*.



that seems not social but ‘objective.’”<sup>295</sup> This abstract domination is found in the labor relation in which individuals are forced to sell their labor as a condition of survival and in the service of value production. Thus, the true location of domination in capitalism is not in the appropriation of surplus value, but in the system of social relations that produces labor value as the source of wealth.

In the last chapter, I began describe the social relations that produce financial value and support arbitrage as the form of value capture in finance when I described the way that powerful financial firms confront each other in a battle and perpetual race to game the system, to find new ways of executing trades at the expense of others. But there is a larger and more complex system of abstract domination at work in finance that requires examination. In this chapter, I suggest that the notion of the axiomatic, a final piece of Grossberg et al.’s capture framework, provides the analytical tools to examine the system of social relations that make arbitrage the form of value capture in financial capitalism.<sup>296</sup> Understanding arbitrage profit requires an understanding of the axiomatic of finance, not simply an accounting of arbitrage trades.

To make this claim, I first revisit Postone’s critique of traditional Marxism in more depth, making the case that his critique can be understood as a call to examine the axiomatic of industrial capitalism. Second, I present the concept of the axiomatic, drawing upon Grossberg et al. and Deleuze and Guattari’s original writing on the subject. Third, I briefly meditate on the impact of Grossberg et al.’s entire framework,

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<sup>295</sup> Ibid., 125.

<sup>296</sup> Grossberg et al., “Conjunctural Theory.”

encompassing value transformations, capture and the axiomatic, for understanding value broadly. Finally, I suggest that a critique of the political economy of finance is possible through an examination of the axiomatic that supports arbitrage as the apparatus of capture of finance.

### Postone's Critique of Traditional Marxism

To explain the axiomatic, I'll return briefly to the work of Postone in *Time, Labor, and Social Domination*. According to Postone, traditional Marxist critiques of capitalism focus on the mode of distribution. The mode of production is not considered a problem and capitalist exploitation can be overcome with "a new, just, and rationally regulated mode of distribution", one that distributes the products of labor back to workers.<sup>297</sup> However, Postone believes that traditional Marxism misreads Marx's critique of political economy. For Postone, Marx was not focused on exposing the exploitation of the labor relation in particular (a critique of capitalism from the standpoint of labor) but was instead attempting to demystify the "abstract domination" of the labor relation as a form of social mediation.<sup>298</sup>

This abstract domination is found in the labor relation in which individuals are forced to sell their labor as a condition of survival and in the service of value production. Thus, the true location of domination in capitalism is not in the appropriation of surplus value, but in the system of social relations that produces labor value as the source of wealth. As Geoff Mann puts it in his discussion of Postone, "Capitalism is worthy of

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<sup>297</sup> Postone, *Time, Labor*, 8.

<sup>298</sup> *Ibid.*, 127.

critique not, principally, because labour does not get enough of the value ‘produced’; capitalism is worthy of critique because, in it, labour is condemned to the production of value.”<sup>299</sup>

Postone reinterprets Marx’s critique of capitalism as an in depth explanation and critique not of the appropriation of surplus value (the focus of ”traditional Marxism”), but of the social relations of abstract domination embodied in the category of value.<sup>300</sup>

Postone suggests that Marx’s objective was to describe the broader system in which labor is not the sole source of *wealth*, but the form of social mediation that defines wealth in capitalism as value produced by labor. Another way to describe Postone’s critique is to say that traditional Marxist critiques of exploitation focus too much on the process of capture itself and neglect the axiomatic.<sup>301</sup>

The axiomatic is a way of understanding the complex rules and social relations that enable capture. Grossberg et al. borrow the term from Deleuze and Guattari who give a lengthy exposition of the term with regard to industrial capitalism.<sup>302</sup> They claim that capitalism is defined “by a social axiomatic that stands opposed to codes in every respect.”<sup>303</sup> An axiomatic thus consists of two parts. First, it is a set of axioms that are

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<sup>299</sup> Mann, “Value after Lehman,” 175.

<sup>300</sup> Postone, *Time, Labor, 7*.

<sup>301</sup> Ibid.

<sup>302</sup> Grossberg et al., “Conjunctural Theory.”

<sup>303</sup> Gilles Deleuze and Félix Guattari, *Anti-Oedipus: Capitalism and Schizophrenia*, trans. Robert Hurley, Mark Seem and Helen R. Lane (Minneapolis, M.N.: University of Minnesota Press, 2005), 248.

not codes or meanings, not “ideological formulas but operative statements... primary statements, which do not derive from or depend upon another statement.”<sup>304</sup> Second, it is a set of social relations that are built upon those statements. The unity of the axiomatic is the complex system of regulative statements and social relations that enable capture. Each apparatus of capture is necessarily bound up with an axiomatic. Labor value capture has its own axiomatic. Deleuze and Guattari write, “Marx demonstrated the functioning of capitalism as an axiomatic.”<sup>305</sup> Other forms of capture likewise have their own, different, axiomatics.

#### Axioms and Social Relations

The set of axioms primarily direct flows of value towards and through the process of capture. In this way, they play a regulative role. Deleuze and Guattari explain this role with regards to industrial capitalism. They highlight the association of axioms with the State: “the capitalist State is the regulator of decoded flows as such, insofar as they are caught up in the axiomatic of capital.”<sup>306</sup> Various initiatives and arms of the state play roles in the production of axioms, in particular economics.<sup>307</sup> So, for example, Deleuze and Guattari say, “Keynesian economics and the New Deal were axiom laboratories.”<sup>308</sup>

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<sup>304</sup> Deleuze and Guattari, *A Thousand Plateaus*, 461.

<sup>305</sup> *Ibid.*, 463.

<sup>306</sup> Deleuze and Guattari, *Anti-Oedipus*, 252.

<sup>307</sup> Michel Foucault asserts that political economy is the “major form of knowledge” of “governmentality.” Michel Foucault, *Security, Territory, Population: Lectures at the Collège De France, 1977-1978*, eds. Michel Senellart, François Ewald, and Alessandro Fontana, trans. Graham Burchell (New York: Palgrave Macmillan, 2007), 108.

<sup>308</sup> Deleuze and Guattari, *A Thousand Plateaus*, 462.

They also claim that “there is a tendency within capitalism continually to add more axioms”<sup>309</sup> and that as these axioms are added, “The State is thus induced to play an increasingly important role in the regulation of the axiomatized flows.”<sup>310</sup>

Grossberg et al. build upon this analysis to suggest that the axioms and the social relations that constitute axiomatics interact in specific ways. In particular, axioms are able to direct flows of value precisely by regulating the social mattering that remains through the failure of previous transformations of value. It is worth quoting this argument at length:

axioms set up the “rules” that distribute sets of divided but not differentiated units, such that one set can be smaller than another and capture can take place.

But such axioms always inscribe the very failure of that capture. This is possible only because earlier (in formal, not in temporal terms) processes of deterritorialization, decoding, abstraction, and so on, are never complete, never entirely successful... Axiomatics allow the necessary and strategic failures of “earlier” transformation processes to be articulated into the process of capture itself... the axiomatic... reintroduces obligation—gathered up from the failures of other processes—back into the materiality of social relations, and hence back into the ongoing transformations and calculations of value. That is, it reconstitutes social reality as a structure of feeling, an organization of social relations. If decoding, unitization and flow remove all meaningfulness from the commodity, the axiomatic strategically reintroduces obligation precisely where it has been seemingly evacuated. The axiomatic establishes affectively organized regimes of behavior without which capitalism itself would fail. The axiomatic defines a particular instantiation of capitalist value (capture) even as it limits the extent to which the logic of capture can be lived.<sup>311</sup>

The rules that allow capture to function are thus directed in part to the regulation of social mattering that escapes complete evacuation by the processes of value

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<sup>309</sup> Ibid., 462.

<sup>310</sup> Deleuze and Guattari, *Anti-Oedipus*, 253.

<sup>311</sup> Grossberg et al., “Conjunctural Theory,” 327.

transformation. Think for instance of the social mattering surrounding labor. Even as labor time is decoded and unitized, so many aspects of workers lives and bodies escape complete transformation. Industrial capitalist capture rests on this contradiction. It requires both the evacuation of social mattering in values through decoding-unitization-flow but also that labor be performed by workers who must necessarily remain social individuals capable of reproducing themselves and continuing to feed the apparatus of capture. Labor continues to bear innumerable codes of extra-capitalist meaning. In order for labor value capture to be successful, it is these remnants of social mattering that must be regulated. Thus, Deleuze and Guattari can claim that axioms “dealing with the working class, employment, union organization, social institutions” were all necessary for, not opposed to, capture.<sup>312</sup> The axiomatic is the system in which that contradiction is worked out through regulative axioms and the social relations built upon them.

Grossberg et al. suggest that this paradoxical function of the axiomatic makes it vulnerable. Even though axioms are taken-for-granted, primary statements that enable capture, “this reintroduction of obligation, of a disembedded obligation to be sure, means there is always something—something affective—that is not captured by the axiomatic... a lived experience of obligation is always threatening to disrupt and even overwhelm the axiomatic, and this defines the axiomatic as a site of constant struggle and transformation.”<sup>313</sup> The axiomatic is the site where challenges to capitalist capture

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<sup>312</sup> Deleuze and Guattari, *A Thousand Plateaus*, 462.

<sup>313</sup> Grossberg et al., “Conjunctural Theory,” 327.

can take place. Deleuze and Guattari also suggest that the struggle against capitalism must be fought at the level of the axiomatic.<sup>314</sup> The axiomatic, as the context of capture, is always in flux as it adjusts to the exigencies of the changing conditions of social and physical existence by adding and subtracting axioms. This flux is an opportunity for struggle to take hold.

### A Contextual Theory of Value

The framework presented in Grossberg et al. has implications not only for understanding arbitrage, but also for rethinking value more generally. Grossberg et al.'s insights suggest that the determination of price is indeed contextual and that the axiomatic defines that context in capitalism. Quite unlike both Marx's theory of value in which prices only reflect value in the aggregate (complete with the "transformation problem" this theory spawned)<sup>315</sup> and the neoclassical formulation of value as subjective and price as the equilibrium solution to differing subjective valuations, a contextual theory of value rejects the notion of price as distorting value or values. Price is the expression of struggles over valuation, and, importantly, in capitalism, those struggles are determined by the axiomatic.

Value is the incarnation of social mattering. The transformations of that social mattering that make it economic value express the relation between social mattering and price. Price is contextually determined by social relations and ongoing struggles over how to collectively value things. Price does not perfectly reflect the social mattering

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<sup>314</sup> Deleuze and Guattari, *A Thousand Plateaus*.

<sup>315</sup> Fred Moseley, "Recent Interpretations of the 'Transformation Problem,'" *Rethinking Marxism* 23, no. 2 (April 2011): 186-197.

of commodities at every moment at the level of economic value, but it is determined by struggles over that mattering. Thus, at the level of the economic, price and value are related but not identical.

The process of capture, however, claims decoded-unitized commodities and entirely strips the social mattering that once anchored them, defining their prices purely in terms of its own rules and relations, i.e. the axiomatic. Through the process of decoding-unitization-flow, the apparatus of capture severs the connection between social mattering and price, producing prices that are determined by the axiomatic instead. Capitalist value therefore *is* price, and the capitalist axiomatic determines that price. The only social mattering involved in the determination of capitalist price-value is the forms of obligation that are strategically reintroduced to secure capture. Capture short-circuits the social process of price formation by replacing social context with its own axiomatic. The struggles over what something is worth run up against a stifling roadblock in capitalism in the axiomatic

Judgments about prices that appear “wrong” or that seem to represent “fictitious” values within capitalism actually reflect struggles over the power of the axiomatic to evacuate the role of the social in determining value. The notion that financial securities shouldn’t count as valuable (i.e. are fictitious) is an assault on the financial apparatus of capture in which these securities are valuable for their role in capture rather than their social importance. Outside of that apparatus, the social mattering of these securities can be debated and challenged; their prices shifted by those struggles. However, within the apparatus of capture, prices remain independent of these struggles to the extent that



latter do not directly engage the axiomatic. The one route for struggles over prices is the same route for challenges to capitalism, through the axiomatic and its strategic deployment of obligation.

### A Critique of the Political Economy of Finance

Postone's *Time, Labor and Social Domination* can be read as a claim that Marx's writings were an attempt to grapple with and critique the complex axiomatic of industrial capitalism, not simply a critique of surplus value appropriation as exploitation. I argued in the previous chapter that arbitrage must also not be seen as too simple a form of exploitation. Although it involves uneven relations of power and profit, arbitrage is, like labor value capture, more complex. The capture framework provided by Grossberg et al. does not provide an answer to the question of where arbitrage profit comes from, precisely because it disqualifies the question. The source of arbitrage profit is not to be sought in balance sheet calculations of the capture that takes place, for instance of the percent dilution in mutual funds due to market timing, but instead in the conditions that make capture possible. The concept of the axiomatic reveals that understanding arbitrage profit requires a demystification of the social relations and taken-for-granted axioms of financial capitalism. And struggle against capture must be directed to the axioms that shape the social relations (for instance, between buy-and-hold investors and arbitrageurs) that we see as exploitative.

To understand arbitrage profit, therefore, a broader set of questions must be engaged. What is the axiomatic of arbitrage capture? What are the taken-for-granted, primary axioms that enable and enforce the validity of arbitrage? How can we identify

times of change or flux in the axiomatic as moments of opportunity to fight or orient new or shifting axioms? What is required, in homage not only to Marx, but also Postone and Deleuze and Guattari, is a critique of the political economy of finance.

### Conclusion

Grossberg et al. also elaborate the important concept of the axiomatic, which can be used to analyze the conditions of capture without falling into “traditional” critiques of exploitation. Instead of locating the injustice of capitalism in the moment of appropriation, the axiomatic shows that there is a set of taken-for-granted rules that not only make capture possible, but also make the monopolistic appropriation of value (by industrial capitalists or arbitrageurs) the only form of distribution possible in a capitalist system. From this perspective, arbitrage is not cheating or theft, but the result of the organization of the axiomatic. Challenging the exploitative nature of arbitrage can only happen through a process of demystifying the axiomatic of finance and directing transformative action to the flux, the addition and subtraction, of axioms.

The contemporary financial system is built upon a complex axiomatic, one that is different from the one Marx attempted to describe even if they share some formal structure. The axiomatic of financial capitalism also has been and continues to be, like the axiomatic of industrial capitalism, in a state of complicated flux. While a full description of this axiomatic and critique of the political economy of finance is obviously beyond the scope of this dissertation, in the final chapter I employ the concept of the axiomatic to critique the process of capture involved in the financial market for subprime mortgage-backed securities in the run up to the recent financial crisis. The highly

profitable arbitrage trade that produced this enormous market relied on forms of regulatory price stabilization that will reveal some broader facts about the functioning of the financial axiomatic and about arbitrage as the financial apparatus of capture. It was also a trade that failed spectacularly, and that failure was a time of extreme flux in the financial axiomatic. With the benefit of hindsight, I will pay special attention to whether and how challenges to the axiomatic were made at that time and with what result, in the hopes that this analysis will reveal possibilities for future challenge.

## CHAPTER 6: ARBITRAGE AND THE SUBPRIME MORTGAGE CRISIS

Arbitrage is the apparatus of capture specific to financial capitalism. That does not mean that arbitrage is the sole source of capitalist profit or that financial capitalism has replaced all other forms of capitalism. Indeed, capture provides a unique analytical tool with which to parse contemporary capitalism into distinct if overlapping and articulated capitalisms. The contemporary U.S. economy (itself an arbitrary selection of contextual boundaries and metrics) is defined by the intersection of several forms of capitalism, with unique but articulated apparatuses of capture, including but not limited to both financial and industrial capture, to say nothing of the myriad non-capitalist economic formations that also coexist with it.<sup>316</sup>

Reframing capitalist economies as constituted by different forms of capture demonstrates how great and troubling is the gap in scholarly understanding surrounding financial capitalism. Finance, in regards to capitalism as a whole, is characterized both in mainstream neoclassical treatments and Marxist accounts as an adjunct to real production or, if central to the economy, still a realm of fictitious capital. The framework provided by Grossberg et al. allows finance to be reframed as a full and complete form of capitalism with its own unique form of capture (arbitrage) and axiomatic that is articulated in complex ways to other capitalist and non-capitalist economic systems.

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<sup>316</sup> J.K. Gibson-Graham, *The End of Capitalism (As We Knew It): A Feminist Critique of Political Economy* (Cambridge, M.A.: Blackwell Publishers, 1996).

As I suggested in the last chapter, in order to understand finance as a capitalist form and arbitrage as the particular practice of financial capture, what is needed is a critique of the political economy of finance: an unpacking not only of the mechanism of capture in arbitrage, but even more importantly, of the taken-for-granted, primary axioms and social relations that enable and enforce the success of arbitrage. I claimed that a simple accounting of who profits and how is not enough as such an accounting leads to characterizations of arbitrage as simple exploitation in the style of the “traditional Marxism” condemned by Moishe Postone. Like Postone’s insight into the abstract domination of industrial capitalism, a critique of the political economy of finance must uncover the rules that create uneven relationships of power in which arbitrage delivers profits to some and not others.

The axiomatic of finance includes all of those axioms and the social relations that make finance not only a mechanism of capture but a unique social system. Axioms direct flows of social mattering so that the apparatus of capture can function. In this chapter, I begin the task of explaining the axiomatic of finance by examining the mechanics of a particular and very important arbitrage trade. In the run up to the 2007-09 financial crisis, arbitrageurs adapted a strategy known as securitization, whereby loan originators transform mortgages into financial securities and sell them to investors, to their purposes. Securitization, the history of which I will address below, seems to have originated as a way to increase lending and transfer credit risk to “capital market investors willing to hold the risk” (Jaffee et al., 68). Arbitrageurs, however, created

sophisticated securitization trades *for the purpose* of capturing value through the transaction.

Examining the mechanism of capture in mortgage securitization and in particular the arbitrage in second-order securitizations known as collateralized debt obligations (CDOs) offers an excellent way to begin the critique of the political economy of finance. The arbitrage delivered billions of dollars in profit to arbitrageurs in the early 2000s based on the subprime mortgages of borrowers who would eventually face defaults and foreclosures on an unprecedented scale. The juxtaposition of extreme profit for arbitrageurs and financial crisis for borrowers, and eventually workers as well after the crisis precipitated a deep recession, suggests that the arbitrage trade was exploitative. But that exploitation was only possible because of the rules and social relations, i.e. the axiomatic, supporting the securitization process. The subprime mortgage CDO arbitrage can serve as a case study of a distinctly financial apparatus of capture and the financial axiomatic.

What's more, the financial crisis corresponded to a spectacular failure of this particular apparatus of capture. This crisis was a time of great flux in the capitalist axiomatic. The value of subprime CDOs plummeted, too-big-to-fail banks went bankrupt or were acquired by other firms, popular outrage at financial firms spurred the Occupy Wall Street movement and new regulations were suggested.<sup>317</sup> In addition, the subprime

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<sup>317</sup> The 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act has been widely criticized as a set of relatively toothless recommendations to the Securities and Exchange Commission rather than a true reform bill. See for example, Matt Taibbi, "How Wall Street Killed Financial Reform," *Rolling Stone*, May 10, 2012,

mortgage CDO apparatus of capture was effectively destroyed in the crisis; the creation of CDOs backed by subprime mortgages has never recovered to pre-crisis levels. However, the question remains as to whether the broader financial axiomatic was significantly changed during this time of flux.

In this chapter, first detail the arbitrage in subprime mortgage-backed CDOs, a trade I characterize as one of the “money machine” arbitrages described in chapter four, because it relied on structural inequalities rather than fleeting differences in price. Next, I reconstruct the historical context out of which this apparatus of capture emerged. In particular, I point to three developments over the last 50 years: the development of individual or everyday finance in which the provision of the everyday necessities of life is more and more dependent on direct or indirect participation in financial markets; the proliferation of derivatives; and the rise of mortgage securitization. These were necessary preconditions for the subprime mortgage CDO arbitrage trade. Third, I derive two axioms out of this context, the axiom that “the provision of security must be achieved by risk;” and the axiom of “risk and return.” By way of conclusion, I ask whether any responses to the financial crisis significantly engaged these axioms. Analyzing responses to the financial crisis can provide insight into how that axiomatic can be proactively shaped in future times of flux.

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<http://www.rollingstone.com/politics/news/how-wall-street-killed-financial-reform-20120510>.

## Subprime Mortgage CDO Arbitrage<sup>318</sup>

The subprime mortgage CDO arbitrage was a complex trade that began with mortgages issued by banks to borrowers with low credit ratings. The designation “subprime” refers to the relative riskiness of these borrowers who must pay higher interest rates on their mortgages. The trade utilized financial securities based upon these mortgages. Subprime mortgaged-backed securities (MBS) were formed when the banks that originated the mortgages sold them to investment banks. These banks then bundled the mortgages together into a single pool of collateral and issued bonds—debt securities—to investors based on that collateral. The pool would receive income in the form of principal and interest payments to the constituent mortgages and this income would be passed through to investors.

However, the income was not divided equally among all the bonds. There was risk that some mortgages in the pool would default and deliver less income than expected on the bonds. Like other private (i.e. those not issued by government-sponsored entities such as the Federal National Mortgage Association (Fannie Mae)) MBS, subprime MBS bonds were divided into different levels of risk and return called tranches. The highest tranches, referred to as “senior” or “super senior,” got first priority in receiving the income from the collateral. If default occurred, they were least likely to be impacted. The bonds in the highest tranches were therefore considered low risk and, like any other financial security, paid a correspondingly low interest rate: low risk, low

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<sup>318</sup> Conversations with former bond trader and Communication Ph.D. Robert Wosnitzer allowed me to better understand the specific mechanics of the trade described in this section.



return. Lower tranches, referred to as mezzanine, junior and equity, would absorb the loss from default first. This risk was compensated by a higher interest rate. These bonds would forego the income in the event of a default in exchange for a higher rate of return if no default occurred.

The risk of MBS was assessed by the same credit ratings agencies that graded more traditional forms of debt such as sovereign and corporate bonds. The ratings agencies were asked to assess the risk to each tranche of MBS and assign it a grade on the same scale as traditional bonds (AAA is safest followed by AA+, AA, AA-, A+, A, A-, BBB+, BBB, and so on all the way to CCC+).<sup>319</sup> They used advanced mathematical models to predict the likelihood of default for each pool of mortgages that was securitized and then predict the level of default each tranche could withstand.<sup>320</sup> (Alchemy). The component mortgages in these deals were risky loans but they were also geographically diverse, so the models used by ratings agencies suggested that while some mortgages in a pool would default, the majority would not.<sup>321</sup> Thus, a large proportion, typically around 80%, of the resultant securities were rated super safe or AAA.<sup>322</sup> See Figure 1 below for an illustration of this process. Individual loans are

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<sup>319</sup> Exact grades differ slightly between the three major credit rating agencies, Fitch Group, Standard & Poor's and Moody's.

<sup>320</sup> Efraim Benmelech and Jennifer Dlogosz, "The Alchemy of CDO Credit Ratings," *Journal of Monetary Economics* 56, no. 2 (2009): 617-34.

<sup>321</sup> Felix Salmon, "A Formula for Disaster," *Wired* 17, no. 3, March 2009.

<sup>322</sup> United States, Financial Crisis Inquiry Commission, *The Financial Crisis Inquiry Report: Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States*, authorized ed. (New York, NY: Public Affairs, 2011), 72.

pooled into a collection of future cash flows. These cash flows are separated into tranches, each of which is rated based on its estimated default risk. The senior tranche highest on the “waterfall” receives the highest rating and is least likely to be affected by default.<sup>323</sup> The deal illustrated is typical in that nearly 80% (79% in this case) of the resultant securities are rated AAA.

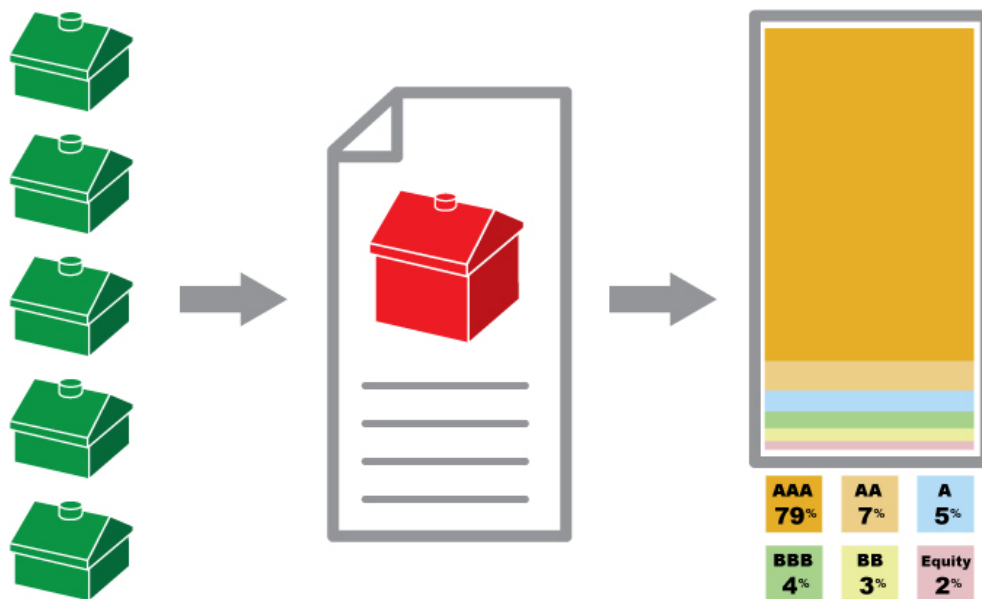


Figure 1: Typical Subprime Mortgage Securitization (proportions taken from Ashcraft and Schuermann.<sup>324</sup>)

<sup>323</sup> Robert A. Jarrow, “The Role of ABS, CDS, and CDOs in the Credit Crisis and the Economy,” (paper presented at Rethinking Finance: Perspectives on the Crisis, New York, April 13, 2012).

<sup>324</sup> Adam B Ashcraft and Til Schuermann, “Understanding the Securitization of Subprime Mortgage Credit,” *Federal Reserve Bank of New York Staff Reports* no. 318 (New York, March 2008), 30.

The subprime mortgage CDO arbitrage utilized the lower rated tranches of these subprime MBS deals to create second-order securitizations known as CDOs. CDOs were developed in the corporate bond market in the late 1980s.<sup>325</sup> Like other securitizations, CDOs were created when an investment bank issued securities on a collateral pool of debt. In the case of CDOs, the issuing bank purchases risky debt in financial markets to construct a collateral pool against which it issues bonds. The first CDOs consisted of “junk” bonds: high risk, high yield corporate debt. But the volume and diversity of deals quickly grew to involve all kinds of debt including low-rated MBS but also home equity loans, credit card debt, student loans, corporate debt and even other CDO securities.

Like subprime MBS, CDO bonds are also tranced according to their sensitivity to default and these tranches are given ratings by credit ratings agencies. Also like subprime MBS, a large proportion of CDO bonds, around 80%, gained the highest possible credit rating of AAA.<sup>326</sup> Figure 2 illustrates a typical, multi-sector CDO deal (the collateral includes home equity loans, residential MBS and low rated bonds from other CDOs). The average risk rating of the collateral pool (left) is BB (mezzanine), while the average risk rating of the CDO securities is AAA (senior).

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<sup>325</sup> Donald MacKenzie, “The Credit Crisis as a Problem in the Sociology of Knowledge,” *American Journal of Sociology* 116, no 6 (May 2011): 1778-1841.

<sup>326</sup> United States, *Financial Crisis Inquiry Report*, 127.

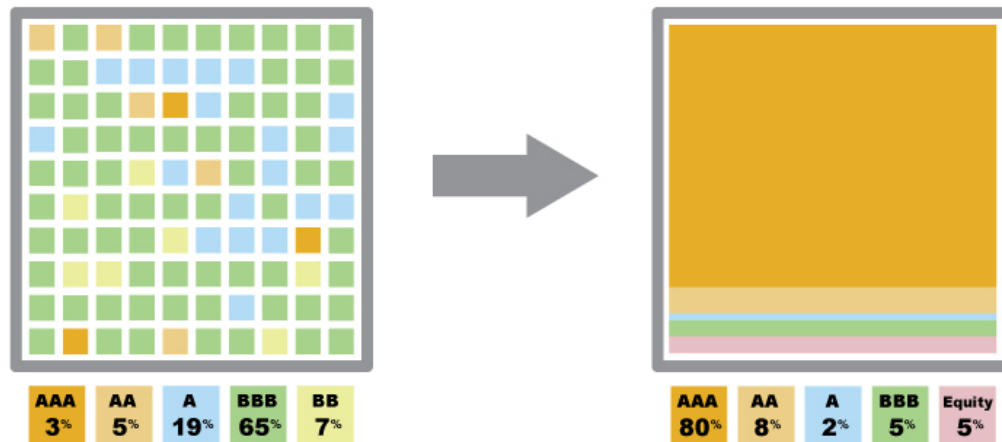


Figure 2: Typical Collateralized Debt Obligation Deal (proportions taken from Covey et al.<sup>327</sup>).

Ratings agencies knew that the collateral pools of CDOs contained high-risk debt, but using the same mathematical models as they employed to rate first round, subprime MBS, the agencies rated these diversified CDO securities as mostly super safe. Benmelech and Dlugosz describe the CDO ratings process as a form of alchemy, since low rated bonds went into the collateral pool and high rated bonds came out.<sup>328</sup>

<sup>327</sup> David Covey, Michael Koss, Akhil Mago, Jasraj Vaidya, Brian Zola, Rahul Sabarwal, Dick Kazarian, Dan Mingelgrin, Stefano Risa, Vivien Huang, Omar Brav, Gaetan Ciampini, “ABS CDOs – A Primer,” *Lehman Brothers Fixed Income: U.S. Securitized Products Research* (November 17, 2006).

<sup>328</sup> Benmelech and Dlugosz, “Alchemy.”

According to Vinod Kothari, CDOs are generally split into two categories depending on their purpose.<sup>329</sup> Balance sheet CDOs are deals constructed in order to liquidate assets held on the balance sheet of a bank, often for the same reasons as first order securitizations: to sell off risky loans and thereby reduce regulatory capital, a topic I discuss in more depth below, and also to free up capital for more lending or investing. Arbitrage CDOs are usually created by firms other than banks for the purpose of capturing the difference in the rate of interest collected on the (risky, high yield) collateral debt of the CDO and the rate of interest paid on the CDO securities.<sup>330</sup> CDO deals result in a large proportion of AAA-rated bonds on which investors expect a lower rate of return, resulting in a large difference or “spread” between the interest rate received on the high-yield collateral and the low interest rate paid on the majority AAA-rated CDO bonds.

The 2006 Lehman Brothers brochure on which Figure 2 is based illustrates exactly how CDO arbitrage occurs.<sup>331</sup> The collateral pool of the CDO deal receives an average interest rate of 180 basis points (bp) (.018%). The CDOs liabilities, i.e. the securities it issues to investors, are nearly all rated AAA, so they pay a much lower yield, on average 49 bp. The “gross excess spread” is thus 131 bp. After the fees deducted by the originating firm (27 bp), a “net excess spread” of 104 bp exists on the

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<sup>329</sup> Vinod Kothari, *Securitization: The Financial Instrument of the Future* (Hoboken, N.J.: John Wiley & Sons, 2006).

<sup>330</sup> *Ibid.*

<sup>331</sup> Covey et al., “ABS CDOs.”

deal.<sup>332</sup> This excess is delivered to the holder of the lowest, most risky tranche. The equity tranche, as it is called, is so risky that it is not rated; any defaults will immediately impact the equity tranche. While rated tranches are compensated with a rate of interest that is both attractive enough to incentivize investors but also is commensurate with their relative risk, the highly risky and unrated equity tranche is compensated with the entire excess spread. Equity generally takes up 3 to 8% of the face value of a CDO deal.<sup>333</sup> Despite its small pay in, the equity receives around a 20% return on investment due to the net excess spread. This return is extremely large compared to other investments (the average annual return on the S&P 500 between 2000 and 2005 was nearly flat at .16%.<sup>334</sup>

Because the equity tranche is the “first loss” piece of a CDO, purchasing it doesn’t seem to fit the economic definition of arbitrage as a trade that nets a riskless profit. However, as I have showed, the economic definition doesn’t describe the process of arbitrage well. Instead, arbitrage is best understood as a financial apparatus of capture. Figure 2 illustrates the correspondence between the subprime mortgage CDO arbitrage trade and steps of the capture process. First, the individual debt instruments that make up the collateral pool of a CDO, including MBS, home equity loans and bonds from other CDOs, are already deterritorialized sets of similar commodities sold in multiple financial markets. They are decoded and unitized by the securitization process.

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<sup>332</sup> *Ibid.*, 7.

<sup>333</sup> Kothari, *Securitization*, 423.

<sup>334</sup> “S&P 500,” *Yahoo Finance*, <http://finance.yahoo.com/echarts?s=%5Cgspc+interactive>.

Instead of remaining distinct securities with individual cash flows, they are pooled by the issuing bank into an undifferentiated collection of future cash flows.<sup>335</sup> They are then divided, or unitized, into CDO securities and put into flow when they are sold to investors. The comparison is made possible by the proposal of equivalence between the collateral pool of the CDO and its issued bonds. When the CDO bonds are subjected to the same credit rating process as the debt comprising the collateral pool of the deal, they were marked with the same assessment of risk and thus made a part of the same market, but since each is backed by the same collateral, their equivalence is easily secured. The price differences that produce the excess spread that is captured by equity holders is produced by the “alchemy” of CDO rating that takes low rated, high yield bonds and transforms them into high rated, low yield bonds. The capture occurs when a portion of the payments to the original debt flows to the equity holders instead of being passed through as interest paid out on the new CDO securities.

The CDO arbitrage occurs over time. As repayments are made to the collateral and then passed through to the CDO bonds, the excess interest is delivered, piece-by-piece, to the equity holder. Thus, like other arbitrage trades, its success or failure depends upon the techniques used to simulate instantaneity and secure profits that are meted out over time. As I explained in chapter four, simulated instantaneity can occur through differential advantages in communication networks or techniques of price

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<sup>335</sup> Randy Martin makes a similar claim in 2007: “Securitization not only stripped debt of its initial content but also delocalized debt, severing the sense that its repayment installed creditors and debtors in a particular place.” Randy Martin, *An Empire of Indifference: American War and the Financial Logic of Risk Management* (Durham, N.C.: Duke University Press, 2007), 33.

stabilization. I also illustrated the concept of money machine arbitrage with the case of cigarette running from southern states to New York. In that case, the low taxes in southern states and high taxes in New York State are enduring structural differences that make the arbitrage profitable.

The subprime mortgage CDO arbitrage practiced in the run up to the financial crisis was also a money machine in which structural inequalities created extreme and enduring price stabilization, allowing an arbitrage trade that continuously pumped out profits instead of closing over time due to the forces of supply and demand. In the case of subprime mortgage CDO arbitrage, the structural difference that constituted arbitrage profit was between the two interest rates. The interest rate stabilization that secured the CDO arbitrage profit as a continuous money machine was sedimented by the alchemy of CDO credit rating. The formulas used by credit rating agencies that rated CDOs as mostly AAA set up a structural difference between the interest rate received on the CDO collateral and the interest rate paid on the CDO bonds. In the Lehman Brothers example cited above, the average interest rate received on the CDO collateral was 180 bp, while the average rate paid to the rated tranches was 49 bp. The arbitrage between the two netted a profit of 104 bp after fees.<sup>336</sup>

Although investment firms are not forthcoming with details of their arbitrage operations, there is evidence that the subprime mortgage CDO arbitrage trade netted billions in profits to arbitrageurs in the early 2000s. The Securities Industry and Financial Markets Association estimates that over \$1 trillion worth of arbitrage CDOs were issued

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<sup>336</sup> Covey et al., “ABS CDOs.”



between 2005 and 2007.<sup>337</sup> An estimate of the arbitrage in these three years, based on the Lehman deal, would have netted around \$11.5 billion in profit. In 2010, ProPublica detailed the activities of Magnetar Capital, a hedge fund that began aggressively buying up CDO equity in the spring of 2006, on the very edge of the credit crisis that would dissolve into the financial crisis.<sup>338</sup> By one estimate, they held one third to one half of CDO equity tranches at that time, meaning that they were engaging in arbitrage by receiving the net excess spread on a huge proportion of CDO deals.<sup>339</sup> According to the *Wall Street Journal*, this single fund made over \$2 billion in 2007.<sup>340</sup>

The subprime mortgage CDO arbitrage was an apparatus of capture delivering large profits to hedge funds and investment banks. But the reasons for its success are far from clear. In order for the money machine apparatus of capture to function, more and more arbitrage CDOs had to be created. This required a steady flow of subprime mortgage debt, the “alchemy” of credit ratings that could transform risky debt into safe investments, and investors to demand more and more AAA-rated CDO securities.

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<sup>337</sup> “Global CDO Issuance and Outstanding,” *Securities Industry and Financial Markets Association*, January 13, 2015, <http://www.sifma.org/uploadedFiles/Research/Statistics/StatisticsFiles/SF-Global-CDO-SIFMA.xls?n=19611>.

<sup>338</sup> Jesse Eisinger and Jake Bernstein, “The Magnetar Trade: How One Hedge Fund Helped Keep the Bubble Going,” *ProPublica.com*, April 2, 2010, <http://www.propublica.org/article/all-the-magnetar-trade-how-one-hedge-fund-helped-keep-the-housing-bubble>.

<sup>339</sup> *Ibid.*

<sup>340</sup> Serena Ng and Carrick Mollenkamp, “A Fund Behind Astronomical Losses,” Heard on the Street, *Wall Street Journal*, January 14, 2008, <http://www.wsj.com/articles/SB120027155742887331>.

However, on its face, the trade is utterly irrational. Why would borrowers choose to pay exorbitant interest rates to purchase a home when they could rent? Why would credit ratings agencies give subprime MBS and CDOs such high ratings? Why would investors rush to purchase these bonds in such large amounts? The next section details the historical developments that provided these preconditions and explores the social relations among borrowers, banks, ratings agencies and investors that resulted.

### The Context

The context in which the subprime mortgage CDO arbitrage emerged and became a successful apparatus of capture is constituted out of the articulation of three important developments that began in the mid-twentieth century: the rise of everyday finance, particularly of mortgage-funded homeownership; the emergence of a proliferating derivatives market; and the rise of securitization.

#### *Everyday Finance*

In the middle of the twentieth century, everyday life became financialized in new ways, particularly with regards to saving and borrowing money. In the mid-1970s, the tradition of saving money in banks and thrifts was disrupted by the introduction of everyday investment products like money market accounts, mutual funds and individual retirement accounts such as the 401(k). These products gave savers access to higher interest rates during the “Great Inflation” of the late 1970s and early 1980s.<sup>341</sup> Paul Langley explains that the move towards “everyday investment” was linked to a cultural

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<sup>341</sup> Joseph Nocera, *A Piece of the Action: How the Middle Class Joined the Money Class* (New York: Simon & Schuster, 1994).

shift in attitudes towards risk.<sup>342</sup> Deposit saving was driven by aversion to risk and the desire to keep money safe for future use, whereas everyday investment relies on the relationship between risk and reward wherein “those investors who are willing to take greater risks will be those who, on average, receive greater reward.”<sup>343</sup>

The shift away from traditional saving towards individual engagement with financial markets through mutual funds and retirement accounts required individuals to take on risk in new ways, and also removed the burden of uncertain investing from traditional authorities such as the state and employers. The consequences for financial markets of increased individual investment in the last four decades are clear: more individual dollars risked on the markets increased both the fees that financial firms take for administering mutual funds and giving investment advice, and the volume of trade. As I already showed in chapter two, mutual funds can be the target of arbitrage in the form of market timing, meaning that individual investments feed directly into arbitrage capture. However, it was similar transformations in borrowing that impacted the specific apparatus of capture defined by the subprime mortgage CDO arbitrage.

Debt is nothing new, and in fact in recent years scholars have argued that debt is at the foundation of monetary systems.<sup>344</sup> For example, David Graeber argues that money emerged as way to settle debts in ancient times.<sup>345</sup> Consumer debt in the form of

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<sup>342</sup> Langley, *Everyday Life*, 52.

<sup>343</sup> Ibid.

<sup>344</sup> Ingham, *The Nature of Money*. Graeber, *Debt*. Richard Dienst, *The Bonds of Debt* (New York: Verso, 2011).

<sup>345</sup> Graeber, *Debt*.

merchant credit and bank loans, including mortgages date back centuries.<sup>346</sup> But the form and nature of consumer borrowing changed in significant ways in the twentieth century. In addition to steadily increasing rates of indebtedness, debt instruments have changed and proliferated with the introduction of credit cards, student loans, home equity loans, and more. Mortgages are a special example of the transformation of debt. Unlike other forms of borrowing that carry the negative stigma of imprudence and vice, mortgage-funded homeownership has been promoted within U.S. culture in the twentieth century, especially by the federal government, as a necessary tool of cultural mobility and financial gain.

Prior to the Great Depression, mortgages were short term (5 to 10 years) and required large payments of principal at maturity.<sup>347</sup> During the Depression, the inability of mortgage holders to refinance these short-term loans contributed to the downturn. Thus, the 30-year, fixed-rate mortgage was created (through a long process that culminated in 1948) as a way to forestall future crises.<sup>348</sup> But even with the more attractive 30-year loan, the heights mortgage borrowing has reached in the U.S. is not the result of a natural appetite for debt or even entirely due to stagnating wages after the 1970s. Instead, borrowers have been actively created in the U.S. since the aftermath of the Great Depression. From 1934 to the present the U.S. government has

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<sup>346</sup> Brett Williams, *Debt for Sale: A Social History of the Credit Trap* (Philadelphia: University of Pennsylvania Press, 2004), 11-2.

<sup>347</sup> Richard K. Green and Susan M. Wachter, "The American Mortgage in Historical and International Context," *Journal of Economic Perspectives* 19, no. 4 (Fall 2005): 93-114.

<sup>348</sup> *Ibid.*

continuously created initiatives and institutions to help support mortgage-funded homeownership at the expense of lending regulations and underwriting standards. Some of these actions include the creation of organizations like the Federal Housing Administration (FHA) in 1934 and the Department of Housing and Urban Development (HUD) in 1965, and the GSEs, Fannie Mae in 1938, the Government National Mortgage Association (Ginnie Mae) in 1968 and the Federal Home Loan Mortgage Corporation (Freddie Mac) in 1970;<sup>349</sup> but also initiatives like the Community Reinvestment Act of 1977, President Clinton's 1995 National Homeownership Strategy Initiative, and President George W. Bush's 2002 American Dream Downpayment Initiative.<sup>350</sup>

These deregulatory initiatives promoted mortgages and homeownership and stimulated Americans to become borrowers. In addition, government initiatives coalesced with growing suburban sprawl to redefine mortgages as a necessary stepping-stone in the path of the American Dream. The result was an enormous increase in mortgage borrowing. Between 1949 and 2001, outstanding mortgage debt rose from \$31 billion to over \$13 trillion dollars and from 20% to 73% of total household income.<sup>351</sup>

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<sup>349</sup> Ibid.

<sup>350</sup> Kat Aarom and Michael Lawson, "Timeline: Homeownership in America, 1995-2010," *Mother Jones*, July 29, 2011, <http://www.motherjones.com/politics/2011/07/homeownership-trends-timeline>. "Community Reinvestment Act (CRA)," *Board of Governors of the Federal Reserve System*, February 11, 2014, [http://www.federalreserve.gov/communitydev/cra\\_about.htm](http://www.federalreserve.gov/communitydev/cra_about.htm).

<sup>351</sup> Green and Wachter, "The American Mortgage." "Mortgage Debt Outstanding: Historical Data," *Board of Governors of the Federal Reserve System*, December 11, 2014,

Mortgages weren't just sanctioned tools of cultural mobility, but also, like forms of everyday investing, ways to take on risk for the purpose of individual financial gain. Between 1950 and 2007, real, inflation-adjusted housing prices in the U.S. nearly doubled, with much of the growth happening since the turn of the millennium.<sup>352</sup> In addition, from the 1980s until the financial crisis, mortgage rates fell below the rate of appreciation in home values, meaning that mortgage-financed homeownership allowed borrowers to rapidly build equity in an amount directly proportional to the difference between the rate of interest paid on the mortgage and the appreciation of home values. This equity could be cashed in by borrowers selling their homes or taking out home equity loans. In this context, mortgages were actually investment tools that allowed borrowers to take on risk (that they could default and lose the home) in order to seek return (in the form of equity). Even riskier loans like adjustable rate mortgages (ARMs), in which the rate of interest could be raised or lowered at specific intervals, and subprime loans with high interest rates, just extended this investment opportunity to lower income and less creditworthy borrowers.<sup>353</sup>

The emergence of everyday finance contributed to the context in which CDO arbitrage took place by stimulating subprime mortgage borrowing and framing it as a tool of cultural mobility and financial gain. This borrowing was further reinforced by

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[http://www.federalreserve.gov/econresdata/releases/mortoutstand/frb\\_mdo\\_historical.csv](http://www.federalreserve.gov/econresdata/releases/mortoutstand/frb_mdo_historical.csv).

<sup>352</sup> Neil Fligstein and Adam Goldstein, "The Roots of the Great Recession," in *The Great Recession*, eds. David B. Grusky, Bruce Western and Christopher Wimer (New York: Russell Sage, 2011), 24.

<sup>353</sup> United States, *Financial Crisis Inquiry Report*, 106.

investor demand for mortgage securities. But before discussing securitization, I must describe a development without which securitization could not have flourished: the proliferation of financial derivatives.

### *Derivatives*

Although derivatives—financial contracts and assets whose value is derived from the value of some other financial asset—are not new, several developments in the 1970s produced a fundamental change in and proliferation of derivative forms. First, although derivatives existed, chief among them contracts for future delivery (futures), options to buy stock issued by corporations (warrants) and options to buy and sell stock issued by private traders (options), they were frowned upon as instruments of speculation and the latter two, warrants and options, were notoriously difficult to price. Because the prices of stocks were unpredictable, especially in the short-term, valuations of warrants and options were subjective and did not lend themselves to robust markets for either. As I explained in the first chapter, that all changed when Black, Scholes and Merton produced their options pricing formula in 1973, the same year that the Chicago Board Options Exchange became the first regulated exchange for trading stock options.<sup>354</sup> The formula successfully “undermined the long-standing cultural association between options and gambling” and helped produce consensus around the pricing of options, allowing for the development of a coherent and active market.<sup>355</sup>

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<sup>354</sup> “Timeline of CME Achievements.”

<sup>355</sup> MacKenzie, *An Engine*, 158.

Second, the collapse of the Bretton Woods agreement in 1971 created a new financial problem for which derivatives came to function as a revolutionary solution. The collapse of Bretton Woods moved the world from a system of fixed exchange rates pegged to the gold-convertible dollar to floating exchange rates.<sup>356</sup> Producers and speculators alike could no longer count on their investments or trades paying off because of the risk that exchange rates would turn against them over time. This risk was addressed through the use of derivatives. As Lawrence Grossberg writes, “it is not coincidental that derivatives emerged—in their present form... after the collapse of Bretton Woods.”<sup>357</sup>

Bryan and Rafferty convincingly argue that after Bretton Woods, “the central problem of the global financial system is commensuration: how, in the absence of a global value unit such as gold... can one form of capital be exchanged for another... at a rate that is predictable and sustainable.”<sup>358</sup> Their answer is that financial derivatives anchor prices in the world of free-floating exchange rates. For example, a currency futures contract allows each party to know in advance what exchange rate they will be subject to at expiration. More broadly, “each derivative product is a package of conversion of one form of capital to another... taken together, they form a complex web of conversions, in which any ‘bit’ of capital, anywhere and with any time profile, can be

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<sup>356</sup> Bryan and Rafferty, *Capitalism with Derivatives*.

<sup>357</sup> Lawrence Grossberg, “Modernity and Commensuration,” *Cultural Studies* 24, no. 3 (2010): 315.

<sup>358</sup> Bryan and Rafferty, *Capitalism with Derivatives*, 131.



measured against any other ‘bit’ of capital.”<sup>359</sup> In other words, derivatives solve the problem of a lack of a universal equivalent.<sup>360</sup>

This function of derivatives is evident in several developments in futures and options exchanges in the 1970s. Currency futures were introduced on the Chicago Mercantile Exchange in 1972.<sup>361</sup> In 1975, the Chicago Board of Trade introduced the first interest rate futures contract on mortgage-backed bonds issued by Ginnie Mae.<sup>362</sup> Futures on Treasuries followed two years later and in the last 40 years, financial futures and options, both exchange traded and over-the-counter, have proliferated further.<sup>363</sup> This proliferation was in some ways enabled by the BSM pricing formula, but necessitated by the end of the Bretton Woods system.

Finally, the enormous expansion in derivatives markets since the 1970s was enabled by technological change: the rise of electronic trading in stock and derivatives markets has allowed growth in those markets that couldn’t otherwise occur. As chronicled by Caitlin Zaloom in *Out of the Pits*, the electronic trading of derivatives that began in the 1990s increased the volume and speed of trading dramatically.<sup>364</sup> Although the majority of derivatives are still traded over-the-counter, in one-off deals brokered via

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<sup>359</sup> Ibid.

<sup>360</sup> Grossberg, “Modernity and Commensuration.”

<sup>361</sup> “Timeline of CME Achievements.”

<sup>362</sup> Ibid.

<sup>363</sup> Ibid.

<sup>364</sup> Zaloom, *Out of the Pits*.

older technologies like the telephone and computer messaging, the impact of electronic trading has been enormous.

The expansion and proliferation of derivatives markets played an important role in setting up the context in which the subprime mortgage CDO arbitrage became a successful apparatus of capture, particularly through the development of swaps. Swaps are a class of over-the-counter derivatives that, as the name suggests, allows two parties to exchange a series of cash flows. The interest rate swap, which was first traded in the early 1980s, involves one party agreeing to pay another regular payments at a certain fixed rate of interest in exchange for payments at a floating rate.<sup>365</sup> Banks, for example, may use interest rate swaps to hedge the risk that interest rates will increase over time when the income from fixed rate loans they originated in the past does not. However, the principal amount on which the rates are calculated need not be held by either party.

Credit default swaps (CDS) are a more recent invention of the 1990s that function more like insurance.<sup>366</sup> One party “sells” the swap, promising that if a default on a particular debt occurs, he will provide the buyer of the swap with the value of that debt. The buyer in turn pays regular fees.<sup>367</sup> As with interest rate swaps, the notional amount

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<sup>365</sup> Michael McCaffrey, “An Introduction to Swaps,” Investopedia, 2015, <http://www.investopedia.com/articles/optioninvestor/07/swaps.asp>.

<sup>366</sup> Harry Wilson, “A Short History of Credit Default Swaps,” *The Telegraph*, September 6, 2011, <http://www.telegraph.co.uk/finance/newsbysector/banksandfinance/8745511/A-short-history-of-credit-default-swaps.html>.

<sup>367</sup> Viral V. Acharya, Menachem Brenner, Robert F. Engle, Anthony W. Lynch, and Matthew Richardson, “Derivatives: The Ultimate Financial Innovation,” in *Restoring*

or “reference asset” need not be held by either party.<sup>368</sup> As I will demonstrate, CDS were crucial to the alchemy of credit ratings that facilitated the subprime mortgage CDO arbitrage.

The combination of the theoretical developments based on the BSM options pricing formula, the use of derivatives in response to the breakdown of Bretton Woods, and the development of electronic trading has resulted in a vast expansion in derivatives. Derivatives markets have grown enormously since the 1970s. The options market alone grew from relative obscurity before BSM to today accounting for over \$400 trillion dollars in financial trading a year on exchanges. Over-the-counter derivatives are estimated at a value of \$700 trillion dollars outstanding today.<sup>369</sup> The notional amount of outstanding CDS grew 86-fold between 2001 and 2008 from \$631 billion to \$54 trillion.<sup>370</sup> Arbitrage is a process of comparison that places two financial securities into a relationship of equivalence and disparity. This process of arbitrage, as capture in financial capitalism, requires the existence of as many instruments as possible that can be favorably compared. In general, the proliferation of derivatives is important because in addition to allowing for hedging against floating exchange rates and gambling-like

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*Financial Stability: How to Repair a Failed System*, eds. Viral V. Acharya and Matthew Richardson (Hoboken, N.J.: John Wiley & Sons, 2009), 236.

<sup>368</sup> *Ibid.*, 237.

<sup>369</sup> “Table 23A: Derivative Financial Instruments Traded on Organised Exchanges,” *Bank for International Settlements*, June 2014, [www.bis.org/statistics/r\\_qa1406\\_hanx23a.pdf](http://www.bis.org/statistics/r_qa1406_hanx23a.pdf). “Table 19: Amounts Outstanding of Over-the-Counter (OTC) Derivatives,” *Bank for International Settlements*, December 2014, <http://www.bis.org/statistics/dt1920a.pdf>.

<sup>370</sup> Acharya et al., “Derivatives,” 237.

speculation on the future movement of financial prices, the vast trading of derivatives provides an almost endless supply of financial products that can be compared to one another for the purposes of arbitrage. But it is the particular role played by CDS in the emergence of subprime MBS that is of greatest importance in the final development: securitization.

### *Securitization*

Mortgage borrowing and credit default swaps are both connected to the emergence and growth of securitization, the final important contextual factor supporting the subprime mortgage CDO arbitrage. Securitization is the transformation of loan assets into investment securities; it is not limited to mortgages, although they remain the largest component of the market. Since the 1980s, many forms of debt including corporate bonds, credit cards, car loans, student loans and home equity loans together known as asset backed securities (ABS) have all become subject to securitization. However, securitization emerged as a major financial technique in 1970 when the U.S. Congress allowed the Ginnie Mae to purchase bundles of mortgage loans issued by savings and loans and then resell them to investors as securities, instruments that would pay a fixed payment over a period of time just like traditional bonds.<sup>371</sup> These payments effectively passed the repayment of mortgages, both interest and principal, through to investors, removing the loans from the balance sheets of the savings and loans so that they could in turn lend more.

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<sup>371</sup> United States, *Financial Crisis Inquiry Report*.

Ginnie Mae, and eventually Freddie Mac and Fannie Mae as well, guaranteed the payments of the mortgage-backed securities to investors. Even if loans defaulted or were prepaid ahead of schedule, these government-sponsored entities (GSEs) provide investors with explicit guarantees against the default of individual securities and investors generally assumed an implicit guarantee that the U.S. government would not let the GSEs go bankrupt or default. Thus, GSE securitizations became attractive investments. Because of the special relationship between GSEs and the U.S. U.S. government, investors viewed their MBS as being as safe Treasury bonds.<sup>372</sup>

Over the period from the 1970s to the present, mortgage-backed securities issued by GSEs grew into a trillion dollar market, with banks, pension funds and central banks all buying these super safe investments. In the 1980s, GSE-guaranteed MBS were joined by the securitization of riskier loans by private banks.<sup>373</sup> These banks securitized “non-conforming loans,” mortgages that didn’t “conform to the GSE’s loan size limits and underwriting guidelines, such as debt-to-income [a measure of whether the borrower has enough income to service the debt] and loan-to-value [a measure of whether the home is valuable enough to cover the loan in foreclosure] ratios.”<sup>374</sup> Subprime and adjustable rate mortgages got the same treatment as safe 30-year mortgages, being sold to investors as bonds.

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<sup>372</sup> Ibid.

<sup>373</sup> Ibid.

<sup>374</sup> Ibid., 39.

However, without the guarantees of GSE securitizations, it was uncertain how risky these MBS were. As I outlined above, credit ratings agencies were tapped to assess the risk of private MBS. The ratings agencies used models to predict the likelihood of default for each pool of mortgages that was securitized and then predict the level of default each tranche could withstand.<sup>375</sup> Default correlation was an important aspect of these risk calculations because it gave a measure of the danger to other mortgages in a pool if one mortgage defaulted. Mathematician David X. Li developed a Gaussian copula formula to calculate default correlation that relied on the prices of CDS, those rapidly proliferating insurance contracts on debts.<sup>376</sup> The Gaussian copula formula used CDS prices as a measure of default risk. Recall that CDS are insurance contracts that can be purchased by any investor who wishes to speculate on or hedge the likelihood of default of any financial security. If CDS prices are high, that suggests that investors believe the chance of default is also high and thus require higher payments to insure against it. Using CDS to measure default correlation risk meant using investors' opinions, reflected by prices, instead of "hard" data. And investors' opinions were influenced by the recent history of housing prices. In 2000, when Li published his formula, "credit default swaps had been in existence [for] less than a decade, a period when house prices soared."<sup>377</sup>

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<sup>375</sup> Benmelech and Dlugosz, "Alchemy."

<sup>376</sup> Salmon, "A Formula for Disaster."

<sup>377</sup> *Ibid.*, 112.

The use of CDS in default correlation models led to the circumstance in which subprime MBS containing risky mortgages could produce a large AAA-rated tranche.<sup>378</sup> In addition, because the component loans in a subprime MBS were risky, they had higher interest rates than prime loans. This higher rate of return was passed through to investors, meaning that AAA MBS bonds received higher interest rates than many other governmental or corporate bonds with the same rating.<sup>379</sup>

AAA-rated private MBS became extremely attractive investments. They were abundant and paid relatively high rates of interest and investors needed exactly that. As Benmelech and Dlugosz note, despite high "institutional demand for highly rated securities... the supply of highly rated single-name securities is fairly limited. For example, only five nonfinancial companies and a few sovereigns had AAA ratings as of 2007."<sup>380</sup> The institutional demand for these securities derived in part from risk aversion among large investors like pension funds. It also has to do with so-called "regulatory capital arbitrage."<sup>381</sup>

Banks like to hold loans on their balance sheets. Loans are assets, future income streams that they can borrow against. If a bank can show that it will receive a certain amount of money in payments to a loan in the future, it can itself borrow lump sums up front from other banks or the central bank based on that collateral. However, under the

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<sup>378</sup> United States, *Financial Crisis Inquiry Report*.

<sup>379</sup> Ibid.

<sup>380</sup> Benmelech and Dlugosz, "Alchemy," 631.

<sup>381</sup> United States, *Financial Crisis Inquiry Report*, 100. The label is a misnomer, as I explain below.

Basel Accords, whole loans, especially risky subprime loans, require banks to hold back a relatively large proportion of their cash (around 5%) to cover potential losses.<sup>382</sup> Banks would rather have as little capital in reserve as possible so that they can lend and receive fees and interest on those funds. AAA-rated bonds are weighted by the Basel Accord system as less risky. Thus, by simply switching out a portfolio of whole, subprime loans for AAA-rated MBS (and recall that subprime deals usually yielded about 80% AAA bonds), a bank could reduce its regulatory capital, the amount of funds it had to retain to cover potential losses, by as much as 20%.<sup>383</sup> Banks still had loan collateral on their books in the form of MBS, but they freed up a significant proportion of capital previously held for losses. This practice is known as regulatory arbitrage because it compares the regulatory treatment of one asset to that of another and in making the exchange frees up regulatory capital for profit making activities. However, this exchange is not an actual arbitrage trade as it only puts previously static funds into flow rather than capturing new value; but it provided an incentive to banks to securitize their subprime loans and then buy AAA-rated subprime MBS.

Thus, there was a robust appetite among investors and banks for MBS. This appetite in turn fueled the boom in mortgage borrowing. As investors demanded more securities, lenders relaxed mortgage-underwriting standards, leading to such “dubious loans” as the NINA loan (“no asset no income” loan for which a borrower didn’t have to

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<sup>382</sup> Ibid.

<sup>383</sup> Ibid.



prove ownership of any assets or income).<sup>384</sup> The growth of private MBS in the 1990s and early 2000s also fueled the resecuritization of mortgage-backed securities into CDOs. As the authors of the *Financial Crisis Inquiry Report* explain, the AAA-rated MBS bonds were easy to sell because of their high rating and relatively higher yield than other bonds. But “despite their relatively high returns, tranches rated other than triple-A could be hard to sell” due to their higher exposure to default risk on the underlying loans.<sup>385</sup> CDOs were constructed precisely from these lower rated bonds.

Benmelech and Dlugosz’s 2009 article in the *Journal of Monetary Economics* that examined the rating of CDOs observed that CDO collateral pools most often included bonds rated B+ and B, far riskier designations than AAA.<sup>386</sup> The excess supply of low rated MBS from the trillions of dollars in subprime securitizations taking place in the early 2000s (between 2001 and 2006 more than \$2.5 trillion worth of subprime loans were originated and close to three quarters were securitized into MBS) fed into the rise of CDOs.<sup>387</sup> CDO creation also stimulated further mortgage lending. The authors of the FCIC argue that CDO managers were so aggressive in seeking out low rated MBS that

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<sup>384</sup> “355: The Giant Pool of Money,” *This American Life*, WBEZ Chicago, Chicago Public Media, produced by Ira Glass (May 9, 2008), radio, [www.thisamericanlife.org/radio-archives/episode/355/the-giant-pool-of-money](http://www.thisamericanlife.org/radio-archives/episode/355/the-giant-pool-of-money). Floyd Norris, “A Bad Loan by Any Other Name,” *New York Times*, November 23, 2007, <http://www.nytimes.com/2007/11/23/business/23norris.html>.

<sup>385</sup> United States, *Financial Crisis Inquiry Report*, 127.

<sup>386</sup> Benmelech and Dlugosz, “Alchemy.”

<sup>387</sup> Dwight Jaffee, Anthony W. Lynch, Matthew Richardson, and Stijn Van Nieuwerburgh, “Mortgage Origination and Securitization in the Financial Crisis,” in *Restoring Financial Stability: How to Repair a Failed System*, eds. Viral V. Acharya and Matthew Richardson (Hoboken, N.J.: John Wiley & Sons, 2009), 68.

they bid up prices on the securities, incentivizing mortgage originators to lend even more (and thus increasing risky mortgages like the NINA).<sup>388</sup> By 2004, half of the collateral in multi-sector CDOs was comprised of low rated MBS.<sup>389</sup>

CDO deals then delivered again typically around 80% AAA-rated securities even though they were based on high-risk, high-yield collateral pools. The same investors eager for AAA-rated MBS purchased AAA-rated CDOs as well. The securitization of subprime mortgages, first into MBS and then again into CDOs, created a feedback loop in which demand for AAA-rated securities from banks and investors combined with demand for mortgage loans from homebuyers to stimulate more and more securitization.

Securitization of mortgages by private banks was touted in the years prior to the financial crisis as an important risk-transfer mechanism that allowed investors hungry for risk and potential return to have access to subprime mortgages.<sup>390</sup> Securitization was therefore thought to reduce the risk that a major decline in housing prices would have a major impact on any one part of the economy. If the risk of default was spread out to many different investors, from hedge funds to pensions, the impact of a significant adverse event, such as the bursting of the housing bubble, would also be spread out and therefore be less intense. However, capital requirements led banks to perform

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<sup>388</sup> United States, *Financial Crisis Inquiry Report*, 133.

<sup>389</sup> *Ibid.*, 130.

<sup>390</sup> Viral V. Acharya and Phillip Schnabl, "How Banks Played the Leverage Game," in *Restoring Financial Stability: How to Repair a Failed System*, eds. Viral V. Acharya and Matthew Richardson (Hoboken, N.J.: John Wiley & Sons, 2009).

“regulatory capital arbitrage” by making poor quality loans in order to garner fees, and then securitizing them and selling them off to other banks. Banks passed these securities back and forth amongst themselves, holding a larger concentration of AAA-rated MBS than any other investor group.<sup>391</sup> When housing prices started to decline and defaults began reaching AAA-rated tranches, banks were caught without capital to cover their losses, resulting in serious capital shortages and in the cases of Bear Sterns and Lehman Brothers, bankruptcy.

Securitization was profitable for a number of parties. Investors received higher returns than other AAA-rated investments; lenders collected fees for originating loans; and banks earned fees for issuing the MBS and CDO bonds and freed up regulatory capital. Still, regulatory arbitrage, investor demand and fees for originating and securitizing loans were not the true animating forces at the center of the securitization feedback loop. Instead, it was arbitrage. Several observers noted that arbitrage transactions began to outpace balance sheet transactions around the turn of the millennium. According to Laurie S. Goodman in the *Journal of Derivatives*, “All of the 22 synthetic CDOs<sup>392</sup> rated by Moody’s in 1999 were bank balance sheet transactions. In 2000, of the 48 synthetic deals rated by Moody’s... 16 had other motivations” i.e. they

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<sup>391</sup> Ibid.

<sup>392</sup> According to Goodman, “in a synthetic CDO, the CDO entity does not actually own the pool of assets on which it retains the risk. This is because the building block for synthetic securitizations is a credit default swap, which allows institutions to transfer economic risk, but not the legal ownership of underlying assets.” Laurie S. Goodman, “Synthetic CDOs: An Introduction,” *The Journal of Derivatives* 9, no. 3 (Spring 2002): 61. I purposefully decided to avoid the issue of synthetics in this chapter for simplicity’s sake. However synthetic arbitrage CDOs also capture value through a net excess spread.

were “arbitrage deals.”<sup>393</sup> Likewise, Kothari also notes the “explosive growth in arbitrage CDO issuance... after 1995.”<sup>394</sup> The timing of this growth corresponds with the greatest spike in subprime lending and housing prices, confirming that it was the arbitrage, not the appetite of borrowers or investors that drove the greatest boom in securitization in the lead up to the financial crisis. Arbitrage is the goal that animates finance, and this goal took over the mortgage securitization process in the early 2000s, ramping it into the overdriven machine that eventually collapsed in the financial crisis.

### The Axiomatic

Describing the arbitrage in subprime mortgage CDOs as an apparatus of capture disqualifies the idea that arbitrage profit is a mathematical error as financial economics suggests. However, it is also not enough to point out that borrowers saddled with exorbitant interest rates and the investors who received the lower interest rates of super safe AAA-rated securities were both in some ways exploited by the arbitrageurs who captured the difference. Instead, labeling this trade as capture raises the question of what social relations and axioms enabled that capture and differentially delivers profits to arbitrageurs. Capture is produced and reinforced by the axiomatic, the set of social relations and regulative axioms that allow it to function through the contradictions of capitalism. To understand the functioning of financial capitalism, then, one must describe these social relations and axioms. Although the capture at the heart of the subprime crisis has remained hidden within the rhetorics of irresponsible borrowers, too-

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<sup>393</sup> Ibid., 62.

<sup>394</sup> Kothari, *Securitization*, 425.

big-to-fail banks and financial deregulation, understanding the subprime mortgage CDO arbitrage is not the hardest task. As with the capture of surplus labor time in industrial capitalism, the calculation of the spread between what is bought and what is sold is relatively simple. The difficult task is teasing out the axioms that allow this capture to occur. It is to this final task that I now turn.

### *Social Relations*

Before identifying specific axioms, I will describe the social relations that emerged out of the historical context described above. These social relations were built upon the axioms and so the axioms will be more obvious once these relations have been traced. I have described the symbiosis between borrowers, banks, investors and CDO originators throughout this chapter. Borrowers received relatively easy debt, characterized by little or no down payment and/or little or no documentation. Banks received fees for origination and securitization, and also reduced their regulatory capital by holding AAA-rated MBS and CDO securities. Other investors got highly rated, “super safe” investments with relatively high returns. And arbitrageurs got billions in profits.

However, two social relations in and around the subprime CDO market stand out as crucial to the subprime mortgage CDO apparatus of capture. First, the relation between borrowers and CDO originators, although seemingly separated by many steps and intermediaries, was an important but complicated one. Popular accounts of the financial crisis often bemoaned the uneven relationship between “Main Street and Wall Street.” In the immediate aftermath of the crisis, popular discourse revolved around outrage at the bank bailouts and the swift recovery of financial markets as compared to

ongoing defaults, declining housing prices and unemployment. However, the relation between high-powered banks and financial firms on the one hand and individual investors and borrowers on the other is not simple or straightforward, and the articulation of mortgage-borrowers into the securitization process is complicated as well. Borrowers provided the raw material for the production of MBS and CDOs. Their debt to banks became the collateral for multiple deals. In some ways, these borrowers served arbitrage capture the way that laborers serve surplus labor capture. The high interest debt payments of subprime borrowers fed the excess spread in CDO deals that accrued to equity holders as arbitrage.

However, the relation is more complicated than this simple analogy suggests. Borrowers' payments fed CDOs until the crisis, but their debt also fueled a form of consumption heretofore impossible for "Main Street" in the form of ever larger and more luxurious homes. This may appear to be a sort of bait and switch strategy of the capitalist class that lured borrowers into debt peonage so that their labor in the capitalist machine would be ensured and newly exploited. And yet the financial crisis resulted not in millions of American homeowners being shackled to their exorbitant debt, but the opposite, waves of default in which "underwater" borrowers walked away from their homes and their debt. By one estimate, "the percentage of subprime loans that defaulted after 12 months was 14.6 percent for loans made in 2005, 20.5 percent for loans made in 2006, and 21.9 percent for loans made in 2007."<sup>395</sup> This is not to say that

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<sup>395</sup> Gene Amromin and Anna L. Paulson, "Default Rates on Prime and Subprime Mortgages: Differences and Similarities," *Profitwise: News and Views*, Federal Reserve Bank of Chicago (September 2010), 1.

mortgage defaults were without penalty for the borrowers. Credit reports are required now not only for the everyday borrowing that is required for the provision of welfare in the contemporary conjuncture, but also for renting and applying for many jobs. And yet, the raw material for the mortgage securitization boom, the borrowers, did not continue to deliver arbitrage profits by whatever means necessary, but instead withdrew from the machine, leading to losses in the financial sector as well.

The second crucial relation was between credit ratings agencies and other market participants. Credit ratings have been relied upon by financial regulators and investors since the 1930s, but the Securities and Exchange Commission (SEC) officially designated Moody's, S&P and Fitch as nationally recognized statistical rating organizations in 1975.<sup>396</sup> Financial market participants use credit ratings as a shortcut to risk analysis, assuming a certain level of risk inheres in securities with a certain rating. This assumption justifies the interest rates that investors will find acceptable. Low rated securities must compensate investors with high returns since their rating indicates they carry higher risk. High rated securities are low risk and thus may deliver lower returns. The extent of ratings agencies' influence over financial participants decisions cannot be understated. According to Benmelech and Dlogsuz,

at least 44 SEC rules and forms incorporated agency ratings as of June 2008. Minimum capital requirements at banks, insurance companies, and broker-dealers, depend on the credit ratings of the assets on their balance sheets. Pension funds, a \$10 trillion source of capital in the United States, also face

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<sup>396</sup> Matthew Richardson and Lawrence J. White, "The Ratings Agencies: Is Regulation the Answer?," in *Restoring Financial Stability: How to Repair a Failed System*, eds. Viral V. Acharya and Matthew Richardson (Hoboken, N.J.: John Wiley & Sons, 2009).

ratings-based regulations... This matrix of regulation creates institutional demand for highly rated securities.<sup>397</sup>

The ubiquity of agency credit ratings in the assessment of and communication about financial securities produced a material and cultural dependence on them; ratings became a common sense signifier of risk. And risk is a taken-for-granted correlate of acceptable return.

The importance of credit ratings agencies was already well established in financial markets before the fastest growth in subprime CDOs, but this importance, combined with the models the agencies used to rate CDOs, actually created the relation of equivalence and difference that allowed capture in the subprime mortgage CDO arbitrage. The Gaussian copula formula utilized by credit ratings agencies did not run scenarios of nationwide defaults on mortgages because, since the creation of the modern mortgage after the Great Depression, no such event had occurred. Instead of anticipating and simulating this possibility and rating CDOs with that scenario in mind, ratings agencies used the Gaussian copula, which measured default risk using historical CDS prices. These prices represented the opinions of investors on the likelihood of default. In the environment of rapidly increasing housing prices, default looked highly unlikely. Even if a homeowner lost her job, she could sell her home at a profit to the next buyer with a NINA mortgage. Thus, ratings agencies based their ratings of CDOs not on the possibility of default in the future, but the lack of default in the recent past. In a regulatory environment in which each new president was making homeownership easier and easier, this was a safe assumption to make. The Gaussian copula allowed ratings

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<sup>397</sup> Benmelech and Dlogsuz, "Alchemy," 630-1.



agencies to rate 80% of a CDO with a collateral pool with an average rating of B as AAA, just as safe as Microsoft bonds or U.S. Treasuries.

Some have cited “ratings shopping” as the cause of the high ratings given to CDOs.<sup>398</sup> Issuers of MBS and CDOs pay credit rating agencies to rate their deals. Richardson and White explain that this “issuer pays” model creates incentives for issuers to shop for the best rating among the three major agencies (S&P, Moody’s and Fitch).<sup>399</sup> Credit ratings agencies have been blamed for offering high ratings to attract business and thus saddling investors with risky securities.

The financial crisis seems to have born out this suspicion with the massive downgrading of MBS and CDOs from AAA to lower ratings (resulting in the write-downs that caused a downward spiral to bankruptcy or bailout for so many banks and financial firms). However, the suggestion of avarice among raters obscures their more basic role in the financial axiomatic as custodians of the relationship between risk and return. The dependence of financial market participants on credit ratings agencies meant that the credit ratings given to CDO securities not only endorsed their safety, but justified the difference in the interest rates between the collateral and the issued securities. Investors assumed an unproblematic correspondence between a credit rating agency’s assigned rating of a CDO tranche and its riskiness, which led those investors to accept lower returns for AAA-rated CDO securities. The lower returns compared to the high

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<sup>398</sup> Aaron Lucchetti and Serena Ng, “Ratings Shopping’ Lives as Congress Debates a Fix,” *Wall Street Journal*, May 24, 2010, <http://www.wsj.com/articles/SB10001424052748703315404575250270972715804>.

<sup>399</sup> Richardson and White, “The Ratings Agencies,” 104.

interest paid to the collateral constituted the spread and the arbitrage profit captured by equity holders.

### *Axioms*

Axioms are taken-for-granted statements that direct flows of value towards and through the process of capture. According to Grossberg et al., axioms accomplish this task by regulating not the flows themselves, but social mattering and obligation.<sup>400</sup>

Obligation is stripped away in the processes of decoding, unitization and flow, leaving a purely mathematical equation of comparison and capture. But this evacuation of social meaning is dangerous. Capitalism can only continue to function if social obligation is strategically reintroduced. Axioms reintroduce flows of social obligation in ways that enable rather than thwart capture. Axioms manage the inherent contradictions of capitalism. In industrial capitalism, capture requires the evacuation of social mattering such that workers are transformed from social individuals into flows of abstract labor. But workers cannot be fully transformed into automata as they must continue to reproduce themselves and consume. Thus, axioms “dealing with the working class, employment, union organization, social institutions” were all necessary for, not opposed to, capture.<sup>401</sup>

A similar contradiction pervades the subprime mortgage CDO apparatus of capture. The apparatus of capture required a continuously growing stream of debt that could be decoded, unitized and put into flow as raw material for comparison and

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<sup>400</sup> Grossberg et al., “Conjunctural Theory.”

<sup>401</sup> Deleuze and Guattari, *A Thousand Plateaus*, 462.

capture. The mass of individuals who had to provision themselves with housing offered such an opportunity, but the social and cultural mattering surrounding housing following the Great Depression did not support mortgage borrowing on such a large scale.

Mortgages were dangerous and expensive and the social meaning of indebtedness made repayment a strong obligation. Economic prudence dictated that taking out loans that one could not repay was a moral failure and a social betrayal.

The subprime CDO arbitrage could only occur if the contradiction between the need for ballooning high-risk debt and the social obligation to repay were managed. More and more risky debt was the raw material for capture, but default would destroy the entire machine, causing losses to the equity tranche that would immediately wipe out profits and sour investors on MBS and CDOs in the future. An axiom that maximized debt and minimized default was the key to the success of the CDO arbitrage. And just such an axiom was instantiated over the crucial period beginning in the 1970s. The axiom that “the provision of security must be achieved by risk”, which drove the development of everyday finance described above, was one of the most important axioms enabling the subprime mortgage CDO arbitrage. To explain this axiom, I must revisit the role of the U.S. government in promoting mortgage-funded homeownership.

Deleuze and Guattari pointed out that the state plays an important role in the manufacture of axioms, and so it is unsurprising that the U.S. government did much to promote the social mattering of mortgage-funded homeownership. Buying a home with debt in the U.S. became easier and cheaper with each new government initiative, but it still required taking the risk that one would be able to maintain income and payback the

loan over the long 30-year term. That risk was not worth taking for many, especially poor potential borrowers; the cost of homeownership was simply too high and the social obligation to repay too strong. The injunction to secure one's everyday needs and future through risk stripped this obligation and replaced it with the calculation of risk and return.

The axiom to risk for security was not an ideological charge, but from the 1970s on became a foundational principle of American life as a part of what may be termed the neoliberal project. The welfare state was gradually reduced through reductions in federal poverty programs including housing assistance at the same time that individuals were invited to secure their own welfare through investing and borrowing.<sup>402</sup> The risk of borrowing was necessary in light of the dearth of affordable housing initiatives and the mortgage incentives provided by the state. But it was also the gateway to security through investment in an appreciating asset. As housing prices began to climb more rapidly in the 1990s, mortgage borrowing was touted as a way to not only provide for everyday housing for more and more, and poorer and poorer, borrowers, but also as a way to supplement stagnating wages by building quick equity. Default was no longer a betrayal of social obligation, but a risk calculation that, in light of rising home prices and lax lending regulation was worth taking.

The axiom to risk for the provision everyday life managed the contradiction between the requirement of debt for securitization and the social obligation to repay debt by reintroducing obligation in another form. The social bonds of obligation were

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<sup>402</sup> "HUD Historical Background," HUD.gov, May 18, 2007, <http://www.hud.gov/offices/adm/about/admguides/history.cfm>.

destroyed by the production of decoded, unitized mortgage debt. The amount of risky debt needed for securitization meant that many mortgages could no longer represent an obligation to pay the community bank for assistance in becoming the owner of a family home, but were instead robo-signed debt instruments used for home buying as investment for borrowers as well as the capture of exceptional profits for arbitrageurs. The social mattering of a home as shelter and dwelling was to some extent evacuated. But securitization was not only enabled but also threatened precisely by this evacuation. Mortgage debt soared, but mass mortgage defaults would, as they did during the financial crisis, bring the entire securitization machine down. Something had to obligate borrowers to repay. The axiom of risk for security managed this threat by reintroducing another form of obligation: that you must put your money to work.

Under the axiom to risk for security, renting was no longer living within one's means but throwing money away. Taking out and properly servicing a mortgage meant allowing one's money to contribute to the growth of equity. Repayment was necessary in order to protect one's credit score and to thus be able to risk for profit again in the future. Speaking about the moral consequences of the rise of securitization in finance, Randy Martin argues that market logic was replaced by the logic of risk and the figure of reason is no longer the entrepreneur but the arbitrageur. The difference between the two, he suggests, relates directly to the concept of property: "The entrepreneur respects the boundary between property and speculation. The arbitrageur can no longer."<sup>403</sup> The axiom to risk for security calls borrowers to see their homes as leveraged (i.e. bought

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<sup>403</sup> Martin, *Empire of Indifference*, 22.

with borrowed money in the form of mortgages), speculative investments. Like arbitrageurs, homebuyers must not be in it for the property, but for the return. Failure to speculate was not just stupid, but irresponsible. And default was similarly illogical as a tarnished credit history would foreclose future borrowing-for-gain opportunities. This axiom eventually failed, at least partially and for a short period of time, under the pressure of truly impossible to repay subprime loans at the beginning of the crisis. But there is another axiom that fared far better.

The axiom to risk for security worked on the edges of the financial system, managing the circuits of debt that tied everyday borrowers to financial capture. It can be understood as a correlate of a much more fundamental axiom that is evident in the social relations of credit ratings agencies to other financial market participants. As I have explained, credit ratings are accepted as common sense signifiers of risk in the financial system. Investors accept the ratings as a basis for acceptable return and regulators accept them as an objective measure of risk, backed as they are by sophisticated mathematical models. These models proved inadequate to the task of truly measuring default risk, but they were not axioms. In fact, the models were built on an axiom that made the impossible task of predicting risk an intelligible way to establish return, the axiom of “risk and return.”

Consider a mortgage-backed security. Return is a function of the payments to the underlying collateral minus fees. It doesn't have to be calculated, but is an objective fact. The MBS is based on a pool of loans that will receive a certain amount of payments. There is a subtle form of social obligation present in the way a MBS passes

these payments through. Investors are getting what they pay for with an MBS. Arbitrage CDOs, on the other hand, are only possible because of a contradiction between the return based on the payments to the underlying collateral, a return that should be passed on to investors, and the return that is offered to investors based on the credit rating of the resultant CDO tranche. The only way for the arbitrage profits to be constituted is for the obligation to pass profits through to be evacuated and a different return to be calculated. The axiom of risk and return provides the basis for that calculation and thus manages the contradiction. As suggested in the previous chapter, the price, or in this case the interest rate paid on CDOs, is determined by context entirely hijacked by the axiomatic, primarily the axiom of risk and return.

The axiom of risk and return dictates that profits derive not from the objective returns of an investment, but to a measure of its risk. This axiom supports arbitrage as the form of financial capture. Arbitrage requires a relation of equivalence between two securities that have different prices. Equivalence is, as I argued in chapter two, created. Singularities must be brought into a relation of equivalence by deterritorialization and decoding/unitization that strips away the unique mattering of these singularities and replaces it with a uniform code that marks them as the same. In contemporary finance, this code is risk. If two securities have the same risk profiles, whether measured as variance, implied volatility or credit rating, they must deliver the same returns. If their returns differ, arbitrage allows capture of that difference.

The entire edifice of financial economics is built upon this one notion first posed by economist Frank Knight in the 1920s. According to Knight, "Profit arises out of the

inherent, absolute unpredictability of things.”<sup>404</sup> In the discourse of financial economics, risk refers to the potential for a market participant to incur a monetary consequence from the uncertain unfolding of events, such as an increase or decrease in the value of a share of stock. Risk and return are correlated; the higher the risk, the higher the return. Within financial discourses, risk is not all bad. Risk is something to be managed, with techniques like diversification and hedging, but not banished entirely, as it is necessary for return.

The axiom of risk and return is built into all the major theories of financial economics. Risk is not an observable variable, as it is a characteristic of the unfolding of an uncertain future. The financial theories described in chapter one all approximate risk with observable phenomena. Mean-variance valuation describes the relationship between the historical mean as a measure of return and historical variance as a measure of risk. The Capital Assets Pricing Model (CAPM) relates the return that can be expected on any stock to a systematic risk factor, beta, which is calculated using historical variance as the measure of risk. Relative valuation is exemplified in the Black-Scholes-Merton options pricing formula that established the necessary relationship between stock prices, option prices, and risk in the present, without appeal to past variance. But the BSM is not generally used to price options, but rather to back out a measure of risk after inputting all the other variables. “Implied volatility,” the risk variable output of the BSM is considered one of the most important measures of financial activity.

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<sup>404</sup> Knight, *Risk, Uncertainty*, quoted in Rubenstein, *A History*, 51.



However, financial models cannot actually predict future states of the world as the history of financial markets has demonstrated time and again. Nassim Taleb has described those events so wildly outside of financial models' predictions as Black Swans.<sup>405</sup> Financial economists speak of "fat tails" as a way to account for events that are practically impossible in "normal" pricing models.<sup>406</sup> The stock market crash on Black Monday in 1987 is one such event. Economists like to point out that it was a "20 sigma event" meaning that its probability lies 20 standard deviations away from the center of the price distribution.<sup>407</sup> In other words, typical financial models would predict a crash of that magnitude to occur less than once in the history of existence. The Guassian copula formula failed to predict the true risk of wide scale default because like all financial models of risk, it attempts to measure an immeasurable phenomenon. Risk is a concept that underpins all financial activity, but it is also fundamentally arbitrary.

The relation of risk and return replaces the social obligation to give investors their due with the obligation to deliver "risk-adjusted returns," profits that are appropriate for the risk attributed to the investments. Neither historical variance nor present volatility of returns can predict the future. So the axiom of risk and return actually replaces the obligation to give investors their due with the obligation to deliver return in accordance with an arbitrary calculation of an impossible-to-know future. While many have

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<sup>405</sup> Nassim Nicholas Taleb, *The Black Swan: The Impact of the Highly Improbable* (New York: Random House, 2007).

<sup>406</sup> Fox, *Myth*, 133.

<sup>407</sup> Vinod Chandrashekar, "October's Market Demons: The '87 Stock Market Crash and Likelihood of a Recurrence," *Risk and Rewards Newsletter*, Society of Actuaries no. 31 (October 1998): 3.

commented on the supposed avarice and duplicity of ratings agencies that gave AAA ratings to deals obviously backed by much riskier collateral, it is the axiom of risk and return and the arbitrariness of risk calculations that even made such an action possible. The risk and return axiom is so fundamental to finance that, while credit rating agencies' risk assessment models have been critiqued and challenged following the financial crisis, the notion that risk and return are in fact related and that this relation is the basis of profitability has not.

The axiom of risk and return is a primary statement, a deep foundation of financial capitalism and multiple apparatuses of capture, including the subprime mortgage CDO arbitrage. Challenging the idea that risk and return are directly proportional is nonsensical in the system of finance; it is a challenge that leaves the system undefined and unintelligible. This is the power of the axiom; even more than hegemonic ideology, it is so taken for granted that critiquing it does not draw ire, but only confusion.

#### Conclusion: The Crash

The failure of the subprime CDO machine was connected in several ways to the financial crisis that began in 2007 and continues to resonate in many ways today. The defaults that caused the initial credit crisis in financial markets and the wave of write-downs and bankruptcies among financial firms also erased the arbitrage profits of arbitrage CDOs. After the crisis, new issuance of CDOs fell from a height of \$520 billion in 2006 to just \$4 billion in 2009.<sup>408</sup> The proverbial jig was up. The crisis constituted a

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<sup>408</sup> "Global CDO Issuance and Outstanding."

vast shock to the functioning of capitalism, not unlike the Great Depression, which Deleuze and Guattari credit with remaking the axiomatic of industrial capitalism.<sup>409</sup> But in the years since the crisis waned, it appears that financial capitalism has fared far better than industrial capitalism did in the years after the Depression. Profits to the financial sector have soared back to their highest levels ever. Many of the instruments that played important roles in the subprime mortgage CDO arbitrage and contributed to the crisis, from CDS to CDOs have come back into common usage. For example, despite the failure of the Gaussian copula formula to foretell the housing bubble's burst, CDS are still considered a good shorthand measure of the risk of bonds.<sup>410</sup> CDOs are also back, growing from their 2009 levels back to over \$100 billion dollars of new issuance in 2014, although this growth no longer includes CDOs with subprime mortgage collateral.<sup>411</sup>

Axiomatics are sites of struggle over capitalism. Because axioms manage flows by reintroducing obligation, "there is always something—something affective—that is not captured by the axiomatic... a lived experience of obligation is always threatening to disrupt and even overwhelm the axiomatic, and this defines the axiomatic as a site of constant struggle and transformation."<sup>412</sup> The financial crisis can be understood as a

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<sup>409</sup> Deleuze and Guattari, *A Thousand Plateaus*.

<sup>410</sup> The credit default swap index, CDX, was often referenced in class discussion as a way to gauge default risk while I was taking finance electives in the MBA program at Kenan-Flagler Business School between 2010 and 2012.

<sup>411</sup> "Global CDO Issuance and Outstanding."

<sup>412</sup> Grossberg et al., "Conjunctural Theory," 327.

moment of disruption. The axiom to risk for security and the axiom of risk and return worked together to enable capture through arbitrage of subprime mortgage CDOs, but they also promoted the very thing that threatened the apparatus of capture the most: default. The level of debt needed for capture also overwhelmed the ability of borrowers to repay. Repayment was contingent on increasing housing prices, and when they began to fall, the old social obligation to honor debts was not there to buffer the crash as it had been stripped away by the new axiom that privileged the obligation to put money to work.

This disruption of the axiomatic presented a moment of rupture in which the axioms could be struggled over. A now well-worn debate erupted in the aftermath of the bursting of the housing bubble, laying blame first on subprime borrowers but then more and more on the mortgage originators, bankers and hedge fund traders as details of the mortgage securitization machine emerged. Anger was directed at the bailout of banks and banks' foreclosure practices (such as the robo-signing scandal) and moral outrage characterized the blaming of each new villain (the film *Inside Job* suggests that a powerful cabal of regulators, banks and traders conspired to perpetrate the crisis).<sup>413</sup>

However, accusing individuals or even an entire system of greed isn't exactly a revolutionary action. The question of whether any response to the crisis actually challenged the axiomatic of financial capitalism remains open. By way of conclusion, I'd like to suggest that while the first axiom to risk for security was at least addressed by the debate surrounding the crisis, the second axiom of risk and return remained hidden and

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<sup>413</sup> *Inside Job*, directed by Charles Ferguson (2010; New York: Sony Pictures Classics, 2011), DVD.

was further entrenched by responses to the crisis. Future challengers to the dominant practices and consequences of financial capitalism would do well to focus attention on that axiom.

One part of the debate surrounding the financial crisis that addressed the axiom to risk for security was the discourse about the perils of indebtedness and admonishments that the crisis was caused by people “living beyond their means.”<sup>414</sup> Following mass defaults on mortgages, the popular discourse surrounding the crisis blamed ballooning consumer debt in the decades before the crisis on the propensity of Americans to live beyond their means. The discourse quickly took hold and, until attention turned to the risky practices and bailout of the big banks, seemed like a good explanation of rising defaults on large swanky “McMansion” homes.<sup>415</sup> The “living beyond their means” hypothesis likely found purchase because it resonated with a much older discourse that Lendol Calder calls “the myth of lost economic virtue.”<sup>416</sup> Taking hold in the early years of the twentieth century, the “myth” suggests that debt is a new development that has corrupted the core American value of thrift. According to Calder, despite the ancient history of debt, each new generation saw the growth in consumer debt as a revolutionary loss of economic virtue and a slide into moral decline.

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<sup>414</sup> David Von Drehle, Jay Newton-Small and Michael Scherer, “The Financial Crisis: Who Can Lead Us Out of This Mess?” *Time* 172, no. 14 (October 6, 2008): 32-36.

<sup>415</sup> Andy Sullivan, “Foreclosures Come to McMansion Country,” *Reuters.com* (Leesburg, V.A.), April 7, 2008, <http://www.reuters.com/article/2008/04/07/us-usa-housing-mcmansions-idUSN0130613220080407>.

<sup>416</sup> Lendol Calder, *Financing the American Dream: A Cultural History of Consumer Credit* (Princeton, N.J.: Princeton University Press, 1999), 23.

The “living beyond their means” discourse smoothly transitioned from an explanation of mass default and foreclosures to a justification of fiscal austerity in the U.S. and European countries involved in the sovereign debt crisis. Why is Greece in trouble? The BBC answered flatly, “Greece was living beyond its means even before it joined the euro.”<sup>417</sup> Public expenditures on wages, pensions and healthcare were viewed in the same way as “McMansions”, as immoral luxury expenditures. The “living beyond their means” explanation of the crisis was not completely dismissed when details of the role of lending practices and risky financial practices gained more exposure, but its incisiveness has waned as borrowing has begun to rise to pre-crisis levels.<sup>418</sup>

The “living beyond their means” moment in the post-crisis debate actually struck out at the heart of the axiom to risk for security. A successful call to reject debt would hinder debt-based apparatuses of capture, including the subprime CDO capture, but also other forms of arbitrage that rely on the production of more and more debt securities of other kinds, from student loans to credit cards, for comparison. This is the premise of the *Strike Debt* initiative that came out of Occupy Wall Street. Without addressing the precise mechanisms by which debt is a source of profit, *Strike Debt* calls for cutting the circuits that connect everyday borrowing to financial markets:

Debt is a tie that binds the 99%. With stagnant wages, systemic unemployment, and public service cuts, we are forced to go into debt for the basic things in life — and thus surrender our futures to the banks. Debt is [sic] major source of profit

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<sup>417</sup> “Eurozone Crisis Explained,” Business, BBC News, November 27, 2012, <http://www.bbc.com/news/business-13798000>.

<sup>418</sup> “Giant Pool of Money.”

and power for Wall Street that works to keep us isolated, ashamed, and afraid. Using direct action, research, education, and the arts, we are coming together to challenge this illegitimate system while imagining and creating alternatives. We want an economy in which our debts are to our friends, families, and communities — and not to the 1%.<sup>419</sup>

While this call to action correctly diagnoses the role of debt in many financial apparatuses of capture, and the evacuation of the social obligation to repay in favor of the axiom to risk for security, it is at its base a deeply conservative proposal. Debt rejection calls for a return to the social obligation that is stripped away in the process of capture, but in so doing mistakes the myth of lost economic virtue for truth. Debt rejection is just that, a refusal to propose a new axiom that would transform capitalism. *Strike Debt's* most successful campaign, *Rolling Jubilee*, which infiltrates the network of debt collectors to buy discounted debt and thereby “liberate debtors” works within the existing axiomatic to provide relief to some debtors, but does nothing to change the context that allows financial capture to function as it does.<sup>420</sup>

Activists applaud *Strike Debt* and *Rolling Jubilee* for doing *something*. The axiom to risk for security has at least come under scrutiny since the financial crisis, while the axiom of risk and return, a more fundamental and deeply entrenched principle of financial capitalism, has not. The ratings agencies that function as the guardians of this axiom came under a great deal of scrutiny for rating CDOs so highly. However, the relation between risk and return has not even been addressed. In fact, the *Dodd Frank Wall Street Reform and Consumer Protection Act of 2010* further entrenches the risk

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<sup>419</sup> Strike Debt, <http://strikedebt.org/>.

<sup>420</sup> Rolling Jubilee, <http://rollingjubilee.org/>.

and return axiom by adding new layers of regulation on ratings agencies which will make their credit rating judgments appear more rigorous and trustworthy.<sup>421</sup>

Financial capitalism is characterized by a form of capture, arbitrage, and a complex axiomatic that makes that capture possible. While the capture, since it appears as exploitation, is the most visible part of the capitalist machine, it is also the simplest. A simple calculation of equivalence, difference and excess sums up the process of capture. The axiomatic, however, is more important and difficult to assess. Axioms are not statements of meaning, but primary formulas that found the system of financial capitalism. The acceptance by financial market participants and critics alike of the axiom of risk and return is evident in the unproblematic adoption of the language of risk into critical assessments of finance. And in the aftermath of the greatest financial crisis since the Great Depression, no challenge to this axiom has been broached. Struggles against financial capture cannot lose sight of the form that capture takes in arbitrage. But they must, more importantly, challenge the notion of risk as a correlate of return.

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<sup>421</sup> “Credit Ratings Agencies,” Dodd Frank Spotlight, *U.S. Securities and Exchange Commission*, September 5, 2014, <http://www.sec.gov/spotlight/dodd-frank/creditratingagencies.shtml>.



## CONCLUSION: THE EMPEROR IS NAKED

The aim of this dissertation is to call for and contribute to a cultural studies of finance: an attempt to construct a new understanding of what finance is and what finance does from a critical perspective that challenges financial economists' esoteric narratives and seeks to contextualize financial value through explorations of its social and cultural foundations rather than accept it as a "purely" economic category. In some ways, the research presented here falls short of that goal by neglecting culture as the quotidian practices and relationships that make up the "whole way of life" of finance.<sup>422</sup> Nor is the analysis oriented towards uncovering, defining or describing in ethnographic terms what might be called "arbitrage culture," the practices, habits and desires of traders (whether in financial markets or auction houses, eBay, Craigslist or other contexts) who carry out arbitrage. I touch on the relationships that make up arbitrage culture in the fourth chapter, where I review the recent history of arbitrage and draw attention to popular criticism and distrust of its practitioners. But I do not give a close account of the culture of arbitrage trading, opting instead to cover broader aspects of American culture surrounding home buying and conventions of financial risk measurement in my analysis of the financial axiomatic, the system of founding statements and social relations that produce and sustain the apparatus of capture of

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<sup>422</sup> Raymond Williams, "The Analysis of Culture" in *Cultural Theory and Popular Culture: A Reader*, ed. John Storey (Athens, GA: The University of Georgia Press, 1998), 52.

arbitrage. An account of arbitrage culture would add necessary depth and new insights to the analysis of the axiomatic, bearing out the axioms and social relations that sustain arbitrage capture.

Examples of this kind of analysis exist. For example, in “Tools of the Trade: The Socio-technology of Arbitrage in a Wall Street Trading Room,” Beunza and Stark explain that the physical orientation of the trading room floor and social interactions between traders are geared towards “generating equivalences” between stocks trading at different prices so that arbitrage can be carried out. In light of the centrality of risk discovered in this dissertation, it would be helpful to see how traders utilize the category of risk in the construction of those equivalences.<sup>423</sup> Robert Wosnitzer’s dissertation, *Desk, Firm, God, Country: Proprietary Trading and the Speculative Ethos of Financialism*, suggests that Weber’s Protestant ethic doesn’t define financialized capitalism so well as a “speculative ethos” that animates financial activity.<sup>424</sup> For Wosnitzer, this ethos emerges out of the “work of arbitrage” as the way that the trader can experience success.<sup>425</sup> The will to succeed through arbitrage may be another important part of the axiomatic. I believe that examining “arbitrage culture” as opposed to the broader analysis of the axiomatic I opt for in this dissertation is a necessary and important part of a cultural studies of finance. This dissertation, however, follows a different path.

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<sup>423</sup> Daniel Beunza and David Stark, “Tools of the Trade,” 373.

<sup>424</sup> Robert Wosnitzer, “Desk, Firm, God, Country: Proprietary Trading and the Speculative Ethos of Financialism” (dissertation, New York University, 2014).

<sup>425</sup> *Ibid.*, 228.

What it does accomplish, though, is answering the appeals for a new type of analysis of economics made by Lawrence Grossberg and Philip Mirowski, who call upon scholars to not take economists at their word and instead investigate the workings of finance critically.<sup>426</sup> The dissertation meets this challenge by focusing on the trading strategy of arbitrage, a central concept in financial economics and a central mechanism of profit making in financial markets. I reject the ambiguous and mystifying definition of arbitrage provided by financial economists, but I do not dismiss financial economics. Instead, I examine the way that arbitrage functions as the conceptual linchpin of financial economics, bringing the contradictions of that system of thought into relief. I pose the question, “where does arbitrage profit come from?” and attempt to formulate an answer. Financial economics conceives of arbitrage as the mechanism that polices the system of financial prices, promoting fairness and autonomy. This focus on the tendency of (some) arbitrage trades to equilibrate prices neglects popular critiques that have been leveled against arbitrage for more than a century that it is cheating or gaming the system. It also means that financial economics doesn’t theorize arbitrage profit at all.

Building on some recent work in the Marxist tradition, I address this aporia by looking at arbitrage as a form of surplus value appropriation. I push this possibility forward by reimagining arbitrage as a form of capture within a new framework for understanding value. Within this framework, value is understood as originating from collective processes for establishing what matters. Value is then transformed into more

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<sup>426</sup> Grossberg, *Cultural Studies*; Mirowski, interview.

concrete forms that ultimately can be captured. My reformulation of arbitrage as capture focuses directly on profit and explains that it is exploitative in a way similar to capitalist surplus labor time appropriation. I further argue that arbitrage profits accrue to those traders who have advantageous differential access to the networks (including high speed trading platforms) and tools (including price-stabilizing derivatives contracts) necessary for carrying out the capture process. Arbitrage is not a fair mechanism for equilibrating prices, but rather a battle among arbitrageurs to secure profits. In fact, the best kind of arbitrage from the perspective of arbitrageurs is money machine arbitrage, trading that relies on structural inequalities in price that are maintained over time allowing for continuously produced profit. Arbitrage in subprime mortgage-backed CDOs, which I examine in more detail, was one such money machine. This is not a conclusion, but the beginning of an analysis that must reconstruct the system of foundational statements and social relations that create the conditions of differential access that enable capture. It is only an examination of this system, which I call the axiomatic, that can yield understanding of the exploitation of arbitrage.

Therefore, my reconstruction of arbitrage culminates with an analysis that examines the axiomatic of the financial apparatus of capture through a particular case: the arbitrage trade in subprime CDOs at the center of the housing bubble preceding the 2007-09 financial crisis. The analysis demonstrates that the arbitrage in subprime mortgage-backed CDOs relied on a foundation of axioms and social relations related to the relationship between risk and return, both in the way that borrowers were “required” to put their money to work purchasing risky mortgages (rather than saving or living

“within their means”) and the way that CDO originators relied on a differential between the calculated riskiness of subprime-mortgage backed securities (MBS) and their CDOs to continuously capture arbitrage profits.

It also demonstrates that the axiomatic is the assemblage that makes or breaks any apparatus of capture. Arbitrage is central to finance because of the strength of the axiomatic that asserts and protects its functioning as natural and appropriate. Central to the financial apparatus of capture, it turns out, is the notion of risk. In the CDO arbitrage, risk was the category that produced arbitrage as a reasonable and appropriate function: citizens needed to take on risky mortgages (rather than saving and renting) to achieve a good life, thus providing the raw material (subprime MBS) for the arbitrage; and the difference in the calculated riskiness of the CDOs and their component mortgage-backed securities literally produced the difference in price that was captured as profit. The centrality of risk is one of the most important contributions of the dissertation and is a topic to which I will return below.

My analysis of the axiomatic deploys the study of culture for the specific purpose of understanding the success and failure of capture, in this case, the CDO arbitrage. The case study does not present an account of arbitrage culture per se, but it does analyze particular, limited cultural milieus to better understand how the CDO arbitrage was able to succeed in producing the profits it did and why it failed insofar as it was a significant factor in the financial crisis. Through this analysis, I contribute to a cultural studies of finance by reconstructing an understanding of arbitrage that dispatches the narrow models of financial economists and puts it into social and cultural context in

order to critically examine its role in capitalism. I am ultimately able to formulate an answer to the question of where arbitrage profit comes from. Arbitrage profit is value emanating from collective social processes, which is transformed into capitalist value and monopolistically appropriated by arbitrageurs. This way of answering the question of arbitrage profit overcomes the weaknesses of both financial economics and most Marxist interpretations of finance. It shifts the definition of arbitrage away from the assumption that it is always equilibrates prices unless it faces some technical “limitations” and firmly establishes the centrality of profit. But it is the analysis of the axiomatic that pushes the rethinking of arbitrage in this dissertation onto the most innovative ground. Capture is only possible and sustainable if an axiomatic can stitch it together and successfully defend its functioning through against ideological challenges. In the case of the CDO arbitrage, many aspects of financial economics and market practice, especially around risk—institutional reliance on credit ratings agencies and complex default correlation risk models—contributed to the axiomatic that made the arbitrage possible.

The axiomatic provides a way of answering perhaps the most important question about capitalism: why do the vast majority of people continue to accept their own exploitation within the system despite their understanding of that exploitation. The axiomatic is the system of social relations and statements that secure exploitation. But even for that narrow context, I don’t provide a full accounting of the axioms and social relations and so therefore cannot fully answer this question in relation to finance. However, the fraction of the axiomatic I do reconstruct suggests that part of the answer

revolves around what I believe will become a central issue for cultural studies of finance: the notion of risk.

Risk is central within financial economics broadly and to the financial economic definition of arbitrage more narrowly. Starting with the publication of von Neumann and Morgenstern's *Theory of Games and Economic Behavior* in 1944, the notion that people make economic decisions by assigning subjective probabilities to possible outcomes became enshrined in every major financial theory, including Markowitz's portfolio theory, the Capital Asset Pricing Model (CAPM) and the Black-Scholes-Merton options pricing formula.<sup>427</sup> Risk reached its apotheosis in the financial economic conception of arbitrage. Enshrined in the "Law of One Price," the relationship between risk and arbitrage makes judgments of the former a precondition for the latter. The Law of One Price requires that assets, which have the same risk and payoff, must also have the same prices. They are judged to be financially equivalent from these two aspects and thus their prices must reflect that equivalence. If they are trading at different prices, the Law of One Price states that arbitrage will inevitably occur because arbitrageurs will want to gain the available profit from buying the cheap and selling the dear. The arbitrage will, it is assumed, force the prices of the two assets into parity. Risk and return are directly related, so risk is the measure that makes or breaks a potential arbitrage trade. Different prices can only be justified by different risk profiles. If risk is the same between assets with the same payoff where prices differ, arbitrage can take place.

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<sup>427</sup> von Neumann and Morgenstern, *Theory of Games*.

The Law of One Price justifies the financial economic definition of arbitrage as “riskless.” Buying the low priced asset and selling the high priced one doesn’t result in any net increase or decrease in risk since the risk profiles of the two assets must by definition be identical for the arbitrage to take place. There is an exchange of equivalent securities that have different prices, so risk exactly cancels itself out while the difference in prices yields a “riskless” profit. However, as already noted, this definition is woefully inadequate to describing actually occurring arbitrage. On the face of it, the idea that anything is ever truly riskless is absurd. The unfolding of time is uncertain. Any action can result in unforeseen consequences. The purest arbitrage trades cannot sustain the moniker of risklessness. In chapter four, I suggest instead that arbitrage, understood as a form of capture, can either succeed or fail and can only be called “riskless,” or seem as if it were guaranteed in advance, *ex post facto*. It is more important to understand the factors that contribute to the success or failure of arbitrage than to classify arbitrage as riskless or not. I offer the concept of time contingency as a way of circumventing risk and suggest that successful arbitrage relies on specific techniques for managing the contingency of unfolding time.

It is evident that risk is a problematic category, and this is due in part to the slippages in the meaning of the term as it gained more importance within financial economics over time. In von Neumann and Morgenstern’s 1944 book, expected utility included a subjective judgment about probabilities of possible outcomes. But as this notion was implemented in finance, it quickly took on a more objective bent. Markowitz’s portfolio theory derived in the 1950s used historical standard deviation of returns to



represent risk, lending an air of universal calculability to the term. The Black-Scholes-Merton (BSM) options pricing formula, first designed to input the price of the underlying stock, the strike price of the option, the time to expiration, the risk free interest rate and “volatility” or risk, has, since its original publication, been turned on its head so that it delivers an “implied volatility” term. Actual existing options prices are plugged in with other variables and the one term that is truly “unobservable”, the volatility term, becomes the output of the equation. BSM thus delivers an on-the-spot risk measurement from current stock and options prices as if the stock market itself measures risk. The importance of measures of the riskiness of assets was institutionalized in 1975 with the national recognition of Moody’s, S&P and Fitch.<sup>428</sup> The ratings produced by these firms have become bedrock, taken-for-granted facts of financial activity, as SEC rules, BASEL Accord rules, and pension fund regulations all rely upon them. In short, what began as a concept describing individual subjective guesses about future events has been reified into an objective thing that can be measured and represented on a simple scale from AAA to D. Risk is now real.

The objectivity of risk as been accepted not only by economists and financial traders, but also by critics of finance who take up the term as if it signifies exactly what it purports to describe, a quantifiable measure of uncertainty that is directly proportional to return.<sup>429</sup> The particular way of measuring or calculating risk might be critiqued as

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<sup>428</sup> Richardson and White, “The Ratings Agencies.”

<sup>429</sup> See for example, Edward Lipuma and Benjamin Lee, *Financial Derivatives and the Globalization of Risk* (Durham, NC: Duke University Press, 2004); MacKenzie, *An Engine Not a Camera*; Caitlin Zaloom, “The Productive Life of Risk,” *Cultural Anthropology*, 19, no. 3 (2004): 365-391.

incorrect (especially in hindsight) but that risk is calculable and necessary for understanding return is not challenged.

But there is something rotten with risk. First, as I argue in the penultimate chapter of this dissertation, risk is the attempt to quantify an unknowable future. What will happen in the future, even in mechanical and biological systems, much less social ones like financial markets, cannot really be predicted by what has happened in the past. The future is contingent, emerging, always becoming a new present, not the repetition of a past present. It may be possible to establish a pattern of the relationship between the past and presents that have subsequently occurred, but that pattern could, with the emergence of each new present, be disrupted. Reifying those patterns into objective facts misses the fundamental nature of the relationship between the past and the future. There is something paradoxical about assigning a stable value, for instance AAA, as a measure of future uncertainty. It is a certainty of uncertainty, a mathematical double entendre: this is the measure of the immeasurable.

This epistemological paradox serves, however, an important purpose. Risk isn't just the paradoxical measure of the immeasurable; it is also, as I demonstrate in the last chapter, a key to several axioms that underpin and support the monopolistic capture of value by some at the expense of others. The axiom to risk for security (in which homebuyers learned to assume that taking on risky mortgages was the price of future wealth appreciation) and more importantly the axiom of risk and return (in which the price differential between MBS and CDOs was cemented by ratings agencies' measures

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of risk) were the infrastructure on which the money machine CDO arbitrage was built. This arbitrage, which delivered billions in profits to certain traders at the expense of pension funds and mortgage borrowers, relied on the stable measures of risk in credit ratings to function. It wasn't that those ratings were wrong, which many commentators on the crisis have argued, but that they did the work of proving that actually immeasurable risk was measured to be AAA in the vast majority of MBS and CDO tranches. Without the assumption that risk could be measured in this way, and that this measure thereby justified a particular return, no arbitrage would have been possible.

Risk functions for finance at the intersection of epistemological paradox and justification of capture. It is the fudge factor, a measure of the immeasurable and therefore the term that, under the guise of rational calculation, can be manipulated through the complicated and consequential machinations of the axiomatic to justify capture. Risk is the emperor's new clothes and capture the result of his subjects' enduring acceptance of his resplendentness.

Cultural studies of finance must become the child who declares the nakedness of the emperor. Just as Stuart Hall analyzed the arbitrariness of the label "mugging" in order to reveal the deeper relations of race, class, migration and policing in England, cultural studies of finance must examine the relations that lie beneath reified "risk." Like "mugging," "risk" may be an arbitrary label, but it has definite, political and economic effects. It is, in this very moment, sustaining processes of financial capture in ways that have been neglected by critical analysts of capitalism and finance alike. One main contribution of this dissertation is to call attention to the central role of arbitrage in

finance; but more importantly, it exposes the need for further analysis of the financial capitalist axiomatic and particularly of risk.

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