DERIVATIVES, MARKET LIQUIDITY, AND INFRASTRUCTURAL FINANCE

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Abstract

Since the 1970s global finance has developed a progressively systemic character, which became exceptionally legible following the collapse of Lehman Brothers in September of 2008. 15 years after the financial turned capitalist crisis that followed that system collapse, how are we to make sense of the ongoing dependence of society and economy on this network of financial markets? Reflecting mainly on the Anglo-American context, but with an eye on the global scale, this chapter argues that infrastructure is an important way to theorize the inability and unwillingness of capitalist states and civil societies to meaningfully reduce the influence of the financial sector. Focused on financial derivatives, the chapter argues that particularly in their liquid, marketized form, derivatives enable new connections across space and time, Despite considerable political resistance, the maintenance of this liquid form, has become an infrastructural or technical matter, but this technicity obscures derivatives' political economic contradictions, especially as they relate to socio-economic inequality. Capitalist states have begun to treat derivative markets, and the broader financial market system, as something that must be protected from breakdown, or illiquidity, and immediately repaired in a crisis. Extending the argument on (il)liquidity and building upon the classic argument for infrastructural inversion, I suggest that financial markets are in a constant state of breakdown and thus in need of perpetual maintenance and repair. This perspective offers possibilities for politicizing finance, by exposing the overdetermination of socio-economic inequality in the original design of financial market infrastructure as well as providing analytical opportunities for rethinking the de-financialization of the basic commodities necessary for everyday life.

Keywords: Derivatives, Liquidity, De-financialization, Risk Management, Marketization, Infrastructure

Introduction: Infrastructural Liquidity

Whatever one's theory of, or political stance on the proper role of finance, it is difficult to deny that financial liquidity is crucial to the reproduction of contemporary capitalism. Capitalist states are increasingly preoccupied with maintaining flows of money, credit, and capital investment, and financial markets are crucial to that circulation. Over recent years central banks have gone to great lengths to avoid another market freeze like what happened during the Global Financial Crisis (GFC) of 2008-9. At the heart of that crisis was a collapse of liquidity (Nesvetailova, 2010), and we can only understand ongoing state support of financial markets by studying the state's preoccupation with maintaining liquidity (Langley, 2015). But what exactly is liquidity, and who does it serve, and why? These questions are rarely asked, although some attention has recently been paid to uneven access to liquidity and how this relates to inequality (Adkins, Cooper and Konings, 2020; Konings and Adkins, 2021). What is clear is that 15 years after the GFC, and despite widespread resentment of the financial sector, that sector is more deeply entangled with capitalist economies and states than ever before. This state support is the starting point for my argument that financial markets have become infrastructural.

This state-finance-liquidity entanglement can only be understood in the context of half a century of layered financialization. Innovations in securitization (Leyshon and Thrift, 2007) and assetization (Birch and Ward, 2022), combined with record levels of financial debt (Streeck 2014) mean that financial stability has become increasingly dependent upon circulation through financial markets. Financial derivative contracts, which didn't exist fifty years ago, now constitute an enormous system of marketized financial risk management that is crucial for coping with uncertainty related to the future value of assets. They are deeply entangled with debt maintenance, portfolio management, currency exchange, and international trade, not to mention their privileged position in energy, raw material, and agricultural markets. The size of the global derivatives market is typically (and crudely) measured at five or more times the size of world gross product.[1] Furthermore, marketized, short-term repurchase (repo) agreements between financial institutions, which are not derivatives but are typically coupled with derivatives trades, are now the main way central banks lend and thus influence

[1] At the time of writing (April, 2023), the World Bank estimated the World Gross Product for 2021 at US$96 trillion: https://data.worldbank.org/indicator/NY.GDP.MKTP.CD The Bank for International Settlements estimated the outstanding value of all over the counter derivates at the end of 2021 to be US$598 trillion. This does not include commodity contracts, credit default swaps, or exchange traded derivatives, which together would add roughly another US$50 trillion. https://www.bis.org/statistics/derstats.htm?m=2071

macro-financial liquidity on a daily basis (Gabor and Ban, 2016) and are an important part of central banks' pivotal role in 'new' state capitalism (Sokol 2023). Together, these developments contribute to the widespreadmarketization of financial relationships across socio-economic fields. As a result, capitalist states treat *financial markets* as a crucial underpinning of production, circulation, and consumption, and thus as a system that must protected from both endogenous and exogenous threats. In other words, liquid financial markets are now treated as a critical infrastructural system.

The concept of liquidity is most recognizable as a defining characteristic of money. Money is considered liquid because it can be exchanged for other things with little friction or cost. As a liquid store of value then, money is a hedge against uncertainty. But in societies where markets are the dominant mode of distributing goods and services, including the basic necessities to sustain life, liquidity can be a matter of life and death. As such, the "preference" for liquidity, as Keynes (1936) understood it, becomes a driving force of social organization in capitalism (Aglietta, 2018). This desire for liquidity, which we might think of as the option to exchange later, is institutionalized in the financial sector, and as such is one of the basic organising principles of post-1970s financialized capitalism (Meister, 2021).

In the financial sector derivatives function in a similar way to money liquidity. They allow actors and institutions to put off decisions about their interest in specific commodities or assets. Meister (2021) calls this quality of derivatives "optionality", which is the capacity to delay choices into the future, but at the same time continually calculate the costs of those delayed decisions. On one hand then, finance capital has internalized optionality and the risk management that goes with it. But like all attempts to profit in capitalism there is an imperative to keep value—or in this case money, financial instrucments, and their valuation—in motion. As such, financial market liquidity has become the sine qua non for the reproduction of contemporary capitalism, and the collapse of the GFC was the exception that proved the rule. This is why on the other hand, capitalist states and civil societies have developed an "infrastructural imaginary" (Langenohl, 2020). Because just as risk management of individual assets has been internalized within the financial market system, the entire risk management system must in the final instance be backed up by the state. This chapter interrogates both the market systems that constitute this financial infrastructure and the politics that are necessary to sustain it. . In relation to the latter, the chapter asks how we might rethink politics in the age of financialization, and not least the politics of uneven access to liquidity across socio-economic class.

The rest of the paper is organized into four sections. The next section sets the scene by defining financial infrastructure in both socio-technical and political economic terms. Section 2 explores the development of financial interconnection since the 1970s, focusing on derivatives and their unique relationship with liquidity and the state. Section 3 dives deeper into the financial, temporal and spatial functions of derivatives. Section 4 concludes the paper by employing the concept of infrastructural inversion to rethink liquidity. It then offers an analytical path towards turning that politics of financial infrastructure on its head by questioning whether society really needs to rely so heavily on marketized optionality and liquidity.

1. Solidifying infrastructural politics

As this volume demonstrates, there are socio-technical (Pinzur chapter) and political economic (Coombs chapter) reasons that contemporary finance appears to be infrastructural. But rather than making a strong ontological argument about the infrastructural nature of financial systems, I am interested in the effects of capitalist states treating finance, and specifically financial markets, as infrastructure. While money, finance and the state have a long history of entanglement (Muellerleile, 2020), since the September 11, 2001 terrorist attacks on the U.S. and then to a greater extent after the 2008-9 Global Financial Crisis, capitalist states have cast their infrastructural gaze upon financial markets, not least because they have become more vulnerable to breakdown. In this section I will offer three explanations of how this has happened related to socio-technical dynamics, securitization, and state infrastructural power.

First are socio-technical dynamics that can be further sub-divided into three categories related to circulation, ordinariness, and capacity. To begin with, infrastructural systems tend to be enabling rather than directly productive, and the things they enable usually relate to movement, connectivity, and circulation through space (Larkin, 2013). Transportation, energy, and water systems are emblematic. Because they are connective, and further because they tend to connect to a wide variety of socio-economic sectors, they tend to require 'rights of way' (O'Neill, 2013) through public and private space and across territorial or jurisdictional borders. Consider for instance the ways railroads or oil pipelines crisscross political territory. Furthermore, even though some infrastructural systems are privatized, they almost always (also) serve a public purpose even though they are also a basic prerequisite for a functioning market economy based on private property.

Financial markets have many of the same circulatory characteristics. Rather than producing new economic value, they mostly assist in circulation of existing value [2], the flows of which frequently cross political borders and produce novel financial geographies. Further, even though financial exchanges are now largely private enterprises (see Petry, 2021), they are heavily regulated by the state and endowed with quasi-public purpose, even if the vast majority of the benefits accrue to already existing wealth (Piketty, 2014).

Second, for those who have access to them to begin with, infrastructural systems tend to be mundane and technical, typically operating in the background. As a result, at least for the everyday user, infrastructural systems tend to blend into everyday life, only drawing serious attention when they breakdown (Bowker and Starr, 2000). Financial systems have a similar quality. Despite the growing integration of things like payment systems into everyday life, almost all financial operations are hidden from public view. Even when their inner workings are visible, most people cannot make sense of them. Finance is, in other words, a field of technical expertise.

Third, because infrastructure is circulatory, but also technical, it also tends to have limited capacity. Whether vehicles, people, water, energy or data, the systems that move these things have limits, and when they are pushed beyond their capacity they lock up or break down. A seemingly sensible solution is to increase the capacity of infrastructural systems. However, in a paradox originally identified by William Stanley Jevons (Alcott, 2005), and what traffic engineers call *induced demand*, increasing the technological efficiency and thus capacity of a technical system often incentivizes more use, which rather than enhancing resilience may just cause more dramatic breakdowns.

[2] There is an important, but complex debate over the productiveness of the financial sector that I cannot engage with in this chapter (cf. Christophers, 2018; Lapavitsas, 2013). My basic assumption is that even if the production of risk is a source of surplus value, the vast majority of the profits in finance are a result of enclosure and rent.

Financial markets have a similar finite capacity to process transactions in an orderly or liquid fashion (Langenohl, 2023). At the same time, digital technologies continue to expand the capacity of the market system to process trades. Regardless, when markets are pushed beyond their capacity, so called 'fault lines' can form (Campbell-Verduyn, Goguen and Porter, 2019, pp. 923-926), and markets can break. These socio-technical breakdowns take different form in different historical or geographic contexts. It happened during the infamous 1987 US stock market crash, where telephone lines between New York and Chicago were overloaded and traders and other market actors could not access market prices fast enough (Muellerleile, 2018). So called 'flash crashes' are another instance, although at an accelerated pace (Campbell-Verduyn, Goguen and Porter, 2019, pp. 923-926). The bottom line is that financial markets are fragile, and technologically driven efforts to speed them up make them more, not less, vulnerable.

To summarize then, the first infrastructural quality of financial markets is that they are socio-technical in nature and this helps us understand their complexity and fragility, but also their relative ordinariness for everyday life. As such it is perhaps unsurprising that states take an interest in ensuring that they function, and an interest in repairing them when the breakdown. This state interest has been evident since at least the dawn of capitalism, but the relationship between financial markets and capitalist states has deepened in the last fifty years, and this brings me to the second way that financial markets are infrastructural.

Since the September 11, 2001 attacks on the U.S., and intensifying during and after the Global Financial Crisis, financial markets have become *securitized,* meaning they are treated as crucial for securing socio-economic futures (de Goede, 2010; Westermeier, 2019). Financial security, in other words, is not only important for capitalist accumulation, but also for the basic health and reproduction of capitalist society. As the U.S. state in particular has become more focused on preparedness for emergency and crisis, financial markets are now subject to "vital system security" apparatuses similar to government approaches to other interconnected systems like energy, transportation, and water (see Collier and Lakoff, 2015).

Langley (2015) for instance has demonstrated that the state's reaction to the Global Financial Crisis was a matter of financialized biopolitics. In the wake of a market breakdown, the state was mainly concerned with securing financialized well-being for the population, which began with rescue and repair of the financial market system. It is important to note, however, that the state chose to rescue banks, brokers and insurance companies or in other words the institutionalized market system, rather than step around the market and provide direct financial assistance to the holders of mortgages who were at risk of losing their homes. The priority was restoration of circulation through the vital infrastructural system rather than direct intervention to assist the end users of that system.

The third way financial markets resemble infrastructure relates to the ways states integrate with financial institutions to exert power over and through their populations. Mann (1984) called this infrastructural power (see Coombs, this volume), in contrast to despotic power, which is more direct, uninhibited, and often enforced through violence. Infrastructural power, which is associated with capitalist and democratic states, explains how states depend upon infrastructural systems for the distribution of power and influence through civil society (Mann, 1984). One example of this is the way the U.S. state has intervened in mortgage markets to encourage single family home ownership since the 1930s. These interventions have taken different forms, including iterative redefinition of mortgages, but with the common goal of (re)constructing a national market for mortgage finance (Ashton and Christophers, 2018). This exertion of state power via financial markets to encourage home ownership is not unique to the U.S. While it took different forms, the basic strategy of encouraging middle class home ownership in an effort to produce social stability was a common strategy among states in the Global North in the 20th century (Forrest and Hirayama, 2015).

Perhaps a more profound example are the various ways that central banks depend upon private banks and financial markets to implement their policy goals and monetary governance strategies. Not unlike the US, which began earlier in the 1970s, beginning in the 1990s the EU attempted to develop a single, interconnected capital market system to encourage continent-wide and securitization-led capital investment (Braun, Gabor and Hubner, 2018). Technocratic reformists within the Italian state, for instance, encouraged derivatives-based arbitrage between Italian and German state debt as a way to ease Italy's entry into the Economic and Monetary Union (Lagna, 2016). Broader efforts to construct a single capital market stalled in the wake of the GFC, but since then, the European Central Bank has actively employed financial markets to achieve its monetary policy goals (Braun, 2020). While post-GFC there was initially significant resistance to reintegration of a

European repo market and serious proposals to implement a repo transaction tax, the banking industry successfully lobbied against this, and the repo market has rapidly expanded in size (Gabor and Ban, 2016). The ECB also directly assisted in the expansion of the asset backed security market in Europe changing its rules to accept them as collateral. As Braun explains (2020), all of this translates into a state-finance nexus of infrastructural power, "market based central banking", and generally the increasing influence of the financial sector over European economic policy.

2: Optional Entanglements

Financial derivatives have only existed for fifty years, and yet they now sit at the core of financial market systems. Derivatives create interdependencies between exchanges, asset classes, and national currencies and thus contribute to the systemic or infrastructural nature of contemporary finance. In the next section I will explain this in more theoretical terms, but first in this section I offer some background on what financial derivatives are, and how they relate to risk management, marketization, and liquidity.

Derivatives enabled new marketized spaces long before anyone referred to financialization. In the middle of the 19th century, the development of agricultural futures markets (the direct ancestors of financial derivatives) in Chicago was co-constitutive with the emergence of telegraphs and railroads and new semiotic systems for grading commodities (Pinzur, 2016, 2021; Carey, 1992, pp. 201-230). These systems converged on the Chicago Board of Trade (CBOT) where after the US Civil War, the trade in grain futures contracts quickly outpaced the spot trade in physical grain. The futures market allowed the exchange of the potential costs and benefits of uncertainty related to grain before it was harvested from the soil. Whilst insurance contracts had existed for centuries by this time, this was one of the first examples of marketized risk management. In addition to allowing hedging and speculation on either side of the contract, the futures market also improved the quality of the underlying collateral for agricultural credit because it could be risk managed (Levy, 2012). Another effect was an increase in liquidity by speeding up of the turn-over time of agricultural capital (Henderson, 1999).

All of this led to a significant increase in speculative trading at the CBOT and other formal futures markets, and it was an important part of transforming the city of Chicago, along with its vast agricultural hinterland, into a capitalist commodification engine (Cronon, 1991). Along with the railroads and telegraphs, the futures markets became crucial 19th century infrastructure for an increasingly interconnected agro-capitalist national economy.

For the next hundred years formal derivatives trading was isolated within the agricultural, raw material, and energy sectors. But with the delinking of the US Dollar from gold in 1971 the various market technologies and state regulatory apparatuses that were originally developed to trade agricultural derivatives were applied to financial instruments (Muellerleile, 2015). As the relatively "integrated monetary world space" of Bretton Woods fell apart (Swyngedouw, 1996, p. 150) banks and corporations found it more difficult to predict the future value of money. Increasing financial uncertainty then produced new demand for risk management instruments, and new opportunities for innovators who might develop them. During the 1970s and 80s markets were developed for derivatives trading on foreign currencies, corporate and government debt, and corporate share indexes to name just a few.

In 1975 the US Congress mandated that that the US stock market regulatory agency, the Securities and Exchange Commission (SEC) develop a "National Market System" for the trading of securities. While there were competing motivations for the legislation in Congress and competing visions of the end product, almost everyone involved agreed that the securities markets were crucial for the ongoing development of the US economy, and that a key goal should be widening access to these markets for a broader array of American consumer-investors. Pardo-Guerra (2019, p. 268) characterizes this legislative turned socio-technical attempt to develop a national market society as *infrastructural*. In his telling, it was an attempt to construct a national scale "form of financialized kinship that established relations through a common infrastructure of participation". Crucially though, this infrastructural market-making project was not limited to stock and bond markets, and derivatives soon became part of the system.

Derivatives markets differ in several ways from markets for underlying assets. The most obvious is that unlike asset markets, derivatives allow investors to realise gains and losses based on the fluctuating value of an asset without taking ownership of that asset. More importantly for this discussion, derivatives can usually be traded with much higher levels of leverage than the underlying assets. Whereas one is able to buy many financial securities such as equities or highly rated bonds with an initial investment of 50%, it is common in derivatives markets to be allowed to hedge or speculate on the same assets by investing only 5% of their value (Muellerleile, 2015). This was the case when Chicagoans developed futures markets on corporate share indexes that were mainly traded on New York “spot” markets in the early 1980s. There was an extended regulatory struggle over the amount of leverage allowed in these early financial derivatives markets, but the high leverage argument won the day, as it did in most early derivative markets.

In October of 1987 the U.S. equity markets dramatically crashed and much of the blame was directed at the highly leveraged derivatives markets in Chicago. While this was strongly contested by the Chicago derivatives traders, there is not space here to examine this in detail. I have argued elsewhere (Muellerleile, 2018), however, that that the metaphor of roads and traffic, as an infrastructural system, is a useful way to understand how the highly leveraged Chicago-based derivatives markets built at first slow and clunky telephone connections to the New York securities spot markets in the early 1980s. In the aftermath of the crash, in no small part as a result of direct intervention by U.S. government regulators, the markets were repaired with expanded capacity for information exchange between the two markets. Where there was once two separate but related markets, the rebuilding of those connections with the aid of much faster “infostructures” (see Campbell-Verduyn, Goguen and Porter, 2019) created a newly integrated market system with an aggregate higher rate of leverage. As a result, it become more rather than less dependent on maintaining market liquidity. This process of repair after 1987 was heavily influenced by the ongoing attempt to construct the US national market system mentioned above.

Over the next 20 years, financial innovators developed both bespoke and standardized exchange-traded derivatives contracts on an endless assortment of financial assets. Not all of these developed into highly liquid markets, but what they all have in common is the capacity to draw risk management instruments that are usually leveraged at a much higher rate, into direct relation with underlying asset markets.

The 2007-9 GFC can be explained in many ways, but an important part of that explanation is the construction of new financial and informational interconnections based on turning relatively illiquid assets (homes) into liquid securities (Fox-Gotham, 2009). Through this came the production of new socio-technical time-spaces highly reliant upon the wildly complicated but nevertheless systematic securitization of mortgages, derivatives on those mortgages, and derivatives of derivatives on those mortgages. From the local to the national to a global space. The causal chain that led to the breakdown is not easily parsed, but a significant factor was the unsustainable amount of leverage produced in a now deeply interconnected system of layered and marketized optionality all of which was based on an illusion that money and market liquidity would never run dry (Nesvetailova, 2010).

This is not the place for a deep analysis of the GFC or the many fixes that were implemented in its wake. But it is worth considering that similar to 1987, much of the discourse framed the 'problem' of the GFC was one of liquidity, its lack, and its restoration (Langley 2015). More radical solutions (e.g. prohibitions on derivatives) were pre-selected out because the terms of the debate were designed around restoring the techno-economic order of financial capitalist circulation and risk management. Put differently, the crisis was framed as a "socio-technical accident," the solutions to which contributed to the "subordination of political calculation to financial power" (Engelen et al, 2011, p. 228). As such, the solution to the socio-technical problem was to repair the infrastructural breakdown, rather than ask if the infrastructure was actually serving the purposes it might have in a more equitable and less marketized world.

3: Risky Prices

A deeper understanding of the relationship between liquidity, economic interdependency, and derivatives requires separating the core functionality of derivatives from the process of derivatives trading.[3] In the simplest terms a derivative contract enables the transfer of risk between parties. Futures, options, and swaps set up a contractual obligation, usually to exchange a commodity or asset, or the difference in value of an asset over time, at an agreed date and price in the future.[4] Buyers and sellers of derivatives may or may not have an interest in the underlying asset, and they may be attempting to hedge an existing risk or speculating

[3] This is an artificial separation and I do it here only for analytical purposes. In actuality, the two functions are dependent upon, and entangled with each other.
[4] When a derivative trader has an interest in the underlying asset, the contract is similar to insurance contract. The insurer takes on risk and is paid a fee (premium) as compensation. The insuree lays off risk and pays a fee to the insurer for this benefit.

by taking on more risk. Whatever the circumstance, in this basic form derivatives contracts have become an important part of risk management processes for both financial and non-financial actors and institutions. But this is only the beginning.

Derivatives have a second, more dynamic function related to their exchange, or when they enter into circulation. Because derivatives are based on the future value of an underlying asset, the prices that derivatives exchange at allow financial modelers to *imply* the present value of that underlying asset. The exchange of a derivative contract always includes an element of guesswork about an uncertain future. As such, when a derivative price is agreed upon in a trade, this price becomes new information about the value of the underlying asset. In other words, it *makes a difference* in the future market value of an asset, and thus it also makes a difference in the present (Ayache, 2010). Financiers and economists call this effect price "discovery", and it is often cited as one of the main benefits of derivatives trading. In effect, what derivatives trading does is isolate and codify the uncertainty over the future value of an underlying asset. It formalizes this uncertainty, converts it to quantifiable risk, and enables its exchange independent of the asset itself. The capacity to use derivatives prices to evaluate underlying assets is one of the basic implications of the Black-Scholes derivatives pricing model developed in the early 1970s, and it is no coincidence that the popularity of derivatives expanded rapidly in its wake (MacKenzie, 2006).

The formalization and marketization of uncertainty with derivatives is important for several reasons. First, increasingly more assets are held in institutional investment portfolios, and are thus subject to formal and continual evaluation and risk management processes. Derivatives allow portfolio managers to more effectively manage risk, and as such they enable portfolios holding more risky assets. Second, by codifying and pricing risk, derivatives have made collateral (that which secures a loan) more liquid (Krarup, 2019). There is a hierarchy of collateral with cash at the top because it is the most liquid asset. For non-cash collateral further down the hierarchy, a key measurement of quality is the option to sell it quickly at a known price (ibid). Assets with have associated derivatives markets thus make for better collateral becauseliquid derivative contracts both allow for direct risk management through trading, and also by continually providing real-time information about the value of the asset.

Mirowski (2010) argues that the emergence of marketized financial derivatives has facilitated the construction of a system of market c*omputation*. The interconnected system of financial markets reduces the complexities of the capitalist economy into legibly priced and tradable securities and derivatives contracts. The problem for Mirowski is that these markets are *dissipative* systems, meaning that they enhance entropy or create irreversible complexity. Crucially, this is not a problem as long as the markets consistently function as price mechanisms. However, if for any reason the market system overwhelms the computational capacity of any particular market mechanism and that market suddenly loses its capacity to price risk, the entire market system loses its capacity to translate—or compute—the messy complexities of its financialized subjects into prices. In other words, the highly complex system of contemporary financial markets are subject to what Mirowski calls *inherent vice,* or like most other infrastructural systems, the inherent tendency to fall apart. Left unrepaired, they leave economic worlds more uncertain and complicated than they were to begin with. This is not to say these worlds could not be made less liquid or *definancialized*, but that is rarely considered in any serious way by state technocrats. Rather the solution to breakdown, or the threat of breakdown, is almost always to increase the capacity of the system, to enable faster circulation, to make it more liquid.

Of course price is only one kind of information that is crucial to financial markets. Financial modelers constantly seek new information about the qualities of assets and to predict future value. The production, transmission, and consumption of that information is complex, contingent, and reliant on "long chains" of information that are vulnerable to breakdown and in constant need of translation (Campbell-Verduyn, Goguen and Porter, 2019). Making this more complicated, access to prices and other market related information as well as humans and machines that can translate data and information between contexts is a field of intense capitalist competition (Grote and Zook, 2017; Grindsted, 2022).

This competition becomes more consequential when we consider that at the same time that financial markets are in a constant state of calculation, price making, breakdown and repair, so is financialized time-space itself (Pryke, 2017). Put differently, capitalist competition in the financial sphere both maps onto existing urban, regional, national and international spaces, and produces *new* financialized time-space (ibid). Financial markets produce these new relational spaces, even though they are difficult to 'see'. In fact, given the "unpredictable, intertwined, and relational" nature of these space-times (Pryke, 2017, p. 108), they often only become legible when they breakdown or when financial crisis hits (French et al, 2009). But when the market transactions that are an integral part of this circulation slow down or stop, the interconnections begin to change. In 2007 when U.S. housing prices began to slump, the supply of mortgage-backed securities slowed, and the future became more uncertain. The derivatives markets that were entangled with mortgage markets became more volatile, and eventually it became more difficult if not impossible to model the most complex contracts. Market liquidity then dried up. At that point, rather than a global space of capital flows, liquidity, risk management, and accumulation, these connections transformed into relations of localized place, illiquidity, incommensurability, foreclosure, and bankruptcy. This is how a group of small towns in northern Norway, who under advisement of an Oslo-based firm had invested (and lost) US$78 million in a highly complex, New York based mortgage securitization fund, could suddenly find itself unable to build the school and nursing home it planned to because indebted home owners in Florida or Nevada could no longer make their mortgage payments (Aalbers, 2009).

I am quickly skimming over the surface of highly complex relationships. Perhaps the town councils of northern Norway were defrauded. Perhaps they should have known better. The point I am making is that these global connections were enabled by the search for profit in the financial sector as well as the capacity of an integrated market system to simplify highly contingent and complicated economic relationships into relatively simple matters of prices, profits—and eventually, losses. Making sense of this infrastructural system of finance, and ultimately developing alternative ways of organizing a post-financial capitalist economy, requires that we look closely at the socio-technical details of these systems, but it also requires a critical political economic lens, because what is increasingly apparent is that the "politics of liquidity…are at the core of how finance capitalism works" (Konings and Adkins, 2022, p. 52).

4: Inverting Liquidity

So far I have explained how the circulation of financial derivatives has engendered interconnection in the financial market system, and how this has contributed to capitalist states turning their infrastructural gaze towards the financial sector, especially at times of breakdown. In this final section I turn to a more radical way to understand liquidity, and its absence, in financial markets and socio-economic relations more broadly. This begins by turning liquidity on its head. It begins with the assumption that financial markets are always in a state of disrepair, or put differently, always in a state of illiquidity. In other words, it begins by appreciating that the interconnection both within the financial market system, and between it and the broader capitalist economy, is perpetually wavering. If this is the starting point, it is easier to see that the socio-technical maintenance of the financial market system is not the exception, but the rule.

While not specifically concerned with finance, Bowker and Starr (2000, pp. 33-50) referred to this kind of approach as "infrastructural inversion". To invert infrastructure is to attend to the politics or economics of the opacity and technicity of infrastructure. It is to ask how the technical operation or mundanity of an infrastructural system is itself consequential. It is to take seriously the flaws of the infrastructural imaginary, or the assumption that infrastructural systems are by nature functionally neutral and fully operable for all of society, which as many have pointed out is rarely the case. The inversion foregrounds how infrastructure capitalizes on "porousness, incompleteness, and uneven accessibility" (Langenohl, 2020, p. 15), and in the process obscures inequality built into the infrastructure from the start.

Returning to liquidity in finance, to invert is to appreciate that financial markets mainly benefit the financial sector and the investor class, even if the credit the financial system distributes is crucial for social reproduction across class divides. It is to invert the idea that liquidity is the normal, stability producing, 'functional' state of a financial market system, that liquidity is a technical prerequisite for the functioning of markets, and finally that illiquidity is a state of disrepair that should always be corrected by the state. In the words of Meister, it is to "transform the concept of financial market liquidity from an assumed precondition of capitalism to an object of political contestation" (2021, p. x).

On a financial market, one key measure of liquidity or 'market depth' is the relationship between offers to buy and sell. This is the *spread* between the bid and ask prices. The most liquid or "deepest" markets have the smallest spreads, the most pending orders awaiting execution, and the smallest price changes in the face of (large) buy or sell orders. In other words, liquid and deep markets are relatively orderly and stable in the face of changes to supply or demand, while illiquid and shallow markets are more volatile. But while liquidity implies relative stability, dealers, market makers, and other market intermediaries benefit from spreads because they constitute opportunities for arbitrage (buying at one price and simultaneously selling at another, and taking the difference as profit), or opportunities to appropriate a bit of the spread by facilitating an exchange between two other parties. As such, who benefits from the spread in various markets is an object of intense competition in finance.

Put differently, the spread represents the very necessity of the market to begin with. If there was no spread, supply and demand would be in equilibrium, there would be no need for negotiation, and no need for market makers. A condition of absolute liquidity is nonsensical in capitalism, as amongst other things it would mean that prices do not change over time or space, which implies zero market volatility and thus zero uncertainty. In this abstract condition there would be no need for derivatives because there would be no uncertainty regarding volatility or changing prices in the future.[5]

The more practical point is that liquidity is relative and relational, or in other words, market liquidity only matters in *relation to market illiquidity*. Market liquidity only matters in relation to what is exchanged, by whom, and at what speed. In terms of access to money, liquidity only matters in relation to a future where money can be exchanged for something less liquid.

Algorithmic and high frequency trading (HFT) offer an extreme, but nevertheless helpful example of this symbiosis of (il)liquidity. HFT is basically a method of high-speed arbitrage. Algorithms search for tiny spreads both within and between markets (e.g. a derivative and its underlying asset) and trade both sides to profit on the difference (see Grindsted, 2022). Space is an important dynamic in HFT strategies. Trading firms invest capital to position their hardware at optimal locations in proximity to market order book computers to gain nanosecond advantages. One result is that HFT deepens markets by adding a large number of bid and ask orders, and it increases liquidity by narrowing spreads through constant arbitrage. At the same time, HFT is so fast that it can jump the queue by reading the

[5] One way to think about this is a system of price controls where markets still facilitate exchange, but do not function as price mechanisms.

order book of waiting trades and executing in advance of slower traders (perhaps everyday investors) who then suffer a higher or lower price than expected (ibid).

As such, HFT puts pressure on the capacity of the market system to process trades, which in the mundane can result in higher volatility and larger spreads, and in the extreme, can result in a "flash crash" like what happened in May of 2010 when the New York securities markets experienced about a 9% drop and recovery in value over a period of 30 minutes. Campbell-Verduyn, Goguen and Porter, (2019) explain this and other related crashes in terms of pressure on the capacity, and subsequent breakdown, in chains of information transmission, which is undoubtedly true. But we must also consider that the informational interconnection of financial actors, firms, and markets exemplified by HFT are part of a broader set of "relational spatial strategies" that "convert distance and speed into trading advantage" (Grindsted, 2022). In other words, there are incentives and rewards in the financial market system for *interrupting* market liquidity and/or producing relative illiquidity. This was true in the age of face-to-face trading, the age of telegraphs, and now in the digital age.

The point of discussing HFT is to demonstrate that access to liquidity is itself subject to the competitive dynamics of capital. Another way to think about this is that the dominant mode of managing uncertainty in contemporary capitalism is by accessing money liquidity and derivative risk management, but access to this 'service' is itself a profit-seeking dynamic of financialized capitalism (Konings and Adkins, 2022). The highly technical system of interconnected markets that is necessary to reproduce both risk management services as well as financial sector profitability is, as the capitalist state sees it, infrastructure. And when the state repairs this vital system, it necessarily repairs marketized finance capital including its capacity to reproduce socio-economic inequality.

This helps explain ongoing efforts to develop global scale market infrastructures to manage climate related uncertainty by converting it to financial risk (Bracking, 2019). The effects of climate change translate into a kind of radical uncertainty that modern institutions, including states, struggle to cope with. Within the bounds of capitalist ideology, the existing financial infrastructure is perhaps the only system capable of converting this climate related uncertainty into both manageable risk as well as a profit-making opportunity. But again, for financial calculation to function as an effective climate risk coping mechanism will rely on maintaining (il)liquidity, which is unlikely to succeed without significant state support for finance capital writ large.

Despite what may appear as an argument of inevitability, it does not need to be this way. And it is worth examining by way of a brief conclusion what would be necessary to disentangle state support for truly vital systems from state support for finance capital. The more precise question in my view is what would be necessary for a situation where the state could allow the financial markets to crash and some significant portion of financial capital to be destroyed without also destroying the lives of millions if not billions of common people?

The answer is implied in the first question—disentanglement—or more precisely de-financialization. Specifically, it would require removing or separating the crucial commodities of basic, everyday life from finance capital. The most obvious example is houses, but similar arguments could be made for health care, education fees, not to mention many of the objects of more conventional infrastructure like the provision of water and public transportation. Currently, at least in the U.S. and U.K., many of these things are only available to most people via massive quantities of private and public debt. Servicing of this debt requires access to liquidity, which has become in the words of Minsky a basic "survival constraint" (see Konings and Adkins, 2022). But if we learned anything from the GFC, capitalist states are rarely inclined to rescue indebted homeowners even when they were subject to predatory lending by finance capital. Rather than offering a liquidity rescue to individual borrowers, the state preferred to repair the financial infrastructure perhaps in the flawed hope that the infrastructure would serve everyone equally.

Other than the accumulation of financial profit, what after all, is the purpose of creating a market infrastructure of derivative optionality for homes? These are big questions, and there are no easy answers. Certainly the politics of de-financialization will be messy to say the least. But if a larger proportion of homes, welfare services, and 'real' infrastructural systems like energy provision were 'de-assetized' and publicly owned, not only would there be less need for the perpetual option to convert them into cash, the financial sector would also shrink dramatically, making it less powerful and less dependent upon the state. Democratic society ought to have the power to provide some level of certainty for itself—a different kind of optionality—

without relying on a financial sector that is both technically flawed and (infra)structurally dependent upon the state.

References

Aalbers, M. (2009) 'Geographies of the financial crisis', *Area*, 41(1), pp. 34-42.

Adkins, L., Cooper, M. and Konings, M. (2020) *The asset economy*. Cambridge: Polity.

Aglietta, M. (2018) *Money: 5,000 years of debt and power*. London: Verso.

Alcott, B. (2005) "Jevons' paradox", *Ecological Economics*, 54(1): 9-21

Ashton, P. and Christophers, B. (2018) 'Remaking mortgage markets by remaking mortgages: U.S. Housing Finance after the Crisis', *Economic Geography*, 94(3), pp. 238-258.

Ayache, E. (2010) *The blank swan*. Hoboken, NJ: Wiley.

Bernards, N. and Campbell-Verduyn, M. (2019) 'Understanding technological change in global finance through infrastructures', *Review of International Political Economy*, 26(5), pp. 773-789.

Birch, K. and Ward, C. (2022) 'Assetization and the "new asset geographies"', *Dialogues in Human Geography*, 0(0). Available at: https://doi.org/10.1177/20438206221130807 (Accessed at: 20 February 2024)

Bowker, G. and Starr, S.L. (2000) *Sorting things out: Classification and its consequences*. Cambrige, MA: MIT Press.

Bracking, S. (2019) 'Financialization, climate finance, and the calculative challenges of managing environmental change', *Antipode*, 51(3), pp. 709-729.

Braun, B. (2020) 'Central banking and the infrastructural power of finance: The case of ECB support for repo and securitization markets', *Socio-Economic Review*, 18(2), pp. 395-418.

Braun, B., Gabor, D. and Hubner, M. (2018) 'Governing through financial markets: Towards a critical political economy of Capital Markets Union', *Competition & Change*, 22(2), pp. 101-116.

Campbell-Verduyn, M., Goguen, M. and Porter, T. (2019) 'Finding fault lines in long chains of financial information', *Review of International Political Economy*, 26(5), pp. 911-937.

Carey, J.W. (1992) *Communication as culture: Essays on media and culture*. New York: Routledge.

Christophers, B. (2018) 'Risking value theory in the political economy of finance and nature', *Progress in Human Geography*, 43(3), pp. 330-349.

Collier, S. and Lakoff, A. (2015) 'Vital systems security: Reflexive biopolitics and the government of emergency', *Theory, Culture & Society*, 32(2), pp. 19-51.

Cronon, W. (1991) *Nature's metropolis: Chicago and the Great West*. New York: W.W. Norton.

Engelen, E., Ertürk, I., Froud, J., Johal, S., Leaver, A., Moran, M., Nilsson, A. and Williams, K. (2011) *After the great complacence: Financial crisis and the politics of reform*, Oxford: Oxford University Press.

French, S., Leyshon, A. and Thrift, N. (2009) "A Very Geographical Crisis: the Making and Breaking of the 2007-2008 Financial Crisis", *Cambridge Journal of Regions, Economy and Society*, 2 (2): 287-302

Forrest, R., & Hirayama, Y. (2015) "The financialisation of the social project: Embedded liberalism, neoliberalism and home ownership", *Urban Studies*, 52(2), 233-244. https://doi.org/10.1177/0042098014528394

Gabor, D. and Ban, C. (2016) 'Banking on bonds: The new links between states and markets', *Journal of Common Market Studies*, 54(3), pp. 617-635.

de Goede, M. (2010) 'Financial security' in Burgess, P. (ed.) *The Routledge handbook of new security studies*. London: Routledge, pp. 100-109.

Gotham, K.F. (2009), "Creating Liquidity out of Spatial Fixity: The Secondary Circuit of Capital and the Subprime Mortgage Crisis", *International Journal of Urban and Regional Research*, 33: 355-371. https://doi.org/10.1111/j.1468-2427.2009.00874.x

Grindsted, T. (2022) 'Algorithmic finance: Algorithmic trading across speculative time-spaces', *Annals of the American Association of Geographers*, 112(5), pp. 1390-1402.

Grote, M. and Zook, M. (2017) 'The microgeographies of global finance: High-frequency trading and the construction of information inequality', *Environment and Planning A: Economy and Space*, 49(1), pp. 121-140.

Henderson, G. (1999) *California and the fictions of capital*. Oxford: Oxford University Press.

Keynes, J.M. (1936) *The General Theory Of Employment Interest And Money*. London: Macmillan and Company.

Konings, L. and Konings, M. (2022) 'Re-thinking the liquid core of capitalism with Hyman Minsky", *Theory, Culture & Society,* 39(5), pp. 43-60.

Krarup, T. (2019) 'The collateral liquidity problem in contemporary finance and the resurrection of quantity theory', *Competition & Change*, 23(3), pp. 245-265.

Lagna, A. (2016) 'Derivatives and the financialisation of the Italian state', *New Political Economy*, 21(2), pp. 167-186.

Langenohl, A. (2020) 'Articulating sovereignty within the infrastructural imagination: The case of the securitisation of finance as "critical infrastructure"', *Politikon: South African Journal of Political Studies*, 47(1), pp. 4-23.

Langenohl, A. (2023) "When transactions turn awry: Infrastructural ambivalence in financial security", *Finance & Society* [forthcoming].

Langley, P. (2015) *Liquidity lost*. Oxford: Oxford University Press.

Lapavitsas, C. (2013) *Profiting Without Producing: How Finance Exploits Us All*, Brooklyn: Verso

Larkin, B. (2013) 'The politics and poetics of infrastructure', *Annual Review of Anthropology*, 42, pp. 327-343.

Levy, J. (2012) *Freaks of fortune: The emerging world of capitalism and risk in America*. Cambridge, MA: Harvard University Press.

Leyshon, A. and Thrift, N. (2007) 'The capitalization of almost everything', *Theory, Culture & Society,* 24(7-8), pp. 97-115.

MacKenzie, D. (2006) *An engine, not a camera*. Cambridge, MA: MIT Press.

Mann, M. (1984) "The autonomous power of the state : its origins, mechanisms and results", European Journal of Sociology / Archives Européennes de Sociologie / Europäisches Archiv für Soziologie, Vol. 25, No. 2, pp. 185-213

Meister, R. (2021) *Justice is an option: A democratic theory of finance for the twenty-first century*. Chicago: University of Chicago Press.

Mirowski, P. (2010) 'Inherent vice: Minsky, markomata, and the tendency of markets to undermine themselves', *Journal of Institutional Economics*, 6, pp. 415-443.

Muellerleile, C. (2015) 'Speculative boundaries: Chicago and the regulatory history of US financial derivative markets', *Environment and Planning A*, 47(9), pp. 1805-1823.

Muellerleile, C. (2018) 'Calming speculative traffic: An infrastructural theory of financial markets', *Economic Geography*, 94(3), pp. 279-298.

Nesvetailova, A. (2010) *Financial alchemy in crisis: The great liquidity illusion*. London: Pluto.

O'Neill, P. (2013) 'The financialisation of infrastructure: The role of categorisation and property relations', *Cambridge Journal of Regions, Economy and Society*, 6(3), pp. 441-454.

Pardo-Guerra, J.P. (2019) *Automating finance*. Cambridge: Cambridge University Press.

Petry, J. (2021) ‘From national marketplaces to global providers of financial infrastructures: Exchanges, infrastructures and structural power in global finance’, *New Political Economy*, 26(4), pp. 574-597.

Piketty, Thomas (2014) *Capital in the Twenty-First Century*, Cambridge, MA: Harvard University Press.

Pinzur, D. (2016) ‘Making the grade: infrastructural semiotics and derivative market outcomes on the Chicago Board of Trade and New Orleans Cotton Exchange, 1856–1909’, *Economy and Society*, 45(3-4), pp. 431-453.

Pinzur, D. (2021) ‘Infrastructural power: Discretion and the dynamics of infrastructure in action’, *Journal of Cultural Economy*, 14(6), pp. 644-661.

Pryke, M. (2017) ‘“This time it’s different”... and why it matters: The shifting geographies of money, finance and risks” in Martin, R. and Pollard, J. (eds.) *Handbook on the geographies of money and finance*. Cheltenham/Northampton, MA: Edward Elgar.

Sokol, M. (2023) “Financialisaton, central banks and ‘new’ state capitalism: The case of the US Federal Reserve, The European Central Bank and the Bank of England”, *EPA: Economy and Space*, vol. 55, iss. 5.

Streeck, W. (2014) *Buying Time: The Delayed Crisis of Democratic Capitalism*, Brooklyn: Verso

Swyngedouw, E. (1996) ‘Producing Futures: Global Finance as a Geographical Project’ in Danies, P.W. and Lever, W.F. (eds.) *The Global Economy in Transition*. London: Addison-Wesley Longman.

Westermeier, C. (2019) ‘Political security and finance: A post-crisis and post-disciplinary perspective’, *Zeitschrift für Politikwissenschaft*, 29(1), pp. 105-122.