

What is a 'Real' Transaction?

The Infrastructural Moralities of Spoofing in High-Frequency Trading

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What is a 'real' transaction? For (at least, some) social scientists, the word 'real' evokes a messy philosophical quagmire. But in contemporary finance, references to the 'real' instigate the concrete politics of fairness and legitimacy that are at the center of public discussions about the role of markets in late capitalist societies; the 'real' really matters in finance.

Consider, for example, recent debates on high frequency trading, a series of practices that entail using sophisticated computers and telecommunications to exploit minute arbitrage opportunities in the electronic trading systems that structure stock and foreign exchange markets today (Chordia et al, 2013). High frequency trading, wrote the leading broker Charles Schwab in a statement in 2014, is "an explosion of *head-fake* ephemeral orders – not to lock in *real* trades, but to skim pennies off the public markets by the billions" (Wall Street Journal, 2014). The firms participating in these activities, noted Peter Henning (2014) of the *New York Times*, have "no *real interest* in the underlying value of the companies whose shares they trade". What does it mean, ask fund managers and other institutional investors, that high frequency traders own stocks and other instruments for only fractions of a second? What does it mean, indeed, that some stocks are now more liquid and fungible than money itself?¹

What matters, surely, is not whether a transaction is real 'in actuality' but rather the conditions under which market participants come to evaluate it as such. I want to reflect on the original question precisely under this light: as a test of how market actors come to see transactions not only as objects that can be qualified as legal or illegal, legitimate or illegitimate, moral or immoral, personal

or impersonal, but more fundamentally as being real against the possibility of being false, fake or fictitious.

The question of what differentiates the discursively real from the discursively fictitious could be adequately resolved through established sociological approaches. Relational economic sociology, for example, would place attention on how views about the 'reality' of particular transactions are tied to the identities and intersubjective evaluations of the agents involved in exchanges (Zelizer 2000, Wherry 2016, Bandelj 2002). The 'reality tests' performed by social actors might similarly be thought of as classification struggles concerning the status of transactions (Thevenot 2007); or as given by recourse to broader evaluative frameworks (Beunza and Stark 2004); or as parts of larger cultural conceptions that shape notions of exchange and property (Fligstein 2002); or even as material devices that perform worlds into being (Muniesa et al 2007).

In this paper, I seek to contribute to these approaches by arguing for the importance of studying moments of conflict, breakdown and maintenance in connection to the creation of shared stable realities. While extant studies of economic life have provided great insights about how category making and boundary building infuse transactions, less has been said about how taken-for-grantedness is stabilized in economic worlds. My objective, then, isn't to expand on accounts of how 'the real' is created through relations or fashioned as a shared category of qualification. Rather, I use this as an opportunity to examine how market actors articulate their senses of what is real by mutually coordinating expectations about the naturalized and "unquestioned conceptualization[s]" of actions and their context¹. Whatever form 'reality tests' take, it is often as moment for the concerted reconstruction of expectations, spaces where potentially contested relations and categories are made 'unquestioned'. In other words, to determine what is 'real' is to perform an infrastructural inversion (Bowker et al 2009) that exposes the devices,

¹ Arthur W. Frank III, Reality Construction in Interaction, Annual Review of Sociology, Vol. 5 (1979), pp. 167-191

techniques, practices and objects assumed to ground action in the field, to then cool their meanings into a stable form.

At stake here is the importance of placing attention on how infrastructures create the conditions for action in economic life—and how agents wrestle with the obdurate installed base where they truck, barter and exchange and refer to it in moments of breakdown and conflict. The definition of the real is certainly shaped by relational, cultural, and performative considerations; but it is also informed by the shared recognition of how things ‘naturally’ work at an everyday operational level. In studying controversies about the reality of transactions, placing attention on these expectations and their infrastructural correlates matters: controversies are resolved not only by imposing definitional categories that reflect the interests, experiences, positions, and affiliations of the social actors involved in a dispute. As importantly, closure also requires seeing whether solutions pass a certain reality test—that is, whether they ‘make sense’, given the infrastructures that ground everyday action.

In this paper, I study the place of this form of infrastructural inversion in economic life by looking at how financial market participants deal with the reality of so-called spoofing in high frequency trading. An old practice, spoofing involves manipulating market prices by submitting “false” orders to buy and sell securities. In the context of electronic financial markets, spoofing has become a particularly notable object of contention for regulators and market participants alike: at the core, the issue is determining the reality of trades. Is a trade ‘real’, the product of clear intentions to exchange, or is it simply algorithmic smoke meant to hide an underlying reality?

Transactions that matter

The reality of economic transactions indexes the larger and more provocative complication of the realism of relations in general. At the core, all transactions imply a relation, whether rooted on distinct interpersonal interactions, as in street markets and intimate exchanges (Zelizer 2009; de la Pradelle 2006), or

mediated by impersonal systems such as trading screens, mobile applications, or automated point-of-sale systems (Vargha 2011). When two agents exchange, they are tied for the duration of their transaction; they are related, even if through their membership of a community of exchange (Weber 1978). This patently relational character of exchange invites rethinking the more fundamental issue of what it means to be related more generally. When can we say that two things, or two individuals, are relatives of a certain kind?

The answer to this might seem entirely trivial: a relation, as a prominent relational scholar noted over conversation, is simply a meaningful connection between people. Relations are the fabric of society (Simmel 1949, 1950; Aldous 1972; Durkheim 2014), and their existence is in many ways given within sociological thought (White 1992). Consider, for example, Zelizer's work in relational economic sociology. For Zelizer (2009), how and why people use specific transactional media (such as gifts, emollients, payments, or transactions in-kind) depends on how they manage three distinct elements: relational packages, formed by combinations of interpersonal ties, interpersonal transactions, and media of exchange; social categories, consisting of "widely recognized relationships within a certain population"; and legal categories that match recognized relations, transactions and media to legal action. Although valuable for stressing the importance of relations within the apparently impersonal sphere of economic transactions, Zelizer's approach nevertheless undertheorizes how relations are constituted in the first place. And in this, Zelizer is certainly not alone. Conventional approaches within sociology (and in economic sociology specifically) treat relations as either contextual reflections of broad shared social categories (e.g. relational packages may be local and contingent on the identities and trajectories of the actors involved in exchange, but they nevertheless respond to established cultural forms), or as processual outcomes that reproduce affinities, dispositions and mental categories through the strategic action of the actors who create networks of interpersonal connections (Erikson 2013). Think too, as an illustration, of Mustafa Emirbayer's now classic *Manifesto for a relational sociology* (1997). An erudite theoretical survey that defends a transactional view of the social world, Emirbayer's

analysis nevertheless fails to identify the boundaries and dynamics of relations and their constitution. “[B]onds, not essences, provide the bases” for social outcomes, notes Emirbayer with reference to Tilly (1999); in avoiding the constraints of substantivism, though, little is said about the makeup of such fundamentally important bonds—“the very fact of connectivity itself” (Emirbayer 1997) is implied in how analysts unproblematically discern meaningful relations within the field.

But ‘meaningful relations’ are neither empirically obvious nor theoretically clear. Consider biological lineage, an exemplar of the prototypically meaningful relation in Euro-American imaginaries (Schneider 1980). There is something meaningful within familiar relations, as Zelizer notes, tying individuals, motives and transactional media in very distinct ways (Zelizer and Tilly 2006). Monetary transfers between spouses or across parents and their offspring occur not as impersonal interactions but bundled in an intricate package of emotional ties and expectations of symbolic reciprocity that encode meaningful notions of familiarity. Genealogical connections, however, only translate into meaningful relations under specifically circumstances. Take the case of the Paiela, for instance, for whom relations are “subjected to the test of time fall by the wayside depending on the warmth of that relationship”, writes Biersak (1982). Genealogical relatives who do provide support become ‘false’ kin whereas those who support each other are thought of as ‘true’ kin. More proximally, think of discussions about relatedness at the intersections of law and biomedical knowledge: transformations in reproductive technologies and legislations around their use mean that biological familiarity no longer guarantees relatedness in Western societies, but does so only under finite combinations of law and technique. A surrogate mother can only lay claim on her child in specific legal circumstances, in the same way that the donator of a gamete is not guaranteed relatedness to his or her genetic offspring. Relations are relative and always underdetermined, be it by law, shared social knowledge, or by technologies of reproduction (Shalev 1998).

The argument above directly evokes the work of Strathern (1995), who provocatively queries the status of 'the relation' as a central analytical object in contemporary anthropological thought. Social anthropologists, writes Strathern, "route connections through persons", attending to "the relations of logic, of cause and effect, of class and category, that people make between things [but also] to the relations of social life, to the roles and behavior, through which people connect themselves to one another" (1995: 11). Such routing is the "substance of anthropological empiricism", she continues, creating a 'double emphasis' on relations "known to the observer as principles of social organization and relations observed as interactions between persons". Social structure is thereby located in relations that are "relevant to people's acts and intentions" (1995: 12). The consequence of this 'double emphasis', she argues, is that persons are discerned and classifiable "by their relations to one another"; the process of making relations encodes society and defines the limits of personhood. The problem, of course, is that the varieties of relevant relations are plentiful. As Strathern notes referring to Gregory Bateson's work with the Iatmul, kinship takes unexpected forms: for the Iatmul, "human beings are simply one manifestation of clan persons also manifested as every conceivable entity in the environment [...] Yams have personal names, give birth, respond to speech walk about at night" (1995: 16). The object of anthropology, then, is not to take relations as ontologically given but to understand their patterned variations and trajectories (see also Vivero de Castro 2002). The boundaries and dynamics of relations are never entirely trivial' indeed, the task at hand is finding how relations and persons are constituted, rather than taking for granted the existence of a dense relational system that serves as the basis of order, strategy and signification.

If anthropologists route relations through persons, sociology channels society through the relational individual, a point that is central to how it conceptualizes economic exchange. Consider Bourdieu's late work on the French housing market (2005). In commenting on Harrison White's interactionist model of markets as spaces of strategic action and mutual observation, Bourdieu suggests subordinating such perspective "to a structural analysis of the

conditions that delimit the space of [the] possible strategies” of actors (2005: 208). By understanding the economic habitus as a “conditioned and limited spontaneity” that drives the formation of connections within and across fields, Bourdieu brings the categories and structures of the field directly into the relation; he routes structure through the individual’s relational tactics. This is, of course not entirely surprising: in his earlier work, Bourdieu suggests that terms of address and reference—two elements that are central to the production of a relational connection—“are first and foremost kinship *categories* [that] contain the magical power to institute frontiers and constitute groups, by performative declarations [...] that are invested with all the strength of the group that they help to make” (1977: 170). Such *catégories*, as Bourdieu notes, “institute a reality” based on the legitimacy of the accepted kinship categories and their implied relations.

For economic sociologists, then, Strathern’s work presents an interesting challenge: while recognizing relations as central to the making of economic life, it compels re-thinking how relationality is constituted and maintained by specific forms of knowledge, technique, and mediation. Here, infrastructure studies provide a potential point of articulation. First, like both Strathern’s anthropological critique and the program of relational sociology, infrastructure studies deal with the apparent opposition between categorical or substantivist approaches and transactional or processual accounts of social life. For Strathern, the anthropological relation is divided into “the conceptual” or categorical and the interpersonal; an abstract ‘general’ and a practical ‘particular’. As she writes:

On the one hand are those relations seen to make connections through a logic of power of articulation that acquires its own conceptual momentum; on the other hand are those relations that are conducted in interpersonal terms, connections between persons inflected with a precise and particular history (2005)

These two elements, the abstract and the particular, are necessarily conjoined in a tandem. Interpersonal relations create what is conceivable, whereas the conceptual apparatus provides a social life to—or infuses with meaning—the interpersonal:

it is through the interacting with persons that diverse interactions and further connections become intellectually conceivable [the interpersonal creates possibilities for the conceptual], while it is through creating concepts and categories that connections come to have a social life of their own [the conceptual as a terrain for the potential interpersonal]

Kinship systems provide an example: there, the eminently abstractive conceptual apparatus of law meets the apparently thicker everyday experience of interpersonal, familial connections. The law is not independent of these, as through court cases and battles over who are related novel categories get made. Conversely, law shapes our everyday experience in distinct ways: who can marry whom, who is deemed a sibling, who has parental responsibilities, are subjects of legal technique that affect our capacity to create kindred groups in our personal lives. Through the tandem, Strathern's work evinces a connection between the relational and the infrastructural: infrastructures are densely inhabited by proxies of concepts—they are worlds of classifications, gateways, standards, protocols, measurements, templates—that make relations possible—by connecting machines, encrypting signals, or locating cases in the same classification situation. Relations are always “people related through some other criterion” (2005); infrastructures are to relations what the abstract is to the particular.

Secondly, the concept of infrastructure is relevant because it is doubly and essentially relational. It is relational in an analytical sense, as Star and Ruhleder (1996) observed: something is infrastructural not in and of itself but only with respect to a particular community and set of practices—there is no substantive quality of being infrastructural *without* reference to practices and knowledges. For me, highways are infrastructures, taken-for-granted elements that melt into the landscape of southern California. But for the Caltrans maintenance crews and the multiple teams of urban planners that trace, engineer and alter them, highways are notably visible objects of intervention, repair and construction.

Infrastructures are also relational in an operational sense: they enact relations by creating categories of membership, equivalence, and interoperability. Think two paradigmatic forms of infrastructure, namely, platforms, standards and classification systems (Edwards 2010, Star and Bowker 2000) that, like relations, ‘summon to the field’, discriminating between “all those possibly connected and those whom one chooses to recognize”. Standards and classifications order entities in the world by locating them within specific categorical systems, but by doing so they also enact associations and dissociations, relations of similarity and relations of difference. Think here of the recent work by Fourcade and Healy (2013), whose Weberian-inspired analysis of classification situations points at how infrastructures—from credit scoring systems to crowd-sourced mechanisms for wine rating—operate as distributed sieves that sort people, things and evaluations according to specific orders of worth—infrastructures facilitate this type of classification situations by making them durable yet implicit.

A focus on infrastructures also provides important lessons for how taken-for-grantedness is created within economic settings—in the form of, for example, shared operational classifications or criteria of equivalence that define relations for some actors in the market. The construction of a stable reality for market actors is necessarily predicated on the infrastructural work carried out by others: what is second nature to those involved in a transaction, what is obviously and blatantly a “meaningful relation” for parties to an exchange, is some other actor’s rebuttable convention (Boltanski and Thevenot 1999) of counting, ordering, and technical interoperability. Like Strathern’s tandem, the double condition of infrastructures makes possible alternative accounts of how stable worlds emerge: they do so not only in reference to the creation of collective, intersubjective, front-stage categories shared by actors in a particular field, but also in connection to how relations are reflected upon the infrastructures that support the field’s operation and that only become apparent in moments of breakdown; contested relations are ‘tested’ by how well they fit with extant infrastructures.

Note the potential shift in explaining the sources of stability and change. Existing institutional, relational and processual accounts place great emphasis on how, during moments of conflict and uncertainty, actors create shared repertoires (Swidler 1986), dominant cultural conceptions (Fligstein 2002), and accepted frames of interaction, narrative and interpretation (Bandelj 2003; Goffman 1978) that allow closing controversies and coordinating action. In Swidler's classical account, for instance, unsettled times are wrangled by recourse to ideologies that bring together actors in distinct cleavages out of which common expectations emerge (Swidler 1986). For Fligstein, the key problem of market actors is curtailing competition by creating shared conceptions of governance, exchange and control that produce stable and predictable worlds within the market (Fligstein 2002). In Zelizer and Tilly's (2006) account, actors participate in the ongoing construction of boundaries through which they stabilize exchanges and tie these to extant social categories. And for Beckert (2009), stability results from how actors solve the problems of coordination to reduce the uncertainty of the environment within which they perform their actions. In these as in other approaches, the field is conceptualized as a space of front-stage action: what matters to markets and institutions are the knowledge and practices of the actors engaged in exchange—producers observe producers, firms observe firms. Actors thus look sideways, at how others in the same relational plane behave; coordination, in this model, is hence mostly endogenous.

What the dual condition of infrastructures allows for is considering how front-stage actors refer to 'deeper' operational planes to settle disputed moments. Actors do not invent the world anew every time there is a controversy or critical moment nor do they constantly engage in a reflexive production of boundaries and classifications (cf. Bourdieu 2005, Zelizer and Tilly 2006). Rather, actors refer to existing conceptions of what is taken for granted, of what works in practice—looking at fields that, for their frame of reference, are mostly invisible that but that become resources in moments of breakdown and controversy (an alternative framing would be to think of such fields as linked ecologies in Abbott's sense, where the hinges become more or less visible

through time). Infrastructures, then, can be said to bootstrap the sense of reality shared by actors, anchoring accounts of what is possible, desirable and permissible in moments of uncertainty.

In what follows, I explore how this perspective allows understanding the dynamics of contentious transactions within high frequency trading. I do this by exploring recent discussion on spoofing in American financial markets. An old practice that involves submitting orders without the intention of their execution, spoofing is a form of market manipulation now recognized as an illegal under the reforms of the Dodd-Frank Act in the United States. While the legal boundaries of spoofing may be clearer today than in the past, though, there remains is a notable complication: the difference between spoofing and bona fide trading is neither entirely clear nor obvious. And this is how infrastructures play an important role.

Spoof!

What is at stake in the reality of spoofs? In addition to its pecuniary implications, spoofing creates ontological and moral uncertainty on the character of market transactions. Questions of spoofing remit to more substantive discussions about the makeup of society: if exchange is, indeed, productive of social cohesion (Bearman 1997; Mauss 1997), if relations matter for creating the forms that give life to the social, then 'false' or 'fake' exchanges can be read as corroding the character of markets. Fake transactions, like the danger of fake relations, challenge the idealized principles of market and society, respectively.

The challenge with spoofs, though, derives from the relative difficulty of their identification: the process for generating a legitimate order to buy and sell securities and a spoof is much the same; both start their lives as standardized messages produced by the trading systems of brokers and other investment intermediaries and that then travel as electronic signals to the computer servers of exchanges where they are processed and matched. A false order will not sink in water, nor will it look differently on the trading screen. Rather, what

differentiates the real from the fictitious is the intent of whoever originated the trade or its underlying automated trading system. A real trade, market participants would say, only exists when it was made *bona fide*. This is precisely how law singularizes spoofing: as an activity that distorts true prices through calculated deception and manipulation. For example, since the securities markets reforms of 2001, it became unlawful, under Section 10(b) of the Securities Exchange Act 1934, “for any person, directly or indirectly [to] use or employ, in connection with the purchase or sale of any security [...] any manipulative or deceptive device or contrivance”. Similarly, under section 17(a) of the Securities Act 1933, it is unlawful to “employ any device, scheme, or artifice to defraud, or to obtain money or property by means of any untrue statement of a material fact [...] or to engage in any transaction, practice, or course of business which operates or would operate as a fraud or deceit upon the purchaser.” Legal prohibitions against spoofing in particular (rather than market manipulation in general) are even more recent: in the United States, they were only coded as part of the Dodd-Frank reform of 2010, when spoofing was defined as “bidding or offering with the intent to cancel the bid or offer before execution”. This definition was reaffirmed in the courts, where spoofing was interpreted as “non-bona fide orders, or orders that the trader does not intend to have executed, to induce others to buy or sell the security at a price not representative of actual supply and demand”.

The notion of intent as a placeholder for reality is at the core of these and other definitions of spoofing and market manipulation. Establishing intent, however, is notoriously difficult (e.g. in parenting, Coleman 1995 and Wald 2006), particularly in the context of a system (the market) where actors are mostly anonymous and their decisions are supposed to reflect personal, subjective valuations and the ever changing state of public information (Malkiel and Fama 1970). It is not unlawful to be a bad investor, nor is it illegal to change one’s mind. It is also not unlawful to consider investment strategies that are contingent on other events (“Buy XYZ while ABC goes up”). It is also perfectly legal to submit orders that are completely nonsensical (and thus that have no real likelihood of being executed; such as a limit order to buy all Apple stocks for

\$0.01 per share)—as financial economists Fischer Black argued, uninformed investors may very well be necessary for the operation of the market (Black 1986). But determining the existence of spoofing requires discerning precisely this type of individual characteristics, of distinguishing the actual motivations of an individual trader or the designer of an automated trading system.

“Identification of an abuse”, writes legal scholar Jerry Markham “is itself problematic, since not every advantage or stratagem is abusive even if it provides advantage to its user at the expense of others”. Under volatile conditions, for example, a trader may engage in an aggressive strategy that involves submitting and cancelling large numbers of orders to buy and sell securities, without the intent of manipulating market prices. The phrasing of law is also far from trivial: if a strategy is based on a probabilistic expectation of execution (say, that 1 of every 100 orders submitted to an exchange will be executed, having to cancel the rest), can one speak of intent, as defined in Dodd-Frank? How to distinguish lousy, erratic, jittery or informed trades from active forms of deceit? In other words, when is a transaction real? When do market participants say that a relation exists?

A partial answer is provided by the Commodities Futures Trading Commission’s (CFTC) Interpretive Order on spoofing (Federal Register 2013), a document that serves as guidance in cases where there is suspicion of market manipulation. For the CFTC, distinguishing between legitimate trading and spoofing requires evaluating “the market context, the person’s pattern of trading activity (including fill characteristics), and other relevant facts and circumstances”. To aid comparisons, the CFTC The Commission provides “four nonexclusive examples of possible situations for when market participants are engaged in ‘spoofing’ behavior, including: (i) Submitting or cancelling bids or offers to overload the quotation system of a registered entity, (ii) submitting or cancelling bids or offers to delay another person’s execution of trades, (iii) submitting or cancelling multiple bids or offers to create an appearance of false market depth, and (iv) submitting or canceling bids or offers with intent to create artificial price movements upwards or downwards.” Note that within the CFTC’s Interpretive Order, the intentionality is framed in relation to specific

technical conditions: “overload of the quotation system”, “delayed execution”, “false market depth”, and artificial price movements. Indeed, although the CFTC does not interpret spoofing as an activity restricted to “trading platforms and venues only having order book functionality”, it nevertheless ties spoofing to a specific technical device, the electronic limit order book.

Order books and second order intentionality

Electronic limit order books are central to the operation of modern financial markets, particularly those dominated by forms of electronic and automated trading. They are relatively new inventions: while order books have an old and illustrious history, the first generation of electronic limit order book traces back to the 1960s and early 1970s when they were introduced at the margins of the financial system to reduce operational costs in the matching and executing of trades. By the late 1980s, electronic order books had been adopted throughout the world, and by the mid 1990s they were widely recognized as the ‘inevitable’ technology at the core of the future of the marketplace (Pardo-Guerra forthcoming).

Order books are infrastructural to finance in at least two clear respects. First, across countries and asset types, the majority of trading today is either routed through or executed in an electronic limit order book. In the United States, for example, at least 59.2% of the trades in equities are automated through order books (with a remaining 22% tied to manual, yet electronic, trading), whereas 97.1% of the most common (G10) foreign exchange operations go through the book. Indeed, soon after their introduction, electronic limit order books became the standard for how to build a market: linking order books is relatively trivial (all that is required are communication standards that allow transmitting information across order books) and leads to a scalable outcome (joining continuous markets generates yet another continuous market), yet other market designs (such as batch auctions and other forms of discontinuous trading) are neither trivially amenable to interconnection nor produce a predictable outcome. It is in this sense that order books became taken for

granted platforms, much in the same way as trading floors were in the past; they are, for all intents and practical purposes, the standard format of the marketplace, possessing a design and operation that is very much undisputed.

Second, and perhaps more importantly, trading strategies are often designed in reference to order book dynamics. Order books matter not only because they are necessary for trading; importantly, their technical details determine, to an important extent, the space of strategies available to market participants. A cursory exploration of ‘practical’ publications in algorithmic and high frequency trading exposes this well: unlike a previous generation of textbooks in financial economics—concerned mostly with determining risk adjusted equilibrium prices—contemporary discussions focus on so-called market microstructure, essentially a set of literature interested in understanding order book dynamics and the effects of variations on market design on aggregate patterns of trade and the profitability of specific trading strategies. Algorithms, for instance, are designed to fit the functionalities of specific order books, exploiting different ways of signaling information, modifying orders, and executing trades (Balarkas and Ewen 2007; interview with platform developer, 2013). In addition to the very simple limit order (an order to buy or sell a certain volume of securities at a certain price), an order book may process Calendar Spread Orders (that instruct to buy one delivery month of a contract and sell another delivery month of the same contract, at the same time, and on the same exchange), Deferred Orders (that sit on the order book until triggered), hidden orders (that are not visible to users of the book), or any other of the 1200 possible order types available in American financial markets across the sixteen national securities exchange recognized by the SEC (Mackintosh 2014).

What matters, in this sense, is that action is tied to infrastructure in concrete ways. Infrastructure matters not only because it channels action, but also because it formats possible courses of action (a theme all too common to infrastructure studies, which echoes the tones of some early structuralist literature). The meaning of a relation, then, is indexical to the infrastructure. As if a pragmatist, communitarian evaluation (Dewey 1939), the reality of a

potentially fictitious market transaction in contemporary finance is gauged in connection to how they represent ‘proper’ or ‘expected’ uses of the order book.

Such indexicality is apparent in how the question of spoofing is resolved in courts of law. While market manipulation is as old as organized finance (in fiction, think of the Monte of Cristo’s efforts to destroy Danglar by spreading false news at the Bourse), the first legal criminal for suspected spoofing as defined under the Dodd-Frank Act occurred only in 2011, when the Commodity Futures Trading Commission of the United States and the Financial Conduct Authority of Britain brought charges against Michael Coscia and his Panther Energy Trading for illegally manipulating markets on the Chicago Mercantile Exchange and the Intercontinental Exchange. Agreeing with the Department of Justice, a grand jury indicted Coscia in late 2014 on six counts of commodities fraud and six counts of spoofing. And during the ensuing trial, the government argued that Coscia knowingly “entered large-volume orders that he intended to immediately cancel before they could be filled by other traders” (*US v. Coscia*, Indictment, 2015).

Coscia’s defense relied on two key arguments. First, that the trial was itself procedurally incorrect because existing the statute against spoofing was simply too vague, encompassing “much routine, innocuous conduct by commodities traders” (*US v. Coscia*, Motion for Acquittal, 2015). Second, Coscia argued that both intent and manipulation were not evident. Since he never made an explicit false statement or material representation about when or how he would cancel the orders submitted to the market, he argued that there existed no element of fraud in his actions (*US v. Coscia*, Memorandum opinion order, 2015).

For the prosecution, however, Coscia’s intentions were clear: his strategy transpired a clear intent to cancel, differentiating his conduct from other, widely accepted legitimate practices such as fill-or-kill and partial-fill orders. According to the government’s legal team, Coscia manipulated the market by conveying “a misleading impression to customers” through his activity (*US v. Coscia*, Memorandum opinion order, 2015). That he had not misrepresented his

intentions beforehand was simply immaterial. Indeed, much of the proof offered by the prosecution consisted in highlighting the logic of Coscia's strategy, which consisted of so-called layering orders, that is, placed large orders to buy and sell instruments slightly above and under the best bids and offers, creating a "false sense of supply and demand". Through this, argued the government, Coscia affected the offers of other (principally algorithmic) market participants and profited from market movements artificially created by his trades (*Financial Times* 2014).

Note the nature of the evidence presented by the prosecution: it involved opening up the CME and ICE's order books—performing an infrastructural inversion, of sorts—to discern the aggregate nature of Coscia's actions by tracing the logics of smaller, fine grained transactions. The indictment, for example, accused Coscia of knowingly transmitting "to a CME Group server Euro FX currency futures contract orders that he intended to cancel before execution, so he could purchase 14 contracts at a below-market price and then sell them immediately thereafter for a higher price, in order to obtain a profit of approximately \$175 in less than a second" (*US v. Coscia*, indictment, 2014) (Though Coscia's indictment included only six counts of spoofing, none of which resulted in more than \$500 in profits, Coscia is thought to have engaged in a multitude of events, producing earning \$1.4 million over a span of little less than three months). The intent of these orders was not established from confessions or other first-person statements, but rather was inferred from the strategy followed by the defendant in the context of what was possible and expected within the order book. In addition to testimony by Coscia's programmer, the government relied on the expert testimony of Hendrick Bessembinder, a Professor of Finance at the University of Utah and specialist in market microstructure theory, who set much the tone for the trial. As Bloomberg reported, Bessembinder "went through data for the jury that showed that even after orders were filled there were attempts to cancel them by Coscia's algorithms" (Louis et al 2015). The explanation of intent relied heavily on understanding how the book works. "The only way trading is generated in electronic markets", noted Bessembinder,

is through order submission. So if one is seeking to generate trading, seeking to generate a reaction, the only way one could do that is by inducing people to change their order submissions. [The] high fill rates on the small orders [suggest manipulation]. They were not only very high relative to the fill rates on the large orders, they are actually remarkably high for fill rates for other high frequency traders, so the high fill rates on the small orders are certainly very much consistent with the idea that the reaction that was generated was to induce other traders to submit orders to trade against, interact with the small orders.

Bessembinder did not speak of Coscia's intentions; he did not "implicate intent as to any element of the crime charged" (*US v. Coscia*, Memorandum opinion order, 2015). Rather, Bessembinder's testimony suggested to the jury what is expected of order book dynamics, signaling that the only possible way of making sense of Coscia's orders was as fictitious transactions. The order book linked (c.f. Abbott 2005) native conceptions of intent with the specific technical repertoires of market microstructure economics. And the coupling was effective: in early November 2015 and after but an hour of deliberation, the Chicago jury found Coscia guilty on all twelve counts.

The trial of Michael Coscia was historically momentous in at least one important way. In addition to testing the waters of Dodd-Frank, it introduced a new way of establishing intent—of testing reality—within the increasingly electronic marketplaces of the American financial system. As economist John Montgomery commented (2016),

the recent enforcement and criminal cases [against spoofing and market manipulation] generally involve allegations that orders submitted by the defendant induced changes in orders submitted by other traders. [...] *It would then fall to economic experts to analyze whether such a pattern exists, and whether the trading suggests an intention on the part of the defendant to induce the other limit orders to be submitted.* The pattern described could be consistent with benign activity as well. For example, the trader could have orders on both sides of the market to benefit from the spread. A more aggressive trader could enter and submit more

aggressive orders that then interact with the other side of the defendant's orders. Seeing those more aggressive orders, the defendant concludes the market is moving, cancels his/her open orders, and submits orders on both sides of the new market price. If a trader is alleged to have pursued spoofing as a strategy, *an analysis of the risk and expected return of the strategy can provide evidence on whether this is a plausible claim* (emphasis added).

There is, then, a reality test: if economic experts find risk-adjusted returns abnormal within the context of a particular order book design, something must be amiss. The result of such logic, argues Steven McNamara, is that *US v. Coscia* “takes the natural step of inferring a second-order intent in the programming of algorithms to accomplish certain tasks” (McNamara 2016). In this, the material cultures of electronic financial markets may not only be cultures of second-order-transparency, as Muniesa (2014) pointedly observes. It is also possible that, following *Coscia*, intentionality within the market is now observable only from a distance, through the judgment of experts that discern the boundaries of actions by discriminating between true and false transactions, real and fictitious market relations, according to how they are positioned within the order book. But this might not be too surprising, after all: relations are, at the end, artifacts of knowledge and craft.

Some final thoughts

That infrastructures matter in configuring relations, that they create and shape the communities that exist above them, can be seen perhaps by looking at the past as much as at the present. Consider, in particular, the trading floor, an infrastructure that contrasts sharply with the logic of the order book. Whereas order books operate under strictly symmetrical rules of price-time priority, trading floors are spaces of slightly more asymmetric interaction. Order books are organized as queues of electronic messages; trading floors take the shape of crowds of traders. Order books are mostly anonymous; the dynamics of trading floors are characterized by interpersonal knowledge and communication (Zaloom 2006, Hertz 1998). Yet spoofing is native to both, receiving quite

different treatments across each setting. In the digital domains of electronic limit order books, spoofing is, quite clearly, an illegitimate transaction, a false relation that threatens the moral standing of the anonymous market. In trading floors, however, spoofing was at times tolerated, sort of a joking relation (Mauss 2013) through which traders on the floor of teasing amongst the market-kin.

One example jumps to mind in this respect: a case of spoofing on the floor of the London Stock Exchange in the early 1980s. Then, prices were mostly verbal, sometimes represented through whiteboards propped on the pitches of market makers on the trading floor. Over interview, a once young trainee at one of the most reputable market makers in London recalled how representations were used to drive prices in particular ways. The individual in question was assigned to work on the Australian mining book, which consisted of a list of mining shares selected and managed by a senior partner. As part of his research, the senior partner travelled to Australia to inspect facilities, talk with managers and engineers, visit brokers in Sydney and Melbourne, and buy shares for the firm's inventory. On an occasion during which the trainee was on the pitch, the partner had returned from Australia, bringing shares of a newly found mining company. The market, as the trainee recalled, was "a bit frothy", yet the price of gold was "really going through the roof". Before the market opened at 9:30, the senior partner introduced his new finding to the other firm's members and trainees in the pitch: "Alright. I've got this company called GEM Exploration, which I've bought 250,000 shares of [...] and I've bought them for the equivalent price of 3p. [We'll] see what we can do with them". So he wrote 'GEM' on the whiteboard and next to it he wrote '5' as the opening price for the share. Because it was written rather than printed on the board, it was clear for everyone in the market that this was a new share. And so, the first brokers were drawn to it. The first one to enquire about this strange new entry said "I see... What's this GEM you've got up there? They look interesting. Tell me about that". As the one responsible for managing Australian mining shares, the senior partner replied: "Well, I went to Australia. I saw this company' and after explaining the business of the company, he mentioned he thought they were 'a real prospect in the current market conditions". Intrigued, the broker asked for a quote. "They're 4 6" replied the

senior partner. “What sized you’d like that?” asked the broker. “25,000” answered the market maker. “OK, well, thanks very much. I’ll go away and have a think about that one”, said the broker as he walked away from the pitch. Regardless of the fact that there had not been a transaction, the senior partner changed the price on the whiteboard, writing in blue the number 6. The next broker approached the pitch, seeing GEM Exploration on the board.

‘What are they this morning?’ ‘Ah, well they’re 5 7’. ‘What’s the size?’ ‘Ah, well they’re at bid for 25, offered in 10’. Which showed that I’m a buyer, obviously. And he said ‘Oh, OK, well, I’ll buy ten’. The next guy comes along and literally, within half an hour, the things are trading at 25p. By the end of the day, they’re trading at 40p, and we’ve turned over 2.5 million and we are we are long 350,000 shares instead of 250,000 shares (Interview with former market maker).

The case was blatantly one of market manipulation: the representation of prices on the whiteboards was meant to elicit, like Coscia’s trades, reactions within the market community. But any similarities obscure an important difference: these types of manipulations on the floor, although certainly contested, had an altogether different moral valence. To manipulate one’s relative is one thing; to manipulate a stranger in an anonymous environment is quite another. But those were the days of the floor. As Gregory Meyer of the *Financial Times* wrote, technology “changes the nature of violations”. But if it does so, it is necessarily because different technologies imply and enact different “mutualities of being” (Carsten 2013). The risk of spoofing is a risk of false, rather than joking, relations—a challenge to the legitimacy, morality and reality of markets (Arnuk and Saluzzi 2012).

So what do we gain by looking at infrastructures? Firstly, they suggest focusing on relations and the mechanisms that bound, format and enact them and their social worlds. The market is, indeed, an arms-length setting: agents in financial markets today, for instance, have an ease of exit that is quite unparalleled historically. Yet markets are also bound by connections, mutual dependencies, and reciprocal obligations—materialized through settlement systems, contractual linkages, and connectivity standards, but also through

associations, professions, employment matching patterns, and others. As Turco and Zuckerman (2014) show, exit is limited, even in the putatively rational and calculative spheres of private equity.

Second, if relations emerge in connection to infrastructures, then the politics of relations cannot be contained within the categories of social actors and their mobilization. Relational economic sociology, like other relational approaches in sociology at large, has stressed the unequal distribution of power and resources as shaping categorical (and thus relational) work. This is certainly part of the story—but what an infrastructural inversion would advise is looking further than front-stage struggles. Definitional battles over spoofing were surely shaped by overt institutional politics, for example (see Arnoldi 2015); but practical instances of spoofing depended on an altogether different articulation of intent on the basis of overlapping (yet disparate) forms of knowledge and expertise. Spoofing was not the object of ideological intervention—rather, it was at best a boundary object (Star and Griesemer 1996), linking the different ecologies of trading platform designers, lawyers, market microstructure economists, regulators, and a mixed gamut of market participants.

Third, infrastructures compel us to think of the ‘invisible’. The question of spoofing is unescapably linked to questions of order books and the implicit assumptions they make about how things can (and should) be meaningfully connected. To understand how reality was realized in finance, how specific modes of action emerged as second nature to market participants, how categories were drawn in the marketplace, requires tracing the histories of these invisible platforms and their multiple makers. For contemporary financial markets, so it seems, reality is partly manufactured by the invisible hands of others.

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¹ As explored by MacKenzie (2014), the main trading systems for the foreign exchange market (for instance, the Electronic Broker Service) were designed to run at slightly slower execution speeds than their equivalents in stock markets. It is thus entirely possible that the most liquid stocks in mature markets may trade at higher speeds than their equivalents in foreign exchange.