



ARTICLES

GAMING THE PLUMBING: HIGH-FREQUENCY TRADING AND THE SPACES OF CAPITAL

By Alberto Toscano , 16 January 2013

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Image: Michael Najjar, from the series High Altitude, 2012

While high frequency trading is often mystified as capitalism's immaterial transcendence, an all-out war is raging to overcome spatial and material frictions in the pursuit of sub-millisecond advantages. Alberto Toscano inspects the gap between the financial fantasies and the muddy realities of the 'robot phase transition'

The Death and Rebirth of Representation Out of the Spirit of Finance

The inscrutable, abstract subsumption of life by finance seems to have become a matter of everyday experience, the anxious perception of causalities and constraints beyond our understanding and response. This state of affairs can only be intensified by hyped and hectic news of the 'algorithmic revolution' which has made it possible for automated high-frequency trading (HFT) to rapidly corner 77% of the volume of transactions on the UK market and 73% of the US market, by some estimates.¹ Mathematical instruments of formidable complexity and mutability, exchange velocities that demand the application of relativity theory to financial markets, catastrophic events (the 'flash crash' of 6 May 2010) that stymie explanation – for many, automated algorithmic trading has turned into the very paradigm of speculation as dystopia. Inevitably, the dystopia has also inspired its fascinated coterie of anti-humanist boosters, celebrating the coming singularity, the rise of the machines, information as substance become subject. For a phenomenon whose material and mathematical dynamics so resist figuration, it is perhaps symptomatic that it periodically calls forth representations which principally serve to reiterate its black-boxed menace and aura.²

Discussions of HFT are often accompanied by graphic presentations of the operations of particular algorithms, with their geometric periodicities, or of jagged trends in the overall volume of algorithmically controlled buy and sell orders.³ The effort to diagram and envision capital has a long genealogy, and it has been plausibly argued that different representational orders have successively shaped dominant conceptions of the economy, beginning with the 'zigzag' of Quesnay's *tableau économique* which,

if properly understood, cuts out a whole number of details, and brings before your eyes certain closely interwoven ideas which the intellect alone would have a great deal of difficulty in grasping, unravelling and reconciling by the method of discourse.⁴

The *tableau* thus allowed for a kind of synchronic totalisation of temporal and material movements, which a sequential, *narrative* account of production would be incapable of figuring. From the *tableau* to the physical models of the economy, representation has arguably been at the core of the making of the economy.⁵

But these activities of modeling, diagramming, and envisioning are representational in what is perhaps a counter-intuitive sense, since they break with a model of representation as mirror, photograph, correlation. They are, *pace* Donald MacKenzie, engines *and* cameras, or camera-engines.⁶ As representations of practically abstract processes and relations, they are also representations of invisibilities. What is it that we see in fact, when we 'see' the economy? In Buck-Morss's account of Adam Smith's vision of the market in *The Wealth of Nations*, only the results ('invisible except in its commodity effects'); from them, by induction, we are to posit the underlying, generative process: the division of labour. In Buck-Morss's gloss: 'We see only the material evidence of the fertile process of the division of labor: the astounding multiplication of objects produced for sale. Commodities pile up...'.⁷

The shift between different regimes of economic practice can also be traced in terms of styles of envisioning, which is also to say of forms of abstracting – in the sense of selecting, extracting, and shaping material for cognition and action. Indeed, Buck-Morss traces an increasing formalisation and stylisation in the movement from classical political economy to neoclassical economics, which is both inscribed in and impelled by an alternative representational regime. We can then in a sense 'read off' the politics of neoclassical economics from its relation to visual display:

Neoclassical economics is microeconomics. Minimalism is characteristic of its visual display. In the crossing of the supply-demand curve, none of the substantive problems of political economy are resolved, while the social whole simply disappears from sight. Once this happens, critical reflection on the exogenous conditions of a 'given' market situation becomes impossible, and the philosophy of political economy becomes so theoretically impoverished that it can be said to come to an end.⁸

This elision of the social is high-on total in the case of HFT. The algorithm as a representation that is itself productive – in other words, a *rule*, and an evolving one at that – can of course be frozen, but in ways that tell the layperson nothing. The jagged geometry of Michael Najjar's digital correction of Argentinian mountains into the peaks and troughs of the markets in his *High Altitude*, that 'subprime sublime', or the dead screens of high-frequency trading photographed and re-installed by Beate Geissler and Oliver Sann, are ciphers of our incomprehension more than visual articulations of relations open to cognition and intervention.⁹

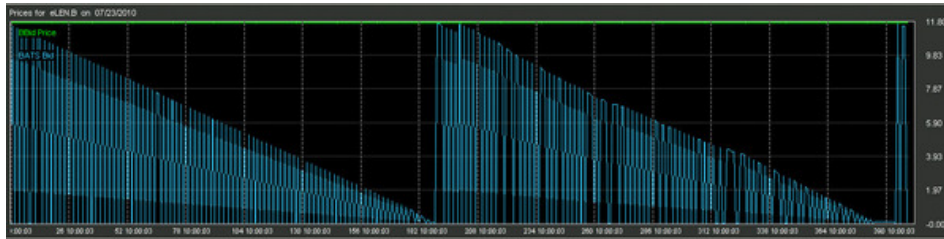


Image: 'stubby triangles' chart showing high quotes being made and then immediately followed by a stub order of \$0.01 (basically canceled in most contexts). The quote is then remade at a lower price and followed with another stub quote. This cycle happened at the rate of 380 quotes a second

If HFT appears as a terminal case of the impossibility of cognitive mapping from one angle, it can also be seen, in its self-generated utopia of algorithms that would react at the speed-of-light to global events (which, needless to say, have to be measured and formatted as instantaneous, itself a momentous conceit), as the fantasy of a world innervated by information, ceaselessly mapping and remapping itself. Scott Patterson's pacy tale of the rise of AI finance, *Dark Pools*, tells of Kinetic Global Markets, a start-up hedge fund in NY's attempt to integrate Big Data into light-speed finance:

As computers spread across the world, more and more information was available about... well, *everything*. Shipping trends in the Persian Gulf. The amount of wheat grown in Kazakhstan. Rainfall in British Columbia. Birth rates in Latin America. Oil shipments in the Strait of Hormuz. The list was endless. One fact was clear: The human mind could never process the Big Data. But a computer, perhaps? And perhaps, a Big Data trading machine could troll the Web and other data systems and discover patterns, *untold patterns*. Those patterns, if all worked as planned, could provide signals that a machine could use to buy and sell stocks for a massive profit'.¹⁰—

Or consider the proposal by MIT academics Alex Wissner-Gross and Cameron Freer to scatter the planet with 'optimal intermediate locations between trading centers', leading to this science-fictional scenario of a terraforming, inhuman distributed finance:

unmanned pods of densely packed microprocessors overseen by next-generation AI Bots processing billions of orders streaming out of unmanned AI pods positioned optimally around the world, the silent beams of high-frequency orders shifting trillions across the earth's oceans at light speeds, all automated, beyond the scope of humans to remotely grasp the nature of the transactions'.¹¹—

Curiously for Wissner-Gross himself the financial terraforming turns out to be an instrument for making 'our planet smarter', financing integrated knowledge systems capable of modeling and coping with climate change, for example. What from one angle appears as a catastrophe of representation, emerges from another as its plethoric utopia.

The Social Life of Algorithms

Among the virtues of the contemporary sociology of finance, with its roots in actor-network theory (ANT) and science and technology studies (STS), has been to counter the visions of homogeneity and dematerialisation that drive many of the technophilic and technophobic, utopian and dystopian visions of phenomena like HFT. Recently, Donald MacKenzie and his collaborators have been particularly thorough in refuting the superficial perception of the algorithmic revolution in finance as the demise of agency, history and matter. To the contrary, an investigation of the genesis of financial automation, sensitive to the multiple conflicts and contingencies that governed the emergence of the particular material, political and economic arrangement of HFT out of specific institutions like the Chicago Mercantile Exchange shows the traces of those power-struggles and the ineliminable differences and specificities that continue to command what to the outsider might appear as the inevitable outcome of a linear technological development.¹² The bodily space of the pit leaves its marks even in the most impersonal of rules. A market algorithm isn't simply an automated rule, it is also a 'social space', a device that is both conditioned and conditioning. Mechanisation is not a uniform process, but the outcome of a contest of knowledges and strategies. I will turn in a moment to what this foregrounding of the contingent history of finance elides, but I wish first to dwell on the manner in which Mackenzie and his co-authors home in on HFT as an object-lesson in the materiality and spatiality of finance.

As processing power and speed gain paramount significance, the customs, networks and hierarchies that governed market-making on the trading pit are increasingly shifted to the search for competitive advantage at the level of the fixed capital of finance: the data centres that provide co-location for companies wishing to reduce to zero their distance from the matching engines linking buy and sell orders, the fibre-optic cables laid through the Allegheny mountains to shave 3 milliseconds off the speed of a transaction between New York and Chicago, at a cost of a 100 million per millisecond. In a financial domain whose operations are difficult to qualify as anything but 'unproductive' we nevertheless encounter, in hypertrophic guise, the lineaments of a Marxian general intellect in which the social brain of science turns human labour into an appendage tasked with oversight (in the case of the 'flash crash', to those responsible for pushing the button or pulling the plug). The 'algorithmic revolution' could thus also be seen as a phase-shift in the organic composition of finance, curiously a domain that had fiercely resisted the depersonalisation and deskilling of labour like few others.¹³— This devaluation of the embodied knowledge of the pits is the obverse of the valuation of bleeding-edge knowledge in physics, mathematics and the 'plumbing' of markets — confirming after a fashion Simmel's link between the dominion of money and the hegemony of the 'intellect'.¹⁴— Similarly, the annihilation of space by time — of which HFT seems a paragon — is the other side of a reassertion of the significance of the spatial infrastructures of capitalism, and of the monopolies that 'naturally' accrue to them.

MacKenzie et al. approach these transformations through the notion, drawn from Carruthers and Stinchcombe's economic sociology, of the 'social structure of liquidity': market liquidity being conceived here as requiring continuous competitive auction, market-makers willing to price and transfer large quantities of stocks for a small margin, and the legal-technical formatting of homogeneous commodities. One of the tasks of the sociology of markets would thus be to excavate the conditions of possibility of such liquidity, its character as a complex and

contested achievement. HFT provides the occasion for MacKenzie et al. to stress, with respect to what appears at first glance as the most mathematically abstract and immaterial of financial innovations, the material nature of markets:

A price is not an abstraction: to be conveyed from one human being to another, or from one automated system to another, a price must take a material form, whether that be the sound waves created by speech, the electrical signals of the telegraph or telephone, or the optical signals that now flow through high-speed networks.¹⁵—

With HFT, the social structure of liquidity takes on an Einsteinian cast: 'high-frequency trading gives the obdurate physical reality of space a renewed prominence, and a physical constraint – the speed of light – is of growing importance'; as some industry commentators note that the state of the market will appear differently in different geographical locations, others remark that the speed of transactions means that one needs to 'abandon the idea that there is a universal truth for the best currently available price'.¹⁶— We thus confront a compression of market-making transactions to speeds far below the threshold of individual human cognition, and an asymptotic acceleration of market turnover. The fastest trading chip executes a transaction in 740 nanoseconds (or 0.00074 milliseconds) while human reaction time to a visual stimulus is around 190 milliseconds.¹⁷— In 1945, US stock was held on average for four years; this dropped to 8 months in 2000, 2 months in 2008, and 22 seconds in 2011.¹⁸— In his *Intellectual and Manual Labour*, Alfred Sohn-Rethel had hypothesised that in commodity exchange, the real abstraction of value was the unconscious determinant underlying an ultimately false consciousness of use and quality. Here the situation is in a sense reversed: the algorithms that enact these exchanges are the product of immensely sophisticated, conscious design, while the acts of exchange are beneath the experienceable threshold of human consciousness, as the exchange-abstraction materially approximates its formal characteristic, again according to Sohn-Rethel, as both timeless and spaceless.¹⁹—



Image: Geissler / Sann, from *Volatile Smile* installation, 2011

The 'obdurate physical reality' brought into relief by HFT takes many forms: the hollowing out of high-rises from Manhattan to Frankfurt to make room for co-location servers, the building of vast data centres at strategic geo-economic locations, the costs and ecological repercussions of the industrial cooling systems needed to run these data centres, and the laying of fibre-optic cable through mountains and across oceans to minimise 'latency'.²⁰ Armed with the intuitions of the kind of materialism proffered by ANT and STS, MacKenzie et al. inquire into the intricate negotiations – involving political regulators, legal frameworks, market agents, and material devices – required to wrest 'fairness' out of this spatio-temporal shift in the social structure of liquidity. Emblematic for them in this respect is the material expedient of equalising cable-lengths from servers to matching engines to neutralise any spatial advantage accruing to firms within the same location.²¹ This speaks to the necessary material arrangement of spacings and timings which accompanies the contingent negotiations that affect the shape of the social structure of liquidity in particular and of markets in general.

But there remains a curious reluctance on the part of this materialism of markets, for all of its stress on space, history and agency, to accommodate a reflection on the systemic trends or logics that lend phenomena like HFT their intelligibility – in terms of the burgeoning role of this facet of finance capital at a considerable distance from productive investment, but also at the level of the dynamics of temporal acceleration and spatial relocation. The ban on the concept of capital – its sin that of totalisation – is critical here.

Building Spaces for the Annihilation of Space

It is not in my capacity to delineate the system dynamics that made it possible for market-making activities geared to rendering 'price discovery' more efficient to gain such prominence, once 'gaming the plumbing' – in Patterson's nice turn of phrase – became such a profitable concern.²² Having said that, mainstream doubts that 'the welfare gains derived from HFT are minimal and perhaps even largely negative on a long-term investment horizon' indicate that super-profits made from the circulation of capital are indifferent or inimical to its production.²³ It is possible to push further the sociological suggestion that attention to the rise of HFT undermines the fables of a flat and frictionless capital. The vagaries of the emergence of HFT in different sites of finance capital, the institutional struggles over its particular shape, the elaborate contests that led to the 'fixing' of certain legal and technical parameters – all of these are well served by a materialist micro-sociology of markets. But while opening up the regulatory, technical and material black boxes that much political economy ignores, this research programme risks black-boxing, erasing or bracketing out some broader tendencies and logics of capital accumulation – spatial ones in this case – generated by capitalist *imperatives*.²⁴ Against the 'sociologies of the social', MacKenzie et al. wish to argue that 'content may become context', that phenomena like HFT can't be contained by a prior understanding of the patterned historical dynamics of finance capital.²⁵ Only the most deliriously Laplacean of Marxists would argue that the particular arrangements of contemporary financial markets are 'inevitable' byproducts of a particular phase of accumulation. Yet the 'context' of capital itself can't be written out.

It is difficult not to be struck by the way in which the financial microcosmos of HFT exhibits some of the spatial logics and contradictions that have distinguished capital through its many conjunctural figures and historical transmutations. The revenge of matter and space, in an economic field whose drive to instantaneousness seems to obliterate spatial difference, corroborates, in the financial arena, a well-known observation from Marx's *Grundrisse*:

The more production comes to rest on exchange value, hence on exchange, the more important do the physical conditions of exchange – the means of communication and transport – become for the costs of circulation. Capital by its nature drives beyond every spatial barrier. Thus the creation of the physical conditions of exchange – of the means of communication and transport – the annihilation of space by time – becomes an extraordinary necessity for it.²⁶

For the costs of financial circulation 'physical conditions' are paramount – as manifested in the fierce competition over co-located server space, proximity to trading venues and access to data, and in related phenomena like the rush to acquire and develop real estate for data centres.

The monopolistic character of spatial competition, whereby 'relative locational advantage translates into excess profits', dictates that the annihilation of space by time 'accentuates rather than undermines the significance of space'; that the frictions and inertias of space 'can be overcome only through the production of space, of systems of communication and physical infrastructures embedded in the land'.²⁷ Spatial and social infrastructures are explicitly designed to minimise the turnover time of capital, or, in this case, the 'latency' of capital in circulation. David Harvey's gloss on the constitutively geographic character of the Marxian dialectic – 'space can be overcome only through the production of a fixed space' – is writ large in the architecture of data centres and the massive outlays for fibre-optic communications. The second part of his statement, however, according to which 'turnover time can be accelerated only by fixing a portion of the total capital in time', would instead require us to explore the way in which HFT firms which hold stock for as little as an average of 11 seconds, and liquidate their positions at the end of the day, relate to the necessary fixing in space and time of capital in other sectors of the economy.²⁸ Thinking of HFT through the prism of a historical-materialist geography, and vice versa, also puts a further kink in the dialectic. The oscillation between locationally and technologically driven strategies to accrue excess profits – 'the closer production approaches some spatial equilibrium condition (the equalization of profit rates across locations, for example), the greater the competitive incentive for individual capitalists to disrupt the basis of that equilibrium through technological change'²⁹ – is here replaced by an apparent identity between spatial and technological competition (whether this is a dynamic that can be observed elsewhere in the economy is another matter).

Born in the midst of, and traversing rather unscathed, a period of financialisation and crisis, the algorithmic revolution embodied by high-frequency trading animates long-standing utopian and dystopian reflexes. The opacity of transactions happening fathoms beneath our perceptual threshold and far beyond our mathematical comprehension makes most 'representations' of this bleeding-edge of finance capital so many ciphers of our ignorance. The flash crash of 2010 nudged that ignorance into visions of impersonal, chaotic causalities – Skynet meets Y2K in a faceless data centre in New Jersey. Recent work in the sociology of markets provides an important corrective to fantasies and phobias of finance, by stressing the legal and institutional contingencies of HFT's emergence, but above all the manner in which attending to its operations dispels the equation of financialisation with immateriality and frictionlessness. A materialism that does not rest content with materiality but strains toward history and totality – a materialism of the really abstract – will need to articulate how the spatial dimensions of the algorithmic chase after excess profits in financial circulation can be routed back into the geographic strategies and aporias of productive capital in the long recession, spanning the unexperienceable speeds of algorithmic trading, the trend-lines of global capital and the lived time of our collective and political life.³⁰

Alberto Toscano <sos01at AT gold.ac.uk> teaches at Goldsmiths, University of London. He sits on the editorial board of the journal *Historical Materialism* and edits the Italian List for Seagull Books. He is the author of *Fanaticism: On the Uses of an Idea* (London: Verso, 2010), and is currently completing a book on the aesthetics of capital with Jeff Kinkle, *Cartographies of the Absolute* (forthcoming from Zero Books, blog at: <http://cartographiesoftheabsolute.wordpress.com/>).

Footnotes

¹<http://www.bis.gov.uk/assets/foresight/docs/comput...>

²On the political valences of HFT's invisibility, an ironic byproduct of its claim to inject greater transparency into market-making, see Paul Jorion, *Le capitalisme à l'agonie*, Paris: Fayard, 2011, pp.136-61.

³<http://www.theatlantic.com/technology/archive/2010...>

⁴Mirabeau, quoted in Susan Buck-Morss, 'Envisioning Capital', *Critical Inquiry*, 21.2, 1995, pp.440.

⁵See Will Wiles, 'Fluid Assets: The Economic Waterworks of the MONIAC', *Cabinet* 47, 2012, and Michael Stevenson, 'The Search for the Fountain of Prosperity' (<http://www.dextersinister.org/MEDIA/PDF/TheSearchForTheFountainOfProsperity.pdf>), for the enlightening vicissitudes of one such model, and its actual plumbing. Timothy Mitchell has argued for the constituent part played by such models in establishing the very idea of *the* economy. See 'Fixing the Economy', *Cultural Studies* 12.1 (1998), pp.82-101.

⁶Donald MacKenzie, *An Engine Not a Camera: How Financial Models Shape Markets*, Cambridge, MA: The MIT Press, 2006.

⁷Susan Buck-Morss, 'Envisioning Capital', *ibid.*, p.447.

⁸'Envisioning Capital', p.463.

⁹See Michael Najjar's photobook *High Altitude*, Bielefeld: Kerber Verlag, 2012, and the catalogue essays by Kevin Slavin ('How Algorithms Changed the World') and Paul Wombell ('Subprime Sublime'). Najjar is the visual hook for Slavin's TED talk on HFT, where he also touches on the graph images of algorithms in operation, their shapes calling forth fanciful names: 'The Knife', etc. Available at: http://www.ted.com/talks/kevin_slavin_how_algorithms_shape_our_world.html. Najjar's work can be found at: http://www.michaelnajjar.com/ipad/gallery_high_altitude.html; The pieces *Volatile Smile (photographs)*, 2010, and *Volatile Smile (installation)*, 2011, can be found at Geissler/Sann's website, with texts by Frank Wagner and Brian Holmes, both of which dwell on the political, cognitive and aesthetic enigma of the dark screens and vacant rooms: <http://geisslersann.com/>

¹⁰Scott Patterson, *Dark Pools: The rise of AI trading machines and the looming threat to Wall Street*, New York: Random House, 2012, pp.297-8. 'With electronic trading, a placeless, faceless, postmodern cybermarket in which computers communicated at warpspeeds, [the] physical sense of the market's flow had vanished. The market gained new eyes – electronic eyes. Computer programmers designed hunter-seeker algorithms that could detect, like radar, which way the market was going' (Patterson, p.7).

¹¹*ibid.*, pp.295-6.

¹²MacKenzie traces the particular design of the Stop Logic Functionality that intervened to stop the 'flash crash' of 2010 in the Merc's experience of 1987's Black Friday. See Donald MacKenzie, 'Mechanizing the Merc: The Chicago Mercantile Exchange and the Rise of High-Frequency Trading', 2012, available at: www.sps.ed.ac.uk/_data/assets/pdf_file/0006/93867...

¹³This *détournement* of Marxian terminology – to suggest that we think of the ratio between constant and variable capital within the domain of finance is intended as a provisional, experimental response to the problems about 'materiality' raised by recent sociological literature on finance. A sustained engagement would require a critique of the literal use of terms like 'fixed' (capital, which is for Marx but a part of constant capital), 'material', and so on, especially in order to avoid 'the confusion of the categories of fixed and circulating capital with the categories of constant and variable capital', a confusion leading to the kind of category mistake that prevents us from thinking how fixed capital can also be *mobile*. As Marx goes on to write, in a crucial passage: 'the formal characteristic that arises from the circulation of value is confused with a concrete [*dinglich*] property; as if things, which are never capital at all in themselves, could already *in themselves* and by nature be capital in a definite form, fixed or circulating'. See *Capital, Volume 2*, trans. David Fernbach, London: Penguin, 1978, p.241. The formal (or abstract) characteristics of the capital-relation are precisely what a sociological concern with materiality risks occluding.

¹⁴'The idea that life is essentially based on intellect, and that intellect is accepted in practical life as the most valuable of our mental energies goes hand in hand with the growth of a money economy'. Georg Simmel, *The Philosophy of Money*, London: Routledge, 2011, p.162.

¹⁵Donald MacKenzie, Daniel Beunza, Yuval Millo and Juan Pablo Pardo-Guerra, 'Drilling Through the Allegheny Mountains: Liquidity, Materiality and High-Frequency Trading', *Journal of Cultural Economy* 5.3, 2012, p.280.

16Ibid., p. 281.

17<http://www.bbc.co.uk/news/business-15722530>; see also Patterson, p.291.

18*Dark Pools*, p.45.

19See Alfred Sohn-Rethel, *Intellectual and Manual Labour: A Critique of Epistemology*, London: Macmillan, 1978, pp. 22ff. For more on Sohn-Rethel, see my 'The Open Secret of Real Abstraction', *Rethinking Marxism* 20.2, 2008, pp.273-287.

20In 2007, the NYSE has launched a \$500 million initiative dubbed Project Alpha. The plan was to build a mammoth computer trading facility on the site of an old quarry in Mahwah, New Jersey. The length of several football fields, the 400,000-square-foot building would allow computer-driven trading firms to put their computer servers right next to the NYSE's matching engine – the computers that brought buyers and sellers together in the frictionless ether of cyberspace. Twenty-inch-wide pipes pumped in water to cool the computers. Twenty surge protectors, each the size of a tank, protected the site against power outages' (*Dark Pools*, pp.281-2); <http://www.nytimes.com/2012/09/23/technology/data-...>

21Issues of fairness arise within HFT itself. Within a data centre, different firms' servers are inevitably going to be located at different distances from the matching engines, and such is the concern within HFT over even tiny time lags that this is an issue of some sensitivity. Trading venues have responded by imposing equal cable lengths so that time delays are equal. The resultant coils of fibre-optic cable (technically unnecessary, but needed for fairness) are a physical reminder that we are dealing here with "the creation and assemblages of Spacing(s)" and "Timing(s)", not simply with "a priori . . . space and time". 'Drilling Through the Allegheny Mountains', p.289.

22*Dark Pools*, p.2.

23<http://www.bis.gov.uk/assets/foresight/docs/comput...>

24Some of the reasons behind these shortcomings of the ANT-inspired sociology of financial markets – among them the danger of producing a 'hagiography of knowledge' in which the world turns into 'a kind of *kampfplatz* of contesting performativities' – are compellingly laid out in Dick Bryan, Randy Martin, Johnna Montgomerie and Karel Williams, 'An important failure: knowledge limits and the financial crisis', *Economy and Society* 41.3, 2012, pp.299-315.

25The formulation is from Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford: Oxford University Press, 2005. I have criticised this formulation in 'Seeing it Whole: Staging Totality in Social Theory and Art', *Sociological Review* 60 (2012), Issue supplement S1: *Live Methods*, pp.64-83.

26Karl Marx, *Grundrisse*, London: Penguin, 1973, p.536.

27David Harvey, *The Limits to Capital*, London: Verso, 1999, p.389.

28David Harvey, 'Money, Time, Space and the City', in *The Urban Experience*, Baltimore and London: The Johns Hopkins University Press, 1989, pp.190-2.

29*Limits to Capital*, p.393.

30One of the conundrums such an inquiry would face can be allegorised by thinking through the relationship (which is hardly a linear one) between two of the Chicago locations photographed by Geissler/Sann: the already mentioned algorithmic trading offices of *Volatile Smile*, 2010, and the vacant foreclosed homes of *The Real Estate*, 2009.

1 comment

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Brian Holmes • 11 months ago

Nice article, Alberto, thanks for all the ideas. I do plan to do what you call for in your note 30, as indeed, Geissler & Sann's work demands exactly that, and they are friends living here in Chicago so it's kinda natural. The question that urges is: How to understand the co-evolution of electronic trading and just-in-time production? Perhaps you or others have some ideas. On the one hand, it seems to me that the key is in the currency futures markets, inaugurated in 1972 at the Chicago Merc by none other than Milton Friedman, in order to provide hedges for exchange rate risks in the new environment of floating values that was brought on by the collapse of Bretton-Woods. On the other hand, it turns out that Chicago is one of the world's largest multimodal container ports, not so much because of the Great Lakes but because North America's six transcontinental rail lines all cross here, so there is a huge train-to-truck-to-warehouse economy, mostly handling Chinese-made goods. Finance was built on calculations of the movements of goods - like the goods moving into people's homes via those JIT facilities. Contemporary finance is still built on that - check out how Chinese bets on Fannie Mae and Freddie Mac were determinant for the US government bailout of those lending institutions, failing which the flow of cheap goods to the suburban homes and the massive Chinese purchases of Treasury bonds would both dry up. As you and MacKenzie point out, there is a continuous transformation from calculations about goods (grains, in our case) to the self-referential games of HFT and derivatives. Could some cognitive mapping be possible after all? It's worth a go!

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