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Assembling an Economic Actor: The *Agencement* of a Hedge Fund

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Abstract

Michel Callon has conceptualised economic actors as constituted of socio-technical *agencements*: collectives of human beings, technical devices, algorithms, and so on. This paper reports a pilot, partially observational study of a hedge fund, a category of actor in financial markets that is of growing importance but that has so far attracted little attention in economic sociology. It draws on that study, and on interviews with other financial market practitioners, to delineate what is involved in viewing such an actor as made up of an *agencement*, and discusses the merits of doing so.

A fundamental question for any discipline that studies financial markets is how we should theorise actors and action in those markets.[1] Dominant approaches in financial economics – and also, for example, in psychology-based 'behavioural finance' – explicitly or implicitly theorise actors as equivalent to individual human beings, whether rational, as orthodoxy posits, or subject to systematic biases as behavioural finance suggests.

Economic sociology rightly contests the construction of the actor as an atomistic individual, and a large and impressive body of literature in 'new' economic sociology, much of it sparked by the work of Mark Granovetter, has demonstrated the 'embedding' of economic action in networks of interpersonal connections and in cultural and political conditions (Granovetter 1985; for an overview, see Swedberg 2003). In recent years, however, a complementary – and to some degree alternative – approach has arisen: Michel Callon's anthropology of economics and economies (for example, Callon 1998).

Callon's approach is rooted in the 'actor-network theory' that he developed with Bruno Latour (Callon and Latour 1981; Callon 1986; Latour 1987). The most distinctive feature of actor-network theory is its agnosticism as to the nature of actors, which are taken as potentially including non-human entities as well as human beings.

[1] We are enormously grateful to the fund we observed for allowing us to do so, and for answering our many subsequent questions. Michel Callon, James Clunie, Peter McBurney, Yuval Millo, Fabian Muniesa, Jan Simon and especially two anonymous referees for *Sociological Review* gave us exceptionally helpful comments on the first version of this paper. Our research was made possible by a professorial fellowship awarded by the U.K. Economic and Social Research Council (RES-051-27-0062).

Callon's anthropology of markets thus differs from traditional economic sociology (even 'new' economic sociology) in its conceptualisation of the actor. 'Action', writes Callon (2005, p. 4), 'including its reflexive dimension that produces meaning, takes place in hybrid collectives', collectives that incorporate 'material and technical devices, texts, etc.' as well as human beings.

In Callon's analysis, therefore, an economic actor is not an individual human being, nor even a human being 'embedded in institutions, conventions, personal relationships or groups'. For Callon, an actor is 'made up of human bodies but also of prostheses, tools, equipment, technical devices, algorithms, etc'. – in other words is made up of an *agencement* (Callon 2005, p. 4). The notion of *agencement* is drawn from Deleuze (for example, Deleuze and Guattari 2004, Wise 2005), and involves a deliberate word-play. *Agencer* is to arrange or to fit together: in one sense, *un agencement* is thus an assemblage, arrangement, configuration or lay-out. The referent in everyday speech is often down-to-earth and material, such as the parts of a machine; indeed, in ordinary parlance, *les agencements* are fixtures and fittings, and to be *bien agencé* is to be well-equipped (Collin, Knox, Ledésert, and Ledésert 1982).

The other side of the word-play in the term *agencement* is *agence*, agency. (We retain the French '*agencement*' because this word-play does not carry over into its usual English rendering as 'assemblage', which thus has somewhat too passive a connotation.) As Callon and Caliskan put it: '*Agencements* denote sociotechnical arrangements when they are considered from the point [of] view of their capacity to act and to give meaning to action'. Actors do not have inherent properties or a fixed ontology. Their characteristics are constituted by the *agencements* of which they are

made up: 'Depending on the nature of the arrangements, of the framing and attribution devices, we can consider agencies reduced to adaptive behaviours, reflexive agencies, calculative or non-calculative agencies, or disinterested or selfish ones, that may be either collective or individual … (Re)configuring an agency means (re)configuring the socio-technical *agencements* constituting it, which requires material, textual and other investments' (Callon and Caliskan 2005, pp. 24-25).

The existing body of research that is closest to the conception of economic actors as made up of *agencements* is the literature on distributed cognition, especially the work of Hutchins (e.g. 1995a&b). Hutchins argues that to understand cognition 'in the wild' one must go beyond the analysis 'of the individual bounded by the skin': such cognition frequently involve multiple collaborating human beings interacting with artefacts (his prime example is navigation as conducted in U.S. warships). '[L]ocal functional systems composed of a person in interaction with a tool have cognitive properties that are radically different from the cognitive properties of the person alone', and a 'group performing [a] cognitive task may have cognitive properties that differ from the cognitive properties of any individual'. Human beings, argues Hutchins, 'create their cognitive powers by creating the environments in which they exercise those powers' (1995a, pp. xvi, 176 and 289).

All sociologists know that group cognitive processes differ from those of individuals, and Hutchins's emphasis on the constitutive role of artefacts in cognition is also now widely accepted. However, Callon's closely-related approach has been intensely controversial within economic sociology and economic anthropology (see, e.g, Miller 2002), mainly because of one specific feature. Callon's view of the

economic actor as having a variable ontology implies that it is possible for economics to be 'performative': for actors to be configured into the calculative egoists posited by orthodox economics, and for economies to be configured in such a way that the postulates of economics have empirical validity. A 'statement' (a proposition, an equation, a model, a method, a tool …) can be made to work if the corresponding *agencement* can be constructed (Callon forthcoming).

In this paper, we do not directly address the debate surrounding the performativity of economics (see MacKenzie, Muniesa and Siu forthcoming), but take a more modest tack. 'The performativity program', writes Callon (2005, p. 5) 'starts with an ethnography of socio-technical *agencements*', and it is to that ethnography that we seek to contribute. We take one example of an actor in financial markets, and document the *agencement* that makes it up: the arrangement (in the broadest sense) of people, technical systems, and so on that constitutes it.

Our overall purpose is to elucidate what it means to view an economic actor as constituted by an *agencement*, and to discuss the merits of doing so. However, we hope that the paper also has empirical virtues. The actor we have chosen is a hedge fund. Such funds are of growing importance in the global financial markets, but have been the object of remarkably little social-science attention outside of financial economics. Indeed, this paper contains what is, to our knowledge, the first study of a hedge fund that includes direct observation (albeit brief observation) of its operations.[2]

[2] For a previous sociological (but retrospective) study of a hedge fund, see MacKenzie (2003).

Although they have not so far focused on hedge funds, there have been a number of sociological or anthropological observational studies of actors and action in financial markets. The literature on workplace ethnography and computer-supported collaborative work (which is closely related to, and sometimes directly inspired by, Hutchins's approach) contains one particularly helpful study of a City of London dealing room (Heath, Jirotka, Luff, and Hindmarsh 1993), and ethnographic studies (for example, Abolafia 1996, Zaloom 2003 & in press) have also been central in the recent rise of 'social studies of finance' (for which see Knorr Cetina and Preda 2005).

Two ethnographies have been especially helpful in informing our study. First, Knorr Cetina and Bruegger focus in their study of foreign exchange trading on the computer screens on which market data are displayed. These screens, they note, are 'appresentational' devices, making 'that which is geographically distant ... interactionally present' (Knorr Cetina and Bruegger 2002, p. 909), a role which screens also play in the fund we observed. Such screens do not represent a market that exists independently of them: they are one of its conditions of possibility, allowing geographically-dispersed actors to constitute as well as to observe 'the market' to which they are all oriented.

The second particularly relevant ethnography is Beunza and Stark (2004). The trading room they studied differs from ours, containing many more people (it belonged to an investment bank, not a hedge fund). However, their emphasis on the trading room as an 'interpretive community', deliberately aided by its physical lay-out, carries over to our study, as does their focus on the way in which '[c]alculative

practices are distributed across persons and instruments' (Beunza and Stark 2004, pp. 370 and 372).

This paper proceeds as follows. First, we discuss hedge funds, outline the pilot study of one such fund that is this paper's focus, and briefly discuss wider research that places it in context. Next, we describe the physical setting of the fund's trading, the assets it trades, and the arrangements that make it possible for a small number of people to engage in global trading. We then discuss briefly a typical calculational tool the fund employs and outline more extensively the social distribution of cognition underpinning its trading. We note that some of this cognition takes place at distant sites and also that the information processing it involves has to be selective. The penultimate section examines two aspects of this selectivity: its geographical focus, and the extent to which attention is paid to political developments. The paper's conclusion outlines a variety of ways in which viewing hedge funds as made up of *agencements* may be consequential.

Studying a Hedge Fund

The category of 'hedge fund' is a creation of law and of regulation, brought into being by the wave of securities regulation that followed the Wall Street crash of 1929 and subsequent Great Depression. Some limited exceptions aside, the U.S. Investment Company Act of 1940 made it illegal for investment companies to short sell (to sell securities they do not own, for example borrowing them in the hope of later repurchasing them at a lower price) or to use leverage (to buy securities using borrowed funds). In consequence, any economic actor in the U.S. desiring the

capacity to act in those ways had to configure itself so that it was not an 'investment company' within the meaning of the act.[3]

Hedge funds are thus structured by the exigencies of avoiding having their capacities for action constrained by the Investment Company Act and its equivalents in other countries. What precisely is required to achieve this has varied, but common threads have been:

a. availability not to the general public but only to individuals who are wealthy and/or deemed sophisticated investors.

b. 'non-solicitation' – hedge funds cannot advertise, indeed in principle are restricted to communicating with potential investors by 'word-of-mouth' (Fung and Hsieh 1999, p. 315);

c. sometimes a limitation on the number of investors permitted – for example, under section 3 of the Investment Company Act, no more than 100.

What is generally regarded as the first hedge fund was A.W. Jones & Co., set up in 1949. (Jones had a PhD in sociology from Columbia University, but to our disappointment we can find no connection between his academic work and his hedge fund.) Jones's striking success was made public by an article in *Fortune* (Loomis 1966), and it began to attract imitators, as, later, did George Soros's Quantum Fund. The hedge-fund sector has not enjoyed entirely smooth growth – there have been well

[3] Investment Company Act, section 3 (especially paragraph c.1) and section 12, paragraph a. The text of the act is available at http://www.law.uc.edu/CCL/InvCoAct, accessed 11 May 2005.

publicised set-backs, such as the near-failure of Long-Term Capital Management (LTCM) in September 1998 (MacKenzie 2003) – but in recent years has expanded sharply.

In 1990, there were fewer than 1,000 hedge funds, managing $25bn in assets; in 2004, there were more than 8,000 funds, managing almost $1,000bn;[4] by March 2006, assets under management had risen to over $1,500bn (Schurr 2006). At the time of writing in April 2006, hedge funds may be about to move into the retail investment mainstream for the first time. The U.K. Financial Services Authority is considering adding 'funds of funds' (which, as the name suggests, invest in portfolios of hedge funds) to its authorised product list and allowing them to take investments from the general public.

Hedge funds' annual management fees of 1 to 2 percent are in line with those of other actively-managed investments, but they also charge a performance fee, typically 20 percent of profits – that is, of increases in net asset value. (Normally, net asset value has to rise above its 'high-water mark' in previous periods before this fee applies.) To curb the incentive to excessive risk-taking created by this fee structure, hedge fund managers are conventionally expected to have as much as half of their own personal net worth invested in the fund that they manage, so that they suffer losses as well as benefit from gains.

[4] Data from International Financial Services London, http://www.ifsl.org.uk, accessed 23 May 2005.

At times, hedge funds can become important owners of particular classes of security: in early September 2005, for example, hedge funds were reckoned to hold between a seventh and a quarter of the stock of Germany's leading corporations, taken in aggregate (Jenkins and Milne 2005). Because nearly all hedge funds are active traders rather than passive 'buy-and-hold' investors, and because the use of leverage is common, their contribution to overall trading volumes is much higher than the proportions of investors' capital that they manage. Hedge funds are now responsible for between a quarter and a third of trading on the New York and London Stock Exchanges (anon. 2005b). In the main market in which the fund we studied operates – emerging-market government bonds – hedge funds amount for around half of total trading (anon. 2005a).

Research access to hedge funds is hard. The sector is a discreet one, partly through necessity (the non-solicitation requirement), partly through choice, with many hedge-fund managers traditionally shunning personal publicity, especially published photographs. Globally, there are two leading geographical clusters of funds: in the suburbs of New York, particularly Greenwich, Connecticut; and in London's Mayfair and the immediately surrounding streets. The fund to which we managed to gain access was based physically in the latter cluster, although its primary registration, like that of many other hedge funds, is in the Cayman Islands.

It was of roughly average size in terms of assets managed. The category into which it fell at the time of our observations, $25-$100 million, covered approximately a third of all hedge funds, with slightly less than a third being larger and slightly more

than a third smaller.[5] (2005 was a successful year for the fund, and it now has more capital and has moved to larger, more prestigious premises, but all description of it in this paper refers to its situation in January 2005.) Like most funds, it was and is small in terms of personnel, consisting in early 2005 of five people. It was set up by the two people we call partners A and B, and also contains a 'strategist' (partner C, a trained economist), an operating officer (partner D, who though present in the trading room is responsible for aspects of what in financial markets is often called 'back-office' work), and a trader's assistant. (An intern was also present on one of the days of our observations.)

We draw upon three data sources. The first is a brief period of observation of the fund's trading (in a group as small as five, the presence of even a single researcher is intrusive, so we felt it unreasonable to ask for prolonged access). We observed this trading during the first week of January 2005.[6] Because Monday 3 January was a market holiday, our observations cover four days. The first-named author was present throughout; the second-named for part of 4 January and all of 5 January. Mostly, we simply took notes, but the fund allowed us to tape-record the 'strategy' meetings it holds at 9.00 a.m. each morning, and as we began to develop a sense of which trading-room verbal interactions were interesting analytically, we sought and were granted permission to tape-record those too.

[5] Data (for end-2003) from www.ifsl.org.uk (accessed 23 May 2005).

[6] In certain markets – notably that for small-capitalisation stocks – behaviour in December and January has unusual aspects to do with matters such as the end of the U.S. tax year (Reinganum 1983), but as far as we could tell there was no such effect on what we were observing.

Partner B sometimes trades, but partner A was responsible for all the trading during our observations (references below to 'the trader' are always to partner A). While observing as best we could what others did and said, we concentrated our attention on him. He allowed us to sit behind him, slightly to one side; we could observe all his actions and all the visible objects of his attention (see figure 1). We could hear his part in all telephone conversations, and we were also able to listen to telephone conference calls. We occasionally asked the trader to explain actions he had just taken, trying to time such inquiries so as not to disturb the flow of his actions. (Heath, Jirotka, Luff, and Hindmarsh [1993] outline the cues participants in dealing rooms use to avoid disrupting others' action sequences.)

The trader seemed remarkably unperturbed by this close observation, but plainly our presence could have affected what he or his colleagues did. However, it is worth noting that the focus of our observations was behaviour that is central to effective trading. Investors in hedge funds often judge them on their performance month-to-month, especially in the case of a relatively new fund (as this one was), and in that context four trading days are consequential. To depart from successful routines would have had a high cost, and the impression we have is that the trader and his colleagues did not allow our presence to disturb their actions in this respect.

Our second source of information is follow-up interviews with the trader and partners B, C and D, and informal meetings held with the trader by the first author on

several occasions. Those interviews and meetings allowed us, for example, to inquire whether events we had seen were unusual or typical and enabled us to investigate a matter that our wider research increasingly suggested was important: the extent to which the *agencement* constituting a hedge fund involves people and technical systems in other physical locations. Our third source of data is electronic mail. The trader permitted us to forward to ourselves nearly all the electronic mail messages he received and sent during the period of our observation. (No selectivity on his part was involved: we simply ran out of time to forward the complete set of messages.) Printed out, these e-mails fill eight lever-arch files.

Beyond the fund on which we focus in this paper, we are conducting a snowball-sample study (so far involving 29 interviewees) of traders in other hedge funds and investment banks, of those who manage such traders and provide them with other services, and of the 'funds of funds' that are now the dominant category of investor in hedge funds. When an interview is quoted without attribution to our fund's trader or one of his colleagues, the quotation comes from this wider set of interviews.

The Arrangement of Trading

Since an *agencement* is an arrangement, let us begin with lay-out. In January 2005, the hedge fund we studied leased two modest rooms in a shared office building. One room was used for the 9.00 a.m. and other meetings and for some conference calls. The other, where most of the action we observed took place, could have been mistaken for normal accommodation for clerical workers, except for two features (see

figure 1). First, rather than being distributed for privacy, desks formed a single rectangle in the middle of the room, and the occupants of chairs all normally faced inwards. Second, there were more computer screens than occupants of the room: in front of the trader, for example, were four screens. The plethora of screens interfered somewhat with lines of sight when seated – partner B would often stand to talk to the trader – but the centripetal lay-out of the room suggests a desire to facilitate communication and mutual visibility.

The fund specialises in 'emerging markets': countries such as Turkey, Lebanon, the Philippines, South Africa, Russia, Hungary, and the nations of Latin America that are outwith the heartlands of the global financial system but nevertheless have significant capital markets. (Sometimes countries such as Iceland, which are developed but on the periphery of the metropolitan heartlands, are also considered as emerging markets, although not by this hedge fund.)

The governments of all the countries in which the fund specialises issue bonds in their own or foreign currency. Bonds are tradeable debt securities that typically commit their issuer to repay the capital sum (the principal) on a given 'maturity' date and to pay 'coupons' (periodic, normally fixed, interest payments) until that date. They are the main means by which both developed and emerging-market governments bridge the shortfall between revenues and expenditures, a shortfall they nearly all encounter almost continuously. The capacity for successful bond issuance enhances a government's freedom of action: money can be spent now – on infrastructure, education, health, war-fighting, and so on – and repaid only in the future, and governments frequently pay the principal on existing bonds that have

reached their maturity by issuing new bonds. The prices and coupon-rates at which investors are prepared to buy bonds have a direct effect on a government's debt-service costs, and thus on its budget balance and ultimately on the policy choices open to it.[7]

The fund we studied also trades currencies, but the core of its trading is of bonds and bond-derivatives such as bond futures (a 'future' is a standardised exchange-traded contract equivalent economically to a commitment to a future purchase or sale of the asset in question at a set price) and credit default swaps (which are contracts equivalent to insurance against a bond issuer defaulting). The bonds the fund trades are identified by country and maturity date (and sometimes also by coupon rate). When the trader telephones a salesperson at an investment bank and asks, 'Can you get me a level on Brazil 14s – one four?', what is being sought are 'bid' (purchase) and 'offer' (sale) price quotations for the Brazilian government U.S. dollar bonds maturing in 2014. ('One four' is a wise precaution because the Brazilian government bonds maturing in 2040 are also actively traded, and a mistake between the two would be serious.) The further qualification – 'Can you ask him [the bank's trader] to show me a bid for [$]5[million]?' – indicates something of the scale on which the fund trades. If the price quotation is attractive, a few quick words on the telephone and a brief e-mail or Bloomberg message confirm the deal.

[7] In addition to the research described in the text, the first author is conducting a broader qualitative and quantitative study of the emerging-market government bonds market: that study has so far involved 77 snowball-sample semi-structured interviews in London, Turkey and Lebanon.

Such transactions can be conducted with apparent ease and informality because they mobilize entities not all of which are rendered evident simply by observing and listening to the trader. Here we encounter an aspect of *agencement* that the social studies of finance (with the exception of Lépinay 2004) has so far largely ignored: the 'back office' infrastructure of trading. When the trader has struck a deal, he writes down its parameters on paper on a 'trade blotter' in a folder that lies on the desk between him and partner D. On one of her screens is the electronic 'blotter' of a trade-capture and portfolio-management system the fund leases. Like other such systems, it contains 'security masters', accessible onscreen via pull-down menus, which contain automatically-updated electronic characterizations of all the securities their users are likely to trade. (An interviewee at a firm that provides technical systems to hedge funds told us that as of January 2006 his firm's system contained 220,000 security masters, updated daily as coupons or principals are paid, and so on) A small but critical part of partner D's role in ensuring the fund's smooth operation is to use the menus to call up the appropriate security master and enter into the blotter whether the transaction was a sale or a purchase, the quantity and price, and some other details such as the identity of the counterparty.

Partner D's work aside, the fund's 'back office' is not physically present. The trade-capture system transmits the record of the fund's trading to its 'administrator', which is a separate firm, the relevant office of which is in Dublin. Amongst the services the adminstrator provides is 'reconciliation': ensuring that the fund and its counterparty have indeed made the same trade. Inconsistencies – 'breaks' as they are called – are common in the world of trading. Sometimes the parties to a trade manually enter details that do not match; sometimes their two security masters,

supposedly characterizing the same security, in fact differ. (Of the 1300 employees of one firm that provides high-tech administration services, 680 are based in Mumbai, working through the London and New York nights, many of them identifying and, as far as possible, resolving breaks.) Crucially, too, the administrator's staff and technical systems employ the trade-capture data to check the trader's and his assistant's calculations of the changing daily values of the fund's assets, which are critical figures because they determine performance.

The fund is also linked electronically to its 'prime broker', a leading international investment bank. When the fund agrees a trade, the prime broker makes the necessary transfers of the electronic traces of money or of title to securities. (A bond, for example, is now almost never a paper certificate: it is an item in an electronic database.) The bank commits itself to make these transfers even if the fund is unable to pay for them, thus facilitating the fund's trading in an additional sense: the fund's counterparties know that not just its creditworthiness, but the bank's, stands behind the trades.

Data transfers from the fund's technical systems to the bank's make it possible for the latter to monitor the fund's risk-taking and its cash flow. At the end of every trading day, the bank's system 'sweeps' the dozens of trading positions that make up the fund's account, and places excess cash on overnight interest-bearing deposit. When the fund is short (has sold securities it does not own, the capacity to do which is, as noted above, almost a defining feature of a hedge fund as an economic actor), the bank will try hard to lend it the requisite securities, either from its own inventory or elsewhere, even if they are 'hard-to-borrow'.

Distributing Cognition

The fund's capacity to enact trades thus depends on people and technical systems not physically present in its trading room. So too its capacity to know which trades to enact. The fund deals in the currencies and government securities of far-flung countries with complex economies and intricate politics, securities that are entitlements to payments that are sometimes far in the future. Who, for example, can confidently know whether the fiscal situation of a government that has issued a 30-year bond will be good enough for it to repay the principal when it finally falls due?

The decisions to be made are difficult ones, and the amount of potentially-relevant information is vast. Much of it is available in the trading room directly on-screen. The whir of discs and fans aside, silence, punctuated only by typing, often prevails in the trading room for minutes on end, despite mass-media portrayals of such rooms in a frenzy of hubbub. Sitting at their desks, their attention on their screens in the manner described by Knorr Cetina and Bruegger (2002), the trader and his colleagues almost continually sift this incoming flow of information.

There was a striking contrast between the small group of people in a modest office in a nondescript London building and the quantity and geographical scope of the information flowing in. Some parts of this information are quantitative: above all, data on price movements in the many markets in which the fund trades. Other parts are qualitative. On one of the trader's screens, for example, were titles of Reuters news stories. If he chooses (he seldom does, for reasons suggested below), the trader

could click his mouse to open up Reuters' account of conditions in the rice market in Manila, or learn that 'after long languor Egyptian politics wakes up'.

Five people (the intern present on one day played no active part) thus confronted multiple appresentations of markets and innumerable representations of events in much of the globe. If human beings had unlimited powers of information-processing, calculation and memory, a single unaided human could perhaps turn the information flowing into the room into an optimal trading portfolio. Since human capacities are limited, as Herbert Simon emphasised long ago (Simon 1955), the necessary tasks are distributed across technical systems and multiple human beings: what goes on in the trading room is indeed 'distributed cognition' in Hutchins's sense.

For example, a technical tool on which all bond traders depend is a yield calculator. The complicated diversity of bond prices frequently needs converted quickly to and from a more uniform metric. Thinking in terms of yields enables different bonds to be compared, and indeed it is common for bond prices to be quoted, or bond-auction bids to be priced, not as sums in dollars or other currencies, but as yields. In today's financial markets, the calculation of yields has become a routine, 'black box' software feature. However, an incident on the second day of our observations suddenly rendered it visible.

The trader asked his assistant to produce a software-implemented calculator to enable price quotations for Turkish government bonds in the form of yields to be converted to and from lira prices. The assistant did so, employing the standard definition

of 'yield' as the average annual rate of return offered by a bond over its entire remaining lifespan at its current market price, which is calculated by finding, by iteration, the discount rate at which the sum of the present values of the bond's coupons and principal equals its market price. The trader, however, quickly saw that his assistant's calculator was wrong. The assistant did not have a crucial piece of 'local knowledge' – the convention in the Turkish bond market is to employ not the standard definition of yield but the annual coupon payments expressed as a percentage of market price:

> Trader: Turkish T-bills work on a simple yield and not a compound yield. Did you know that?
>
> Assistant: No.

Once corrected, the Turkish yield calculator becomes part of the sociotechnical *agencement* that constitutes the hedge fund. The calculator's construction is itself heterogeneous. It mixes programming expertise, knowledge of market convention, and specialised factual knowledge: the coupon rates of Turkish government bonds with specific maturities. Two people produce it: the trader could in principle have written it himself, but in practice he needs to delegate the task, and also to assess whether it has been carried out to his satisfaction. In these aspects, the Turkish yield calculator is unusual only in that we were present as it was being constructed. What Hutchins (1985a, p. 374) says of navigation is true also of our hedge fund: 'The setting of…work evolves over time as partial solutions to frequently encountered problems are crystallized and saved in the material and conceptual tools of the trade and in the social organization of the work'.

The 'social organization of the work', in the sense of the distribution of cognition and action across the people in the room, was evident during our observations in many ways. For example, the trader frequently asks colleagues questions regarding information he has (possibly temporarily) forgotten: 'At what price did I do that trade?' or 'What was the [U.S.] unemployment rate last month?' (As Hutchins 1985a, p. 134, puts it: 'remembering is jointly undertaken'.) When the trader is out of the office during office hours (which typically happens only briefly), he relies on his colleagues to observe market activity. When he returns, his first words often are 'What's happening?' or 'How is the market?' (He also called a salesperson in the U.S. while at dinner with the second author, in effect asking him the same questions.)

Partner C also frequently takes the initiative in orienting the trader's attention to forthcoming data releases, and partner B often points him very directly to relevant market developments: 'Hey … you can put the trade on again at 110', or 'Wow. Phil [Philippine government bonds] is trading down. Don't you see these messages?' Implicit in pointers of the latter kind is often a view of an appropriate trade. If that view conflicts with the trader's, a brief discussion will often take place:

Partner B: … have you seen the ZAR [South African Rand]?

Trader: Yes, it's going my way. What is your problem? Do you want me to take it off now?

On other occasions, however, the trader will do no more than acknowledge the comment ('Yeah, I saw it'), or will not reply at all.

Although the trader has evident confidence in his views, he acknowledges that others have expertise that he does not: in particular, the 'strategist', partner C. His role is to follow economic and political developments in emerging-market countries but also (for reasons we explore below) economic developments in other countries: mainly, but not exclusively, the United States. The following exchange, for example, took place after the monthly release of the U.S. employment figures, the data event during the period of our observations to which by far the most attention was devoted. The trader and partner C are looking at the same information screens during the exchange, and the trader is simultaneously trying to complete the purchase of some Brazilian bonds (the breaks in the text are mainly when he is talking on the telephone about this):

Partner C: Christmas sales have been kind of sluggish. By all accounts there was a lot of discounting and going out and ordering new merchandise and also this employment report, the reason why it is below expectations was because retail jobs cut by 20,000.

Trader: … So the economy is weak, yeah …

Partner C: So the retailers are having a tough time. They're not hiring like they usually do in December and are probably discounting.

Trader: … So the number. Based on this number, what do you think Treasuries [U.S. government bonds] should do, overall? If you had to close everything else off and, based on this number, just on these numbers, what?

Partner C: Just Treasuries?

Trader: Yeah, what would you say Treasuries should do? Up, down, unchanged.

Partner C: In a word, I would say unchanged.

Trader: Right, thank you. But don't you think that market professionals will look through the numbers and they will imply something for inflation? Or that's not going to happen?

Partner C: You asked for one word say I gave you the, yeah, I'll embellish a bit more. Yeah, it's as I said. It appears that Christmas was kind of, overall it was okay for retailers. It was okay because they were discounting to move the merchandise. So that's positive for inflation, for December anyway … But you have to weigh that up against the fact that the average hourly earnings was a bit higher than expected.

Trader: Right.

Partner C: So.

Trader: That's what I meant about the, reading through those …

Partner C: Yeah, that's why I say unchanged because there are these cross currents going through.

That was an exchange about the bearing of economic conditions on the U.S. bond market. Other exchanges between the trader and partners B and C debate specific features of trades. They often begin quite casually and move gradually towards a collective decision:

Trader: Should we do, I mean I'd like to do the trade, the Taiwan Dollar trade versus the [U.S.] Dollar. You don't think …

Partner B: He'll [partner C will] tell you to do it versus the Euro.

Trader: But this is a big change. I mean you know, you can't change like that, like overnight. Let's think about it. Maybe we change it, okay, but …

Partner B: Change what?

Trader: I mean, in a way, it's a trade that it says go long the Dollar and short the Euro, right? I mean … this trade, if you don't think the Dollar/Euro is going towards, let's say, in at 120 [an exchange rate of 1 euro = $1.20]. If you thought the Dollar/Euro was going to 135, you wouldn't propose this trade.

Partner C: Well, I would in the sense that, there's three scenarios, two of which, this Taiwan thing will work … in Europe. One is that U.S. does the right thing.

Trader: Right.

Partner C: And the Euro … more against the Euro

Trader: My proposal, which I've made on the Mexican Peso as well, is that we do these trades against a basket of Dollars and Euros, at this point, rather than just go all short Euros.

Partner C: Yeah, I mean I'm not proposing that I've changed my view on the Dollar generally, just, I was thinking just through the Taiwan and the Asian, Taiwan but all the, it's one way or the other, if you believe that story is going to happen this year …

Partner B: I believe it.

Partner C: And I do too.

Partner B: But the issue we're discussing is not whether to buy the Asia. What we're discussing is what to short against it. ...

Partner C: ... if you're ambiguous about, if you're a little bit ambiguous about Dollar's direction for the year, then it would be, I think, still a kind of a win/win against Taiwan versus the Euro …

Cognition is seldom entirely separate from emotion (Damasio 1995). After discussions such as the above have stabilized an interpretation and generated a decision, or even when the trader has taken a decision without consulting his colleagues, they frequently provide him with emotional support. His work is stressful, involving actions in which large amounts of money (his own and his colleagues', as well as the fund's investors') are at stake. Support for decisions that have already been taken was often restated explicitly: 'I really like that trade' or 'Yes, I would be pretty comfortable with that'. If prices do not move as predicted, colleagues' comments both support the trader and encourage him to maintain focus: 'Yeah, don't let it affect you'; 'You're going to make no money thinking about it. Just forget about it and move on'. Sometimes the encouragement to do this last is very explicit: 'What else would you buy? What else is there to sell?'

Multi-Site Cognition

The cognitive processes that inform the fund's decision making are distributed more widely than over the people and technical systems in its trading room. The necessary sifting of potentially relevant information is also conducted elsewhere, often in different countries or continents. Sometimes, the results of this sifting arrive via telephone calls or via telephone or web-cast teleconferences organised by investment

banks. Most commonly, however, the results of others' sifting arrives in the form of electronic mail messages. Into this category fall the vast majority of those e-mail messages received by the trader during our four days of observations that did not have a specific purpose such as to confirm a deal or to give a price quotation – and even messages giving price quotations often also contain a brief commentary on market developments.

Usually, these e-mails are not the bilateral messages on which Knorr Cetina and Bruegger (2002) focus, but messages to multiple recipients. As the trader put it: 'In a way the e-mails that you get are like being … in an area where, you know, there are twenty different people sharing information'. A sample of the e-mails follows (items marked with an asterisk are the titles of electronically attached pages from services such as Bloomberg News):

> *(sender 1) 4.1.05, 14:58:* 'CHILE COURT SAYS PINOCHET CAN FACE KIDNAPPING, HOMICIDE CHARGE'* At last …
>
> *(sender 2) 5.1.05, 00:30:* Today's highlights
> Brazil: In terms of data releases, watch today for the December C[onsumer]P[rice]I[ndex]-Fipe ([Sender's bank's prediction]: 0.6%) and fx [foreign exchange] flows for December.
>
> Mexico: The peso nearly reached our 11.45 recommendation target and we advocate closing long USD/MXD positions when the peso gets closer to that level.

(sender 3) 5.1.05, 02:34: ROP [Republic of the Philippines] flying despite EM [Emerging Market] sell off and rates….!!!! technicals…

(sender 4) 5.1.05, 07:19: [Philippines' government bonds] holding in very well vs-rest of emg [emerging market] spreads tighter by 8-10 [basis points]

(sender 3) 5.1.05, 07:38: 'Philippine 10-Year Dollar Bonds Rise on Narrower Budg'* – market on fire despite overnight action in Latam [Latin American] credit. If this story is the sole driver the market participants are much more naive than even I gave them credit for….after 11 months budget deficit was at 160, an annualised amount 175bn pesos…..of course the annual deficit was likely to come in at somewhere between 170-190…this story is surely no surprise.

(sender 5) 5.1.05, 08:22: Still think Philli sells off more as it is only down 1/4 point

(sender 3) 5.1.05, 08:24: [Philippines' government bonds] Just on fire.

(sender 6) 5.1.05, 11:26: BRAZIL JUST GETTING WHACKED ON THE BROKERS , 27'S , 40 , 34 [bond maturities]

These incoming electronic mail messages generally contain information already available to the trader via the screens in front of him. He has access to Reuters, Bloomberg News, and other services. He can easily find out when the level of the Consumer Prices Index in Brazil is due to be announced, the exchange rate of the Mexican peso against the dollar, the prices of the bonds of the governments of Brazil or the Republic of the Philippines and the extent of their reported budget deficits.

These electronic mail messages thus generally serve to draw the trader's attention to some of the data items available to him, and not to others of those items, and often explicitly or implicitly suggest 'framings': ways of interpreting data items (see Beunza and Garud 2004). For the trader and his colleagues to monitor all available data items would be infeasible. The constant arrival of 'pointers' reduces the need to attempt to do so, and sometimes feeds directly into action. After a flurry of e-mail on the morning of 5 January (including the messages from senders 3, 4, and 5 quoted above), at 08:30 the trader concludes that the prices of the government bonds of the Republic of the Philippines are about to fall, and short sells $5 million of such bonds (denominated in U.S. dollars) to sender 3's bank, e-mailing to his counterparty (who is located in Hong Kong): 'You haven't moved [your prices]. London will sell it'.

Clearly, the messages quoted above differ. Sender 1 is drawing attention to a news item, and offering a personal opinion. Sender 2 draws attention to a forthcoming data announcement (many incoming messages do this), and, in respect to

Mexico, offers his investment bank's explicit trading advice. The messages from senders 3, 4, 5, and 6 take the form of reports on or analyses of market developments: no advice is explicit, but only a brave recipient would receive sender 6's message and promptly buy Brazilian government bonds.

Many more such messages flow into the fund than flow out of it, and of course we could not observe the processes that led to the incoming messages. We did, however, witness the formulation within the fund of a trading idea that *it* chose to disseminate, and were able to follow the early stages of its dissemination. Partner B noticed that the 'sell off' of emerging-market bonds referred to in the above messages had led to an apparent anomaly in the relative pricing of two different Brazilian government U.S. Dollar bonds. The trader asked his assistant to construct a spreadsheet of recent prices of the two bonds, which supported the view that it was indeed an anomaly and thus a trading opportunity. Having first made the necessary purchases and short sales to take advantage of it, the trader then phoned a contact in an investment bank to direct his attention to the anomaly – 'There is at least half a point in that trade, and there is zero market risk' – and sent him the spreadsheet.

Why should traders share such ideas with others? If an idea is a good one, a rational economic actor might be expected to keep it to himself or herself. However, all traders are capital-constrained: there are limits to the amount of capital they have available to them, and prudential constraints that prevent them devoting too much of it to a single trade. Having devoted as much capital as reasonable to a trade –

explaining to us the positions he had taken, the trader said 'This is the right size for this anomaly' – they thus lose nothing by alerting others to it.

Furthermore, there is sometimes something to gain by alerting others. 'All I want is people even to talk about it', said the trader: if others also took action on the pricing anomaly, they would prevent it widening. Should it widen, explained the trader, '[t]here might be a reason [for it] I don't understand. I might have to reconsider the decision [to construct a trading position predicated on it narrowing]'. Even if a trader in that situation decided that he or she was right, the widening of anomalies can sometimes cause positions to have to be abandoned because traders run up against formal stop-losses and eventually capital constraints. The temporary losses involved can be intolerable to those such as hedge fund investors and senior managers in investment banks who supply traders with capital (for a delightful formal model of the process and its consequences, see Shleifer and Vishny 1997).

Members of investment banks have an additional motivation for disseminating trading ideas (their own, and those they receive from others such as the fund we studied). Fees paid by hedge funds for prime-brokerage services are now a major income source for those banks, and hedge-fund trading benefits them also via commissions and the bid-ask spread (the difference between the prices at which they will buy and sell a security), and – iteratively – via the way in which knowledge of trading flows makes opportunities visible to them.

The sources of ideas for trading (or of other results of information-sifting) are thus economic actors in their own right, who can be presumed often to have an interest in what others will do when they receive them. It is in effect expected that market participants will 'talk their book' when circulating ideas for trading – that they will already hold a position the virtues of which they are propounding – and a certain amount of 'gilding' or exaggeration in so doing is discounted (less pardonable is 'sandbagging' [Biggs 2006, pp. 2-3]: advocating a position while oneself unwinding it). It is important that many of the exchanges we are discussing (such as the emails about Philippine bonds) are multilateral, so that opportunism that leads to an idiosyncratic viewpoint may be detectable. As the trader says, 'it's fairly obvious … because you can see if one person is saying A, and everybody else is saying the opposite'.

Furthermore, some sources of ideas or sifting are more credible and more authoritative than others. As the trader puts it: 'some people are more informed; … some people are more thoughtful, sophisticated; some people are simpler, you know they have sort of based their decisions on hunches and so forth… so there's a difference in style, and I don't like to pigeonhole this guy is always right, this guy is always wrong… but of course they have, you have some sort of a bias whether, you know, how they think, and their style… and you factor that into your decision'. Partner B likewise notes: 'as you talk to all those people day after day after day, you kind of develop a feel for who has the right mindset and who doesn't … you will feel that, yeah, this guy has a good call on the market and that guy not so much'.

Selectivity in Information Sifting

Fully to characterize the sifting of information that goes on within the fund's trading room and in other locations connected electronically to it is a task beyond this paper. Here, we discuss only two aspects. The first is geographical: the surprising extent to which the attention of our fund was actually directed to the U.S. As already seen, although the fund trades the bonds of countries such as Brazil and the Philippines it nevertheless paid detailed attention to matters such as, for example, the pre-Christmas retail market in the U.S. Our follow-up interviews confirmed that that was not unusual. Partner C reckons that the weight given to international factors – 'usually the U.S., really' – in the fund's decisions is around 30-40 percent, with considerations specific to the emerging-market country in question accounting for around 60-70 percent.

The metric of 'yield' allows the vast range of bonds issued worldwide quickly and easily to be compared. For example, the yield of the dollar-denominated bonds issued by Brazil or the Philippines can be compared with the yield of similar U.S. Treasury bonds, and the perceived probabilities of default by Brazil or by the Philippines are condensed into 'credit spreads' of the yields of their bonds over Treasuries. Indeed, a price quotation for an emerging-market bond will often take the form of a spread of its yield over comparable Treasuries.

The valuation of emerging-market bonds as spreads over U.S. or Euro government bonds means that, ceteris paribus, the price of the former will move in

line with movements in the latter. However, our fund 'hedges out' this direct connection by taking offsetting positions in U.S. and Euro bond futures. A less direct link nevertheless remains. If domestic investments in the U.S. earn only low yields, emerging-market bonds (with the additional 'spreads' they offer) seem to become more attractive. Amongst the consequences can be an improvement in the perceived creditworthiness of emerging-market governments: more attractive bonds mean lowered debt-service costs and thus improved budget balances, and an increased possibility of selling bonds with longer maturities, which has the effect of reducing the risks intrinsic to frequent refinancing. In contrast, if U.S. yields rise, emerging-market bonds lose some of their attractiveness, and this virtuous circle can reverse, with perceived government creditworthiness declining and credit spreads widening. [8]

In consequence, U.S. interest rates and bond yields affect not just the overall levels of emerging-market bond yields but also the spread of those yields over Treasuries, a factor to which our fund *is* exposed. Much of the action in emerging-market bonds that we observed had to do with the release on the night of 4-5 January of the minutes of the December meeting of the U.S. Federal Reserve's interest-rate-setting Open Market Committee, which indicated a clearly increased probability of interest-rate rises to come. Despite the protection offered by the trader's hedges, it is thus not surprising that on the morning of 5 January we observed him reading those minutes with great care. They were the key interpretive context for the emerging-

[8] For discussions on the relative influence of endogenous and exogenous factors on emerging market bond spreads, see for example Manzocchi (2001) and Eichengreen and Mody (2000).

market 'sell off', including the puzzling initial failure of the bonds of the Philippines to fall in concert, and the anomaly in the pricing of Brazilian bonds.

Such phenomena are, of course, part of the meaning of that most familiar of notions: 'globalisation'. It is worth noting, however, that in this case globalisation acts in part through an algorithm. Without the metric of 'yield', comparing the bonds issued by different governments, with all their particularities, would be slower and much harder. An *agencement* that includes a yield calculator (or its less mobile predecessors, the 'yield books' that investment banks used laboriously to produce) differs from one without such a resource (just as MacKenzie 2006 hypothesises is the case for an *agencement* including an option pricing model). In particular, the metric of 'yield' helps to construct a *global* bond market.

A second issue concerning selectivity in cognition is the extent to which attention is paid to the politics of the emerging-market countries in whose bonds the fund invests. At one point, we noticed the trader carefully reading a news story about Abdalá Bucaram, the maverick, populist former President of Ecuador, styled (by himself, as well as by his enemies) *el loco*, the madman. This story had not arrived via an e-mail message, and it prompted us to ask the trader how important a consideration was the politics of the countries whose bonds he traded.

His answer was succinct and general: 'The weaker the credit, the more important the politics'. The higher the probability of a government defaulting on its

bonds, the more salient is information on that country's politics. That Pinochet might finally stand trial was, as far as we could tell, simply political news about Chile, and a source of personal satisfaction (or otherwise). That *el loco* might return to Ecuador from his exile in Panama was, in contrast, news of a different kind. The credit of Ecuador, said the trader, 'is one of the weakest there is' (Ecuador defaulted on its bonds as recently as 1999). In such a case, '[o]ne or two guys can change the way things are'.

A single trader spending a few minutes reading a news story is of course a weak datum, but the trader's explanation is consistent with the extensive study by Mosley (2003). A key bond-market divide is between governments that are reckoned reasonably likely to default, and those whose default is regarded as effectively inconceivable. Ecuador is in the first camp. The U.K. and U.S. are in the second camp, and Chile has made partial, sometimes painful progress towards joining them. Bond investors monitor both camps in respect to government deficits, inflation and interest-rate decisions, but 'politics' in countries in the second camp tends to be of interest only to the extent to which it is likely to affect these factors. (Only 58% of Mosley's interviewees mentioned elections in such countries as a factor they took into account, and of those who mentioned them almost nine-tenths said they were not important: Mosley 2003, table 3.1, p. 56.) In contrast, as one interviewee told her: 'Politics is huge for emerging markets' (Mosley 2003, p. 129). Our trader's explanation implied a further differentiation, and in his attention to Ecuadorean politics he was not unique. In April 2005, Ecuador had to abandon an attempted bond issue 'because of rising political tension' (Weitzman 2005).

Conclusion

The notion of '*agencement*' does not displace the classic analytical tool-set of economic sociology. Social networks, for example, plainly still matter, as when one prime-broking investment bank suggests on its website that 'leveraging of relationships with custody banks' helps give it its crucial capacity to facilitate the borrowing of securities. Nevertheless, '*agencement*' is a potentially useful broadening of that tool-set, in particular in its emphasis on 'technical' linkages as well as on 'social'ones.

The risk of broadening, however, is that it becomes indiscriminate. The task of tracing an *agencement* in an interconnected world is formally endless, and the notion could become simply a jargon into which to translate banal description and narrative, as happened to some degree when actor-network concepts first became fashionable in English-language science and technology studies some 15 years ago. It is thus essential to be selective: to focus, for example, on aspects of *agencements* that are not obvious and on ways in which the composition and configuration of *agencements* affect economic action.

At the most basic level, the notion of '*agencement*' helpfully directs us to the conditions of possibility of economic actors: the often-ignored infrastructure that enables them to be the actors they are. Why are there now over 8,000 hedge funds? The reasons of course include economic and political developments, but it is also important that setting up a hedge fund is much easier in 2006 than it was 20 years ago. The real-time

interconnection of trade-capture and other systems makes it possible to standardise, automate and risk-manage administrative and prime-brokerage services, which can thus be supplied on an industrial (rather than 'cottage industry') scale and relatively cheaply.

It is worth noting that it is in the infrastructure of economic action – rather than in what we might call action's glamorous agential nodes, such as trading – that employment is largely to be found. While we know of no precise breakdown of finance-sector employment in this respect, it is clear that traders are only a small minority. The vast bulk of jobs concern other roles in *agencements*. Their gender balance is different: trading is still mainly a male preserve, but more women are to be found in the infrastructure that underpins it. The geographical location of the infrastructural jobs also differs, at least potentially, from that of the glamorous ones. The Republic of Ireland, for instance, is not a prominent site of trading but has become perhaps the world's leading site of hedge-fund administration, providing not just 'offshore' legal status and a favourable tax regime, but also a robust communications infrastructure. ('Locating computers in a place with hurricanes, it's just not … a good plan', noted one interviewee from the world of administration, explaining why the Cayman Islands were unattractive in this respect despite their tax advantages.) Ireland also offers trained English-speaking staff and responsive regulation: 'in Dublin, you can go and visit the regulator ... have a cup of coffee', said the same interviewee.

A smoothly-functioning infrastructure is normally invisible: we had deliberately to seek out the infrastructure of our fund's economic action, rather than it being drawn to our attention by events in the trading-room. However, in the wider hedge-fund world

there are ways in which apparently infrastructural issues can suddenly impinge on freedom of action. Thus one main means by which risk is controlled in that world is 'mark-to-market' collateralisation of contracts. As market prices move in favour of one or other party to a contract, collateral assets are transferred between them: such transfer now often take place daily.

In the words of one interviewee, it is logical to meet such 'mark-to-market calls' by pledging out 'the most illiquid collateral that you have that fits the collateral requirements'. So what remains in a hedge fund's easily-grasped 'box' (the unlent and unpledged securities that it owns) will often tend to be its most liquid assets. Under normal circumstances this is unimportant, but when a fund suddenly needs cash (for example because of investor withdrawals or of mark-to-market requirements that must be met in cash) it can be consequential, especially if combined with technical systems that have not been set up to include fields that allow the fund readily to determine matters such as how quickly assets pledged as collateral can be reclaimed and made available for sale:

> The market starts to go down, now you got to sell something, because you're getting calls all over the place on mark-to-market. So you just, you look and say, 'oh, what can we sell?' In a perfect world you'd sell a balance of your portfolio of liquidities so that you keep some sense of control over the balance of what's there. But if you don't know where that collateral is and when it's coming back you are just relying on the faith of people that you pledge it for a week and it will come back a week later, and you don't care 'cos it's going to come back. In a normal market that would be fine but in a

> fast market you've got to sell now. So, you say, 'oh shit ... it's going to take me a month to figure that out [which illiquid assets can be sold] so I'm just going to sell this [highly liquid] U.S. two-year T-bill', or whatever it is. So ... a ... hedge fund ... if they're not prepared for it, will be left with their most illiquid collateral only, which is also the stuff that the Street already knows you own. 'Cos you created a lot of attention when you bought it ... And then you start selling it, and they go, 'shit, that guy owns 30 percent of that issue, we better start selling it too'.

As well as *agencement* constituting the conditions of possibility of economic action, the distribution of cognition and of action it involves may shape the properties of actors. As already noted, orthodox finance theory posits (for the purposes of modelling) an investor who is a completely rational individual with unlimited cognitive capacities, but has been challenged by 'behavioural finance'. This also views investors as individuals, but sees them as hampered by the systematic cognitive biases revealed by experiments of the kind conducted by Kahneman and Tversky (1979) and summarised in their 'prospect theory'. One such bias is a systematic tendency to behave differently in situations of perceived gain (in which many subjects become risk-averse, unwilling to take the chance of losing what they have won) and perceived loss, in which the propensity is to gamble to recoup the loss. For traders, the temptation is thus to avoid making a loss 'real' by liquidating a loss-bearing position, but to continue doggedly to hold it – in the jargon of trading, to become 'married' to it – in the hope it recovers (Fenton-O'Creevy, Nicholson, Soane, and Willman 2005).

Hence the apparently commonplace matters of emotional support and assistance in focusing after a trading loss are of theoretical significance: amongst their effects may be to diminish the 'prospect theory' bias referred to above. Traders' culture is certainly reflexively aware of that bias. In the pits of the Chicago Board of Trade, for example, traders sometimes hum Mendelsohn's wedding march to signal that a colleague appears to have become 'married' to a position (Zaloom in press), and our wider interviews confirm that traders (and especially those who manage traders) are alert to the possibility of 'marriage'. Note the form of the general point this suggests. That individual traders are affected by their colleagues and managers, that their culture is reflexive, and that cognition and action is distributed across people and technical systems may have the effect of making the economic actor more like the fully rational agent posited by orthodox finance theory.

However, also note that economically rational action may not always promote stability. Another possible effect of the composition and configuration of *agencements* is on the risk of contagion: the spread of a financial crisis in one country to others, including countries with few trade or other connections to the original site. With many countries in which to invest, highly selective information-processing routines are likely to be optimal (Calvo and Mendoza 2000), and we certainly observed such selectivity. It would, for example, be most unlikely to be cost-effective for our fund to hire a Magyar-speaking economist to deepen its understanding of Hungary, one market amongst many in which it operates.

There may in consequence be situations in which the optimal strategy for actors who spread their investments over many countries involves imitation: if an actor observes other actors – especially those judged to have expert understanding of the country in question – buying or selling, it may be sensible to do the same as quickly as possible. We should emphasize that we did not witness our fund behaving in this way, but our observations (and the corpus of e-mails to the trader) contain ample evidence of the circulation of information about particular classes of actor buying and selling. What is, however, harder to observe is *why* an actor is buying or selling. A sale of assets in one country may, for instance, arise simply because losses have been incurred in other countries with minimal economic links to it. Such sales may not convey any information, superior or otherwise, about the country in question, but may be misinterpreted as conveying 'bad news' (Calvo and Mendoza 2000).

Such processes can create surprising interconnections. On 22 February 2006, for example, a pessimistic analysis of Iceland's prospects by the bond-rating agency Fitch triggered falls in currencies ranging from the South African rand to the Indonesian rupiah: the Brazilian real, for example, temporarily fell almost 3 percent (Johnson and Simensen 2006). Seemingly particularly yoked together in February and March 2006 was the geographically diverse trio of Iceland, Hungary and New Zealand. The precise linkages are unclear, but seem to include the 'carry trade', a hedge-fund staple (though not a strategy employed by our fund). In this, a fund borrows in a low-interest-rate currency such as the yen or (until recently) U.S. dollar, and invests in the bonds or other assets of a high-interest-rate country such as Iceland. A significant depreciation of the currency of the high-interest-rate country can cause a carry trade to become loss-bearing,

and at one point on February 22 the Icelandic krona had fallen by 9 percent from its dollar exchange rate on February 20. What appears to have happened on February 22 is that 'the emerging market contagion [was] caused by investors cutting profitable positions in order to plug their Icelandic losses' (Johnson and Simensen 2006).

Finally, what of agency? An actor-network economic sociology does not itself attribute agency, but instead follows the way in which such attributions are shaped and channelled by factors including the composition and configuration of *agencements*. Agency is of course commonly attributed to individual human beings such as the trader, but is also often attributed to 'higher-level' entities. Our hedge fund, for example, is a legal entity, and the law of contract attributes agency to it, not to the individuals who comprise it: the trader may speak or write the words, but it is the fund, not him as individual, which makes a deal and takes on a commitment.

Under some circumstances, too, market configurations can be such that agency can seem to have left particular economic actors and to reside in the market as a whole: for example, in the crisis surrounding LTCM, hedge funds often had little or no choice as to their courses of action (MacKenzie 2003). The attribution of agency to 'the market' is indeed common when it is an entity invoked in political discourse, both right- and left-wing. More exotically, economic agency is also sometimes attributed to entities smaller than human beings, such as specific brain structures. Successfully doing so requires an *agencement* including specialist technical equipment, in particular a magnetic-resonance brain scanner, and is the terrain of the fascinating new field of 'neuroeconomics' (see, for example, Saufey et al. 2003).

The attribution of agency may seem an esoteric, academic issue, but for financial-market practitioners it is in fact a pervasive concern. Much of the rewards to traders and those immediately around them come in the form of bonuses that are supposed to reflect individual contributions to a firm's profits. Because *agencement* is collective, this 'singularisation' – the attribution of agency to specific components – is problematic, [9] and, unsurprisingly, is often the object of bitter jealousy and intense conflict. Its richness as a sociological topic has been demonstrated brilliantly by Godechot (2004).

The example of the attribution of agency reflects the overall merits of the notion of '*agencement*'. Used in a selective way, it can help trace linkages that are crucial in making up economic actors and framing contemporary economic life, thus throwing familiar phenomena into new light and uncovering surprising connections and underpinnings. *Agencements* constitute markets, and we cannot afford to treat them as black boxes.

[9] We owe this way of framing the point to Fabian Muniesa.

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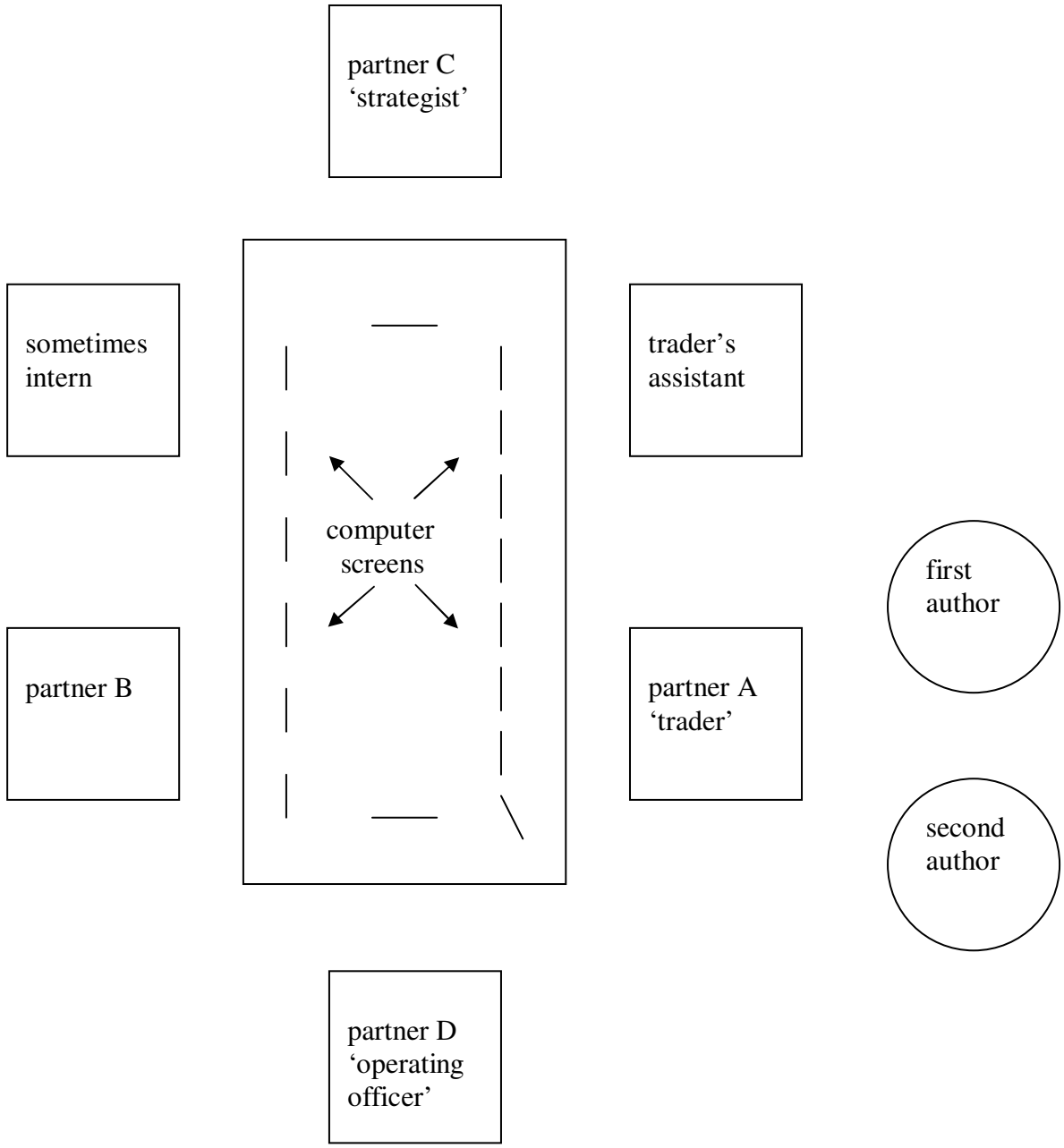

Figure 1: lay-out of the hedge-fund trading room.