

Theme issue contribution

## The Semiosis of Stock Market Indices: Taking Charles Sanders Peirce to a Trading Room


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### Abstract

Stock market indices are among the signs populating financial markets and allowing traders to support their valuation work. The movements of the Dow Jones and the S&P 500 are constantly monitored, but how are they interpreted? Is this interpretation unique to each trader? Does it depend on how the indices are communicated? Considering these questions, this article aims to illustrate the heuristic interests of Charles Sanders Peirce's semiotics. Peirce's concepts can elucidate that stock indices assume different semiotic statuses. Depending on the financial context in which they operate, their signification and thus their function for traders will vary. This article demonstrates the usefulness of these concepts through empirical illustrations drawn from the literature, the financial press and a fieldwork in a trading room. Beyond this case study, this article reveals how the Peircian toolbox contributes to the studies of valuation signs.

Keywords: stock market index; semiotics; finance; Peirce; trading room

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<https://doi.org/10.3384/VS.2001-5992.2023.10.1.10-31>

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<http://valuationstudies.liu.se>

## Introduction

Traders are overwhelmed by signs.<sup>1</sup> ‘This is the fate of all our contemporaries’, a postmodern thinker might reply. Admittedly, every city dweller is constantly stimulated by their environment (advertisements, passers-by, road noise ... ). However, they allow themselves to refuse most of these ‘propositions’; they adopt, for their psychic well-being, ‘the blasé attitude’ (Simmel 1995: 412). Since ‘nothing is a sign unless it is interpreted as a sign’ (2.308<sup>2</sup>), most urban stimuli do not flower into semiosis. This is different in trading rooms where signs are better received. According to the sociologist Charles Smith, this receptivity is the trader’s main mission: ‘The crucial task here is not to become fixated on any given set of markers at any given time, since new markers of importance are apt to appear suddenly while others are likely to disappear’ (Smith 2011: 279). This implies a permanent vigilance not only for signs, but also for the absence of signs, which then becomes a sign. As Smith notes, ‘some key markers take the form of the expected not happening: these markers make their mark by continuing to remain dormant’ (Smith 2011: 284). The trader’s semiotic work does not stop there though: ‘When a marker appears, it still needs to be interpreted within the existing context’ (284).

These ‘markers’ do not bring together all the signs that traders are confronted with. The work of interpretation involves discarding some stimuli deemed irrelevant (the attire of colleagues, the noise of the trading room fan, etc.). The markers evoked by Smith are the signs *that enable the valuation of financial products*. Only these markers are used by traders to revise their positions. Their scope is unclear: some are well established (price-earnings ratio, volatility, volume, etc.), others make rather cyclical appearances. For example, the generally insignificant attire of colleagues can become a relevant ‘marker’ if sweaty halos are perceived as an index of panic in the market managed by that colleague. In this article, I will adopt the semiotics of Charles Sanders Peirce to study a well-established valuation sign: the stock market index.

The contribution of this article is therefore predominantly theoretical. It presents the ‘toolbox’ of Peircian semiotics and demonstrates, through a case study, its twofold relevance for valuation studies. On the one hand, concepts relating to the relationship between

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<sup>1</sup> The term ‘trader’, often used generically to designate any participant in financial markets, will refer in this article to the profession which consists in buying and selling securities – whether for own account or within a mandate. Located at one extremity of the chain of participants (client-salesperson-trader or employee-pension fund-asset manager-trader), the trader is therefore the one in direct contact with the market which they monitor via their various screens.

<sup>2</sup> Peirce’s writings are referenced in the standard form: (n.m) refers to paragraph m of volume n of the Collected Papers.

a sign and its object (icon, index, symbol) allow a systematic description of ‘valuation signs’ through identification of the plurality of their meaning: a sign is not assigned, *a priori*, to a unique object. On the other hand, the second conceptual triad explored in this article (rheme, dicent, argument) opens the way for an analysis of the role of signs in the process of valuation, by suggesting certain hypothetical effects that can be tested empirically. Given this double contribution, I believe that pragmatist-oriented studies on relations between economic devices and valuation practices can benefit from Peirce’s toolbox. If its main purpose is to illustrate the heuristic virtues of this toolbox, the case study proposed in this article also sheds light on stock market indices, at the heart of contemporary stock markets but yet little studied.

The article is structured as follows: The first section presents the concepts of Peirce’s semiotics, which will be useful for analyzing stock market indices and then reviews previous works linking Peirce, valuation and financial markets. The following sections illustrate how stock indices can assume different semiotic statuses. Depending on the financial context in which they operate, their signification and thus their function for traders will vary. Finally, the conclusion focuses on the consequences for this theme issue of *Valuation Studies*, and for studies of valuation in general.

### **Key concepts of Peircian semiotics**

For Peirce, semiosis is a process of signification involving ‘the cooperation of three subjects’ (5.484): a sign or representamen (e.g. a cry) that refers to an *object* (a person’s fear or distress) for an *interpretant* (the effect produced: directing attention to the origin of the cry). This already implies the pragmatic dimension of semiosis. First, the relationship between the sign and the object (which will determine the one between the sign and the interpretant) is attached to a situation; in other words, only practice informs to which object the sign refers (for a cry: surprise, joy, distress, madness ... ). Second, the attribution of a semiotic status is contextual: a public cry can become the *object* if a witness plans to mime the situation, while the orientation of the witnesses’ attention can be a *sign* of an event ‘worthy of attention’ for other passers-by. Each component of semiosis, as well as each relationship between these three components, can itself take three forms.<sup>3</sup>

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<sup>3</sup> These triads are always structured around the three categories of Peirce’s philosophy: Firstness (pure quality remaining at the state of potential; for example, solidity), Secondness (actual causal relation; a stone hitting a wall), Thirdness (general mediation, ensuring predictability; the law announcing the reaction of the wall to the shock of the stone).

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The referral of the sign to the object can be iconic, indexical or symbolic (2.299). The icon *resembles* the object; it owes its semiotic power only to its own quality (a unicorn drawing is a sign, even if its object does not exist). The index<sup>4</sup> is *marked* by the object; it testifies to the object by a physical connection with it (a weather vane can only refer to its object if the wind actually blows). The symbol is associated by *convention* with the object; it refers to the object via a mediator who links them by virtue of a general rule (the semiotic quality of a word is based only on the convention regulating interpretation).

As for the relationship between the sign and the interpretant, it can be rhematic, dicent or argumentative. A rheme loosely determines its interpretant, limiting itself to *suggesting* a potentiality; ‘not true nor false’ (8.337), it is illustrated, in Peirce’s work, by phrases with blanks, such as ‘ -- *buys-- from -- for the price -* ’ (3.420). A *dicisign* transmits information ‘without furnishing any rational persuasion of it’ (2.313). It relies on previous experience to *submit* an interpretation. Peirce takes the example of a photograph: ‘the mere print does not, in itself, convey any information. But the fact, that it is virtually a section of rays projected from an object **otherwise known**, renders it a Dicisign’ (2.320, emphasis in the original). The argument, finally, *involves* its interpretant, whom Peirce then calls its ‘conclusion’ (2.95); deductive reasoning, for example, brings into play arguments that constrain the interpretant to the point of making it necessary.

	Firstness	Secondness	Thirdness
Relation to the object	<i>Iconic</i> (looks like)	<i>Indexical</i> (marked)	<i>Symbolic</i> (refers to by convention)
Relation to the interpretant	<i>Rhematic</i> (suggests)	<i>Dicent</i> (proposes)	<i>Argumentative</i> (implies)

Table 1a: Two triads of Peircian semiotics

Source: Author’s work, from Peirce (1931-5)

### Peirce and valuation studies of finance

This article’s approach lies at the crossroads of two research streams: valuation studies and the social studies of finance. In the first field of research, I take up the perspective of pragmatist-oriented works that grasp valuation as a *practice* rather than as the discovery of an essence or the convergence of desires (Muniesa 2011a). In this practical operation, ‘valuation signs’ are mobilized to make emerge and then ‘hold’ the value of things (Bourgoin and Muniesa 2016). For

<sup>4</sup> In this article, the term ‘index’ will be used alone, without qualification, when referring to the second element of the Peircian triad, and it will be qualified (‘stock market index’ or ‘stock index’) when referring to the empirical object.

example, as Philippe Lorino (2018) noted about Shewhart's control card (a management tool representing the evolution of a performance), 'manufacturing engineers often used control [cards] as manifestations of scientific truth in quality evaluation' (Lorino 2018: 247). Muniesa's (2014) theorization explicitly linked Peirce's sign theory to this research perspective. So far, this work has mobilized the icon-index-symbol triad. I continue and extend this work by paying attention to the two triads presented in the previous section.

In the field of social studies of finance, I join what could be called the 'informational' perspective. Researchers here have paid special attention to how financial market actors process massive flows of information in such a way as to reduce the uncertainty of their environment and make decisions (Arnoldi 2006). In this effort to reduce uncertainty, these actors will rely on situational cues: the content communicated by these cues, as well as the way they are communicated, is a key object of exploration for the 'informational perspective'. In this spirit, different studies have inspected the semiotic power – that is the potential as 'uncertainty reduction tools' – of trading volume (Schinckus 2010), data patterns stimulating high-frequency trading algorithms (MacKenzie 2018), 'spreadplots' (Beunza and Muniesa 2005), as well as the decisions and profiles of managers of listed companies (Certo 2003; Janney and Folta 2003).<sup>5</sup> Such an approach has not been applied to stock market indices. While the latter have been the subject of historical studies (Stillman 1986; Goede 2005; Hautcoeur 2006; Duterme 2021) and have recently attracted the attention of political economists (Petry 2021; Petry et al. 2021), they have never been studied for themselves in the context of the Social Studies of Finance. That said, as will be elucidated in the next section, they have become central features of financial markets and thus appear in several works that I shall mobilize as empirical support points.

Three articles have explicitly mobilized Peirce to grasp certain dynamics of financial valuation.<sup>6</sup> They lie at the conjunction of these

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<sup>5</sup> These last two publications are part of the 'signaling theory' initiated by the so-called Nobel Prize for Economics holder Michael Spence, that focuses on situations of information asymmetry in which 'one party, the sender, must choose whether and how to communicate (or signal) that information, and the other party, the receiver, must choose how to interpret the signal' (Connelly et al. 2011: 39). Constrained by the framework of neoclassical economics, the scope of investigation is therefore much narrower than that of Peircian semiotics (exclusively signals from humans to humans, consciously emitted and consciously perceived, implying a cost and a 'return', within the framework of information asymmetry).

<sup>6</sup> Two other publications refer to Peirce to study the financial sphere: Johnson (2017) proposed a brief analogy between the scientific community theorized by Peirce and the financial community, while Souleles (2020) relied on the icon/index/symbol triad to formulate a critique of the concept of 'semiotic ideology'. However, these two papers do not address the issue of valuation.

two fields and are therefore close to my perspective. First, Fabian Muniesa (2007) studied the stock market price itself, revealing the relationship between the ground (i.e. ‘the material vehicle of signification’) and the type of referral of the sign to the object (iconic/indexical or symbolic). He argues that different market technologies perform prices with different semiotic statuses. Thus, the Parisian closure call auction produced a price-sign whose indexicality ‘held’ (the sign bore witness to the actions of the operators, durably and consensually). Conversely, the ‘weighted mean’ (another technology implemented at the Madrid Stock Exchange) produced a price-sign with a low indexicality because it was ‘perceived as being “calculated from the outside”’ (Muniesa 2007: 388). Then, based on historical research on the Chicago and New Orleans futures markets at the end of the 19th century, David Pinzur (2016) compared the impact on volatility of two ‘semiotic infrastructures’ embodied by the classification practices of the products traded (wheat and cotton). Unlike the grade produced in New Orleans, the grade produced in Chicago was a bad index (because it was often manipulated) but provided a secure connection between the index (used on the spot market) and the symbol (used on the futures market). These semiotic qualities favoured speculation rather than hedging, explaining – at least partially – the greater volatility observed in Chicago. Finally, Benjamin Lee (2018) traced the evolution of the use of the ‘Black-Scholes model’ as an ‘indexicalization’ of this valuation sign. Designed to ‘reveal’ the price of an option from different market variables, the model was then ‘diverted’ to calculate one of the variables (volatility) from the market price, triggering some self-referential dynamics: ‘the calculation of implied volatility ties Black-Scholes to the indexical time of trading and the market; the starting and end points of the pricing process are the market prices of options’ (Lee 2018: 243).

Of these three pioneering pieces of research, the last one is the closest to my work. The reason is that the first two question the valuation of the sign itself (the price for Muniesa, the grade for Pinzur), and not the valuation that the sign allows – as a ‘valuation tool’ – to be instituted. Like Benjamin Lee (and Lorino in another field), I study the role (or, rather, the roles) that a sign plays in a process of valuing *something else*. While Lee explained the semiotic status of the Black-Scholes model in the valuation of financial products, I will explain the semiotic status of stock market indices.

## **Methodological approach**

In order to understand the different roles of stock indices in the valuation work of traders based on Peirce’s concepts, it is important to identify (1) what a stock index can refer to for a trader (sign-object relationship), then (2) the impact of this reference on their decision

making (sign–interpretant relationship). I approached the first part through fieldwork spread over two years (from March 2020 to April 2022). I first conducted exploratory interviews with five traders and distributed a questionnaire aimed at understanding what the main Belgian stock index (the BEL 20) represented for traders active in this market. Then, I deepened and broadened the initial findings through a three-month participant observation in a trading room of one of the main European banks. As an intern, I had the opportunity to conduct one to three semi-structured interviews with the 19 traders in the room and to spend days sitting next to several of them. I was thus able to address the first issue: the observation of what a trader looks at on their six screens, completed by requests for explanations.<sup>7</sup> This allowed me to identify the different objects to which a stock index could refer. These results have been corroborated in discussions with traders and, as we shall see, are frequently found in the financial press (*Bloomberg, Financial Times, Wall Street Journal ...*). In reality, they are not very innovative – at least for financial market professionals and commentators. At this stage of the approach, I used Peirce’s toolbox to put some order into these empirical materials. Specifically, his triad ‘icon-index-symbol’ offered an effective structuring of the different objects to which stock market indices refer.

The second part is more original and implied a reversal of the relationship between field and theory. The impact of these different relations between the stock index and its object on traders’ purchases and sales is more difficult to identify, above all, for very practical reasons. Not all appearances of the indices give rise to position taking (or not immediately; they are kept ‘in a corner of the head’). Decisions are always motivated by several factors: the moments of buying and selling are stressful and monopolize the trader’s attention, who cannot explain the reasons for their action while acting. Therefore, I had to operate in a more deductive way. Peirce’s conceptual architecture seemed to be particularly well-suited to this purpose. To each reference observed empirically (sign–object relation), I associate a theoretical effect (sign–interpretant relation). The result is a set of original but more speculative propositions. The following sections attempt to demonstrate their empirical relevance by using ‘vignettes’ from fields explored by other sociologists of financial markets. While they help limit the risk of excessive idiosyncrasy, these illustrations do not constitute proof. They reveal a certain relevance of conceptual hypotheses that remain open to challenge. The discussions and critical mobilizations that they can fuel even constitute their main contribution.

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<sup>7</sup> ‘Why do you devote a screen to the American indices?’; ‘why is the S&P 500 down?’...

Finally, it should be noted that my focus on the semiotic powers involved in the valuation work of traders leaves some issues unaddressed. These same stock market indices will present – under another ‘semiotic framing’ (Kockelman 2005) – other semiotic qualities: when the CAC 40 logo appears on the *Euronext* website, does the index not become the *object* of this iconic sign? Moreover, in addition to the value of a security, the stock market index can indicate the quality of the firm that calculates it (representative sample, consistent weighting, etc.) but also the ‘normal return’ (against which an asset manager’s performance will be evaluated). In other situations, it can also signal the health of the economy (when it is announced on the television news), the difficulty of paying a loan (if the rate is indexed to the S&P 500), or even the ‘financialization of societies’ (if it rises during an economic and health crisis). All these semiotic aspects, interesting as they are, will not be discussed here.

### **Stock market indices as valuation signs**

Formally, a stock market index is an average of the price of a sample of stocks, usually weighted by the size of each stock (i.e. the number of shares issued). During the 20th century, indices – produced by financial newspapers, national statistical offices or stock exchanges themselves – were one focus among many for market participants. In the 1970s and 1980s, their importance exploded as a result of an evolution in financial theory and its impact on portfolio management: the random walk hypothesis. This hypothesis argues that, given the random (‘Brownian’) movement of prices, no investor can, on average, obtain a better return than ‘the market’ as a whole. The indices were doubly impacted. First, in the academic arena, researchers wanted to test this hypothesis and therefore needed a representative of ‘the market’. This is how stock indices are invoked in most scientific articles. Sometimes, researchers try to demonstrate that an investment technique ‘[beats] the average represented by the S&P 500 Index’ (Sorensen et al. 1998). In other cases, they propose a new algorithm ‘to predict the stock price index’ (Kim and Han 2000). Second, in the financial world, several investment techniques – grouped together under the label ‘passive management’ – have sought to take advantage of the conclusions of the random walk hypothesis by investing in ‘the whole market’. This involved transforming indices into financial products. After an intense socio-technical process described by Millo (2007), index futures and index options emerged



and became very popular.<sup>8</sup> In addition, index funds offer to guarantee the performance of the index to those who invest in them; if they are listed on stock exchanges, these funds are called ‘exchange-traded funds’ (ETFs) – the ETF having become one of the main investment products, with US\$10 trillion assets under management (Statista 2022).

This explosion in popularity has transformed the way stock market indices are produced. They now represent very profitable brands for the few companies owning them – MSCI, S&P Dow Jones Indices, FTSE Russell and Euronext – which are constantly trying to adapt to the needs of their clients, to the point where Bloomberg now references more stock indices than stocks (Dutermé 2023a)! Despite this proliferation, the historical stars – Dow Jones, S&P 500, CAC 40 ... – remain the most influential indices. Who do they influence? First and foremost, asset managers. If they adopt a passive strategy, they *de facto* delegate their decision-making powers to the index engineers (Petry et al. 2021). If, instead, they are active managers, the indices dictate the performance benchmark against which they will be assessed, encouraging them to deviate little from passive management. As early as 2006, MacKenzie noted that ‘if, as was increasingly the case, a manager’s performance was judged relative to an index such as the S&P 500, then there was some safety in selecting a portfolio that closely resembled the makeup of the index’ (MacKenzie 2006a: 86). However, asset managers are not the only ones to be more influenced by indices since their popularity exploded. Traders are forced to consider them carefully in their valuation work.

The traders at the heart of this article are equity traders, responsible for trading on (a specific part of) the stock market, although we will see that other traders are also impacted by stock indices. Equity traders are traditionally distinguished according to the ‘side’ of the financial system in which they operate: ‘sell-side traders’ respond to requests from clients for which they act as counterparty (which implies giving a price to the requested product and then hedging the position taken), while ‘buy-side traders’ manage a portfolio of products that they hold (typically within an investment mandate of a fund). Although this distinction is important for grasping the potential variety of traders’ responsibilities, it will not impact the rest of the analysis because, in both cases, their main job is to assess the value of

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<sup>8</sup> An index option gives the holder the right to sell or buy the index at a predetermined price and date, while the index future establishes a transaction at a predetermined price and date. Since indices – unlike the agricultural commodities that are the source of these derivatives – are not ‘deliverable’ at the maturity of the contract, the holder obtains from the seller the difference between the predetermined price and the market price at maturity (if positive, of course).

the securities for which they are responsible.<sup>9</sup> In both cases they rely on signs. These signs include stock market indices as an icon, index and symbol. The predominance of one semiotic dimension over the other depends on the specific stock market situation.<sup>10</sup>

First, the stock index can refer to its object as an icon, by virtue of its resemblance: it is the representative ‘of the market’. I have mentioned that this is the case in the financial economics literature, but also on the trading floor, where comments on the state or sentiment of ‘the market’ are frequently associated with stock index movements. Financial commentators take up – and help to stabilize – this first sign–object relation, as in the following excerpt: ‘the July signal was not as good as many of the previous signals, but it still preceded a 10% rally in the S&P before the market reversed’<sup>11</sup> (White 2022); what has ‘reversed’ is the price of the S&P 500, but it is now referred to as ‘the market’. Note that this iconic quality is independent of its object (‘the market’). Moreover, a little bit like the drawing of a unicorn can dispense us from proving its existence, the stock index as an icon of the market allows us to avoid a definition of this object, since it is confused with the object. A good icon-index is representative *whatever the definition of the market*, that is, independently of its object – which is well in conformity with the Peircian definition of an icon.

As for its role in the traders’ valuation effort, I argue that the index has a *rhetic* relation to the interpretant. This is a relation of incomplete determination (see the example of Peirce’s phrases with blanks). In fact, an index-icon does not imply any univocal reaction or even proposes a type of response. It only conveys potentiality about the state of the market. A rise in the index *can* mean a future rise (and have the *buy* as interpretant), but *can* also mean, if the point reached is a ‘peak’, a future fall (and have the *sell* as interpretant). In this respect, it is indicative that this sign is coveted by technical analysis. This has been the case for a long time: the Dow Jones was conceived in 1896 by Charles Dow precisely to develop his own technical analysis (the ‘Dow

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<sup>9</sup> Another frequent distinction separates traders according to their type of strategy: scalping, day trading, swing trading, arbitrage, technical trading ... Again, these categories are not central here, because none of them exempts the trader from the essential work of stock valuation (even when this work is assisted by an algorithm). However, we will see that there are ‘elective affinities’ between certain semiotic properties of stock indices and certain trading strategies.

<sup>10</sup> Let us note, by the way, that with regard to another Peircian triad dealing with the nature of signs ‘for themselves’, the stock market index is always a legisign, that is to say, a sign of a general nature established by convention. ‘Usually established by men’ (2.246), the legisign is illustrated in Peirce’s work by a word or a graph (independently of their practical realization, their replica which is a sinsign).

<sup>11</sup> I mobilize articles from *Bloomberg*, rather than the *Financial Times* or the *Wall Street Journal*, on purpose: the Bloomberg Terminal, which relays these articles, is the platform most used by traders and contributes to disseminating certain interpretations of events (Duterme 2023b; Carluier 2005).

Theory'). Even today, indices are popular tools for many technical analysis models (Edwards et al. 2018). As opposed to fundamental analysis which is based on an examination of company balance sheets, technical analysis bases its predictions on the trends 'revealed' by the history of stock prices. It is characterized by the openness of its interpretation: two traders using technical analysis can, from the same sign, deliver contrary recommendations. Thus, Olivier Godechot (2016) relates the predictions on CAC 40 movements made by the technical analyst of a trading room: 'He envisioned a fall that should either stop at 2812, or at 2784, or in the worst case at 2650, unless prices should rise, in which case it would reach 2857 or 2885' (2016: 424). In conclusion, as an icon, stock market indices do not reduce the uncertainty of the valuation of financial products.

Second, the stock market index can refer to its object as an index when it 'physically' bears the mark of its object. As I have shown, stock indices are now treated as products in their own right, autonomous entities from the stocks they aggregate. When one invests in an S&P 500 ETF, they invest in the S&P 500 index as such. Therefore, as with any financial product, stock indices can signal some behaviours by the brand they imprint on it. They become an index of 'the attitude of other investors'. Again, this sign-object relationship is part of the common sense of traders and often comes up in financial commentary. For example, a Bloomberg analyst recently described the movements of the major US stock index as: 'after a bounce that started around noon in New York and was attributed to a big options trade, the S&P 500 came back lower again' (Nazareth 2022a).

In practice, this indexical relationship takes two forms. The most explicit is the recognition of the 'paw' of a financial operator in a movement of the index price or of its order book (all bids and asks pending). This phenomenon appears regularly in trading rooms and has been identified in previous research. The anthropologist Caitlin Zaloom (2003) gives the example of the 'spoofers'<sup>12</sup> that the London traders she met were trying to unmask: 'Traders learned to identify a spoofers by watching changes in the aggregate number of bids or offers on the screen' (2003: 10). Without focusing on this phenomenon,

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<sup>12</sup> The 'spoofing' is a technique consisting of entering very large buy or sell orders in order to inflate the volume on one side of the order book (bid or ask), then to cancel these orders. The objective is to make other traders react in the direction desired by the spoofers.

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Donald MacKenzie (2006a) notes two other illustrations.<sup>13</sup> Finally, Fabian Muniesa (2011b) found that traders are not the only ones to exploit the indexicality of stock market indices (and other financial products): market surveillance officials also manage to detect the activity of ‘arbitrage traders’ through the movements of CAC 40 stock. The second form of this indexical relationship is not offered spontaneously to the eyes of traders; it involves an intervention in order to be ‘unveiled’. It is the recognition of the positions of other financial operators in the depth of the index’s order book.<sup>14</sup> If a moderate buy order doubles the price of the S&P 500, it is an index of the weak presence of other operators at the sale. This sign, as frequently seen as the previous one, therefore requires intervention in the situation, taking a position in order to ‘test the market’.

And what is the effect (on the valuation of financial securities) of the stock market index as an index? In its relation to the interpretant, this second type of index is a *dicisign*: it transmits information without proof of its validity. Unlike the rheme, the informational content of the *dicisign* is sufficiently structured to be true or false (e.g. it is indeed a spoofer or not), but – unlike the *argument* – it does not, in itself, provide ‘any rational persuasion of it’ (2.313) (i.e. the proof that it is indeed a spoofer or not). Another characteristic of *dicisign* is its reliance on prior knowledge: Peirce’s print only becomes *dicisign* when a photograph is recognized in it, when it is associated with an already established landmark. In the example given by Zaloom, the evolution of prices only provides information on the presence of a spoofer if the principle of the order book is kept in mind. Without this ‘background knowledge’, the numbers displayed on the trading screen would not reach *dicisign* status. Without convincing, *dicisign* thus allows one to frame the interpretation: ‘traders try to gain contextual clues from their interactions with other traders (...); [this] helps traders create

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<sup>13</sup> At the end of the 1990s, ‘arbitrage traders’ recognized in the movements of index prices certain strategies of traders from the Long-Term Capital Management fund. Earlier, during the crash of 1987, the decline of the S&P 500 was associated with the behaviour of traders from portfolio insurers (forced to sell to secure the floor they guarantee to their clients): ‘the crowd detected a pattern of a guy who had to sell as the market went lower. So what you do? You push lower’ (quoted in MacKenzie 2006a: 186). In these two cases too, the ‘proposed’ interpretant is mimicry (cf. Table 1b below).

<sup>14</sup> In an ‘order-driven’ market, buy (resp. sell) orders are ranked in descending (resp. ascending) order to establish the price range (bid–ask spread) of a security. The depth of a security can be understood as the capacity of its order book to ‘absorb’ large volumes of purchases or sales without the price varying greatly (this happens when a large number of orders have been introduced close to the bid–ask spread: even a large buy order can be absorbed by these numerous sell orders without straying too far from the price range). Depth therefore provides information on the ‘state of the forces at play’. Finally, it should be noted that this second form of indexicality can also be found in a ‘price-driven’ market (e.g. by testing the counterparty’s reserves).

understandings of market fluctuations that direct their decisions to enter and exit the market' (Zaloom 2003: 7). As Zaloom notes, this type of marker 'directs', but does not 'determine' the valuation effort of traders. As *dicisigns*, stock market indices therefore propose an interpretant; the latter can be picked up by the formula: 'follow him!'.

On financial markets, information on the position of competitors (whether judged from the price movements or revealed in the evolution of the bid–ask spread) offers an opportunity for profit. The *index-dicisign* says 'follow him!' What does it mean? For example, when the index (through its price or bid–ask spread) signals important upward pressure, it *suggests* that the index should be valued more and thus bought and vice versa. In other words, it invites adoption of a mimetic behaviour. Note that the 'to take advantage of the future appreciation' is a rationalization of the interpretant that is not included in the *index-dicisign* itself and is therefore largely dependent on the example: the same semiotic quality can produce, in other illustrations, very different or even opposite rationalizations (e.g. 'to avoid future loss'). This means that the advice 'follow him!' does not contain the reasons for following him. Since it is not rationally founded, this interpretant is not necessary. The case of the spoofer perfectly embodies this persistence of uncertainty. In fact, if a trader relies on the indexicality of the index to interpret a price movement as a symptom of the action of a spoofer, 'follow him!' will no longer translate into an imitation, but into a stalking: '[traders] aspired to "take out" the Spoofer by calling his bluff, selling into his bid, and waiting for him to balk' (Zaloom 2003: 10), which gives rise to a reverse valuation (selling rather than buying in the face of upward pressure). More generally, a trader can also take the opposite side of the '*dicisign* advice' if they judge the position of their competitors to be 'unfounded' or revealing a 'short-lived bubble'. In sum, as an index, the stock market index gives financial operators a grip by reducing uncertainty, while at the same time leaving room for doubt. More stabilized than technical analysis, it is still less so than logical reasoning.

Third, the stock exchange index can refer to its object as a *symbol* when it functions as a convention. The most popular stock market indices are formidable centres of attention and are therefore at the origin of the well-known self-referential sequence. When everyone looks at the index, everyone knows that everyone looks at the index and thus everyone tries to look at it as everyone else looks at it. From this dynamic popularized by Keynes's (1936) beauty contest, a collective perception of the index is born. This perception is not the result of each individual's view of the index, but of each individual's view of what the collective view of the index is. In other words, each member of the group learns to read the evolution of the index *as the group reads it*. This interpretation will be reinforced by a broad

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adherence (if every member shares it, it will effectively represent the ‘collective gaze’) and destabilized by dissident readings. These are the features of a *convention* (relatively arbitrary, collectively sanctioned, nourished by repetition ...); the association between the prices of the index (sign) and a collective interpretation of these prices (object) is thus of a symbolic nature.

This association is found in the press when financial journalists invoke shared understandings of the financial community to account for the movements of a stock index: ‘It was a sea of red across equity trading desks, with the S&P 500 briefly breaching its June closing trough (...). Chartists looking for signs of where the rout might ease had identified that as a potential area for support’ (Nazareth 2022b). Traders associated the crossing of a symbolic milestone (the June closing of the index) with a technical interpretation known to all (once this threshold is crossed, the decline will be accentuated), which fed the validity of this association since these traders wanted to sell before the lowest point (‘sea of red’). These articles, just like the textbooks taught in business schools that use their content, stabilize the convention, notably by facilitating its transmission. As a child learns the conventional association between words and things, the young trader learns to associate prices of the index and the collective opinion.<sup>15</sup>

A well-known and several times empirically observed phenomenon (Cyree et al. 1999; Lobão and Pereira 2016; Woodhouse et al. 2016) provides an illustration: the abnormality of the movement of stock market indices when they approach ‘round numbers’ (e.g. prices ending in 00). For example, the growth of the Dow Jones has been regularly interrupted near the threshold of tens of thousands. Behavioural finance links this phenomenon to biased reasoning: investors tend to cling to benchmark numbers that should not be relevant to a rational individual. But this hypothesis becomes hardly tenable when one discovers that traders are generally aware of this phenomenon (Mitchell 2001). It is therefore likely that this ‘roundphobia’ is more the result of collective reflexivity than of behavioural bias. If the trader has learned to associate a stock index movement (a rise approaching a round number) with a collective interpretation (‘fear’ preventing prices from reaching this number), their decision not to buy in order to avoid the stagnation (or even the fall) of prices is not irrational. On the contrary, it is rational reasoning – based on the symbolic quality of the stock market index – that explains the persistence of this conventional phenomenon.

Reflexively, the trader recognizes in a sign a type of reaction specific to their community (not to buy as a round number approaches) and relies on this information to react by *imitation*. Imitation must be

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<sup>15</sup> Tullio Viola (2018) relies more on Mead to characterize this institutional power of the symbol that ‘allows the individual to adopt the attitude of a generalized Other and to internalize the attitude of other members of the community’ (Viola 2018: 83).

distinguished here from the mimicry that characterized the interpretant of the stock index as an index: whereas the ‘follow him!’ implies a ‘simple’ mimicry (copying the other’s behaviour, regardless of the motivation for this behaviour), imitation ‘requires copying both the form and function of another’s behavior (both what others do and why they do it)’ (Kockelman 2005: 294). Our trader’s reflexive reaction is to adopt the same attitude as their peers (not to buy) for the same reason as their peers (each judging that the community is afraid to cross some thresholds). By the same token, the nature of the relationship between the sign and the interpretant is no longer *dicent* (proposal of an unproven answer), but *argumentative* (deduction of a proven conclusion). Where the index-*dicisign* transmitted information without rationalization (detection of a presence through price movements or bid–ask spread, but without proof that it is a spoofer), the index-argument relies on a ‘law’: the growth of the index weakens around a round number, *by virtue of roundophobia*. The interpretant, taking a short position, is therefore logical. It is even necessary, because the law covers all potentialities, present and future: the slowing down of the index around round numbers is certain, conditionally, not to future behaviours, but to the ‘law’ pacing them. In other words, this sign can only produce other effects if it violates its own rationalization, that is, if it is no longer a symbol-argument. The adoption of a short position by the trader perceiving the sign is the *conclusion* of this sign.

This symbolic quality of the index is the most general and comes to weigh on markets other than equities. Despite the weak connections between equities and their scope (foreign exchange), one trader I met devoted half of one of their six screens to the evolution of major stock indices and justified it as follows: ‘because of self-fulfilling prophecies’. At the same time, all equity derivatives markets are symbolically linked to indices. Traders watch the movements of the index to establish the value of index-based derivatives. One might even say that, in the case of index futures and index options, the symbolic relationship has stabilized to such an extent that traders fluently interpret them as if they were reading in their native language. Formalization has contributed to this evolution: until the mid-1970s, traders deduced the value of derivatives from those of the underlying assets, based on certain ‘traditional rule-of-thumb heuristics’ (MacKenzie 2006a: 257) similar to *roundophobia*. These rules were then supplanted – or extended (Haug and Taleb 2011) – by the Black-Scholes model, which enjoyed tremendous success in the financial community. Once they were widely adopted (notably because they were accessible to all), the equations of this model made it possible to stabilize the link between the value of the underlying (in this case, the index) and that of the corresponding option. The model was later embedded in price evaluation software.

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Regarding the interpretant, this type of sign results in an adjustment of the trader's position which is logically deduced from the sign itself. This adjustment is generally entrusted to an algorithm (again, modelled on the risk hedging techniques initially proposed by the Black-Scholes model). It is not surprising that algorithmic techniques can support, or even supplant, the trader's interpretation of this type of sign; their functioning fits easily with the generality and necessity of the symbolic-argumentative relationship of a Peircian triad. Moreover, we could imagine, if the convention hardens to the point of crossing the threshold of mathematical formalization, an algorithmic treatment of *roundophobia*. Conversely, the interpretant of the stock index, as an icon and index, seem too weakly marked out to allow for deterministic treatment. However, here again, as the appearance of the 'volatility smile' showed (MacKenzie 2006b), control of the future allowed by the stock market index remains relative.

Below, I reproduce Table 1b now completed with the salient features of the three semiotic statuses of stock market indices.

	First index	Second index	Third index
<b>Relation to the object</b>	<i>Iconic</i> (looks like the market)	<i>Indexical</i> (marks the behaviour of peers)	<i>Symbolic</i> (refers to a collective interpretation)
<b>Relation to the interpretant</b>	<i>Rhematic</i> (suggests potentiality on the state of the market)	<i>Dicent</i> (proposes a mimetic response)	<i>Argumentative</i> (implies a revision of the position)
<b>Examples</b>	Technical analysis, general impressions on the state of the market	Detection of a spoofer, interpretation of a shocking fact (e.g. a sharp rise)	<i>Roundophobic</i> Black-Scholes model, unanimous conclusion of a typical phenomenon

**Table 1b: Two Peircian triads applied to stock market indices**

Source: Author's work, from Peirce (1931-5)

## Conclusion

By mobilizing the triad 'icon-index-symbol', I have conceptualized the significations of stock market indices in the trading room. In a certain way, they always evoke the market: by constituting a representative sample (icon), by bearing the imprint of the forces at work (index) or by referring to a shared reflexive interpretation (symbol). By adding the triad 'rheme-*dicent*-argument', I was able to grasp the indices as valuation signs, through their effects on traders' interpretation. This allowed me to explore the ways in which stock



market indices *could* be used by traders as a basis for their decisions. To explore this issue, which is at the heart of this theme issue, I conclude by briefly addressing a question that may have confused the reader: if the index as a symbol-argument is more effective in reducing uncertainty, why would traders rely on the stock index as an icon-rheme or index-*dicent*?

In my field experience, some traders refused to rely on stock index as an icon-rheme ('I don't believe in technical analysis') and as an index-*dicent* ('it's too risky: other orders can bypass me, like the algos'). On the other hand, others used them generously, devoting two of their six screens to technical analysis (to 'spot patterns in the market') or scrutinize the dynamics of the order book (to identify the 'big players'). To account for these situations without resorting to the behavioural perspective of 'bias', two approaches exist. The first is 'genealogical' (Viola 2018), whereby today's symbols are yesterday's successful icons and indices. Some of today's extravagant interpretations of technical analysis could therefore achieve the symbol's degree of certainty if they convince enough to stabilize. Conversely, today's symbols, unanimously approved, could not have germinated without the effort of lonely precursors. It is therefore useful to look at the stock market index as a rheme: it could reveal the symbol to come. The second approach is more institutional: in financial markets, consensual signs are not profitable. For example, once they were integrated into pricing software, the Black-Scholes equations could no longer be used to exploit discrepancies between theoretical and actual prices, precisely because their success made such discrepancies disappear. Traders who use technical analysis often put forward this argument: 'it allows me to see things before others' (interview extract).

The pragmatic turn in sociological research on economic valuation has brought to light processes that reifying conceptions of value had tended to ignore (Muniesa 2011b; Elder-Vass 2022). Indeed, many works have done justice to the roles of unsuspected objects, such as the underlying assumptions of models, graphs or computer cables. This theme issue has called for new concepts and tools that help us to better understand the semiotic and dramaturgical aspects of valuation. For there is a need. The massive recourse to the concept of 'performativity' in this field of study is symptomatic: this concept allows us to grasp a type of impact of a device on valuation practices (Sparsam 2019). However, performativity captures only one of the modalities of this 'device-valuation' relationship. Peirce's concepts can help to fill this gap: as the summary tables illustrate, they offer a systematic view of the plurality of sign contributions to valuation, from the most loose and unstable ('rhematic') to the most instituted and performative ('argumentative').

As this article has shown from a study of stock market indices, mobilizing Peirce's concepts offers two types of insight. On the one hand, it allows us to identify the plurality of objects to which a sign can refer – without enclosing these objects in a relation of internal correspondence determined *a priori*. In other words, and contrary to non-pragmatist semiotic concepts (such as the 'signifier-signified' pair mobilized by Schinckus 2010), the 'icon-index-symbol' triad is sufficiently flexible to shed light on the plurality of significations, but also on their evolution (e.g. the tendency towards symbolization of language evoked by Peirce). This first contribution refines the *description* of 'valuation signs' and enables us to put some order into the empirical material. On the other hand, the Peircian toolbox makes it possible to elaborate conceptual hypotheses concerning the roles of devices in valuation processes. The triad 'rheme-*dicent*-argument' can indeed be conceived – and has been effectively conceived in this article – as a set of propositions that need to be tested empirically. This second contribution is the most original and enriches the *analysis* of valuation signs.

This article thus opens the way for a Peircian study of other valuation signs. The economic sociology literature is full of potential candidates. For example, central bank interventions, like stock market indices, are signs that are closely monitored by many financial market actors. Their semiotic dimension has already been raised (Holmes 2013; Braun 2015). The Peircian toolbox could be used to structure and enrich this work, first by clarifying the objects to which central bankers' interventions can refer, depending on the 'enunciation context' – as an index (are securities purchases identified in prices?) or as a symbol (a conventional reference to the future state of the economy?) – then by suggesting different impacts on traders' decision making – as a rheme (during ambiguous communication?), *dicent* (following price movements driven by the Central Bank?) or argument (automatic conformism according to the adage 'Don't Fight the Fed'?<sup>16</sup>). The Peircian framework thus offers both a logical organization of empirical material and an opening to potentially unexplored avenues. Its formalism may seem costly to adopt, but this article has tried to highlight the many 'returns' of such an investment.

### Acknowledgments

I would like to thank the *Fonds de la recherche scientifique* (FNRS) for supporting this work, as well as Jean De Munck and Catherine D'Hondt for their valuable comments. I also thank the anonymous reviewers for their insightful suggestions. Finally, I am grateful to

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<sup>16</sup> Moreover, attempts at automated processing of monetary policy decisions seem to suggest a tendency towards symbolization (Goshima and Kumano 2019).

Brecht Rogissart and Laura Cauwenbergh for their meticulous proofreading and writing tips.

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